THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF EDWARD CHERIAN ON BEHALF OF GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name and business address.

A. My name is Edward Cherian. My business address is P.O. Box 326, Concord, New Hampshire, 03302.

Q. Who is your current employer and what position do you hold?

A. I am employed by Iberdrola Renewables, Inc. ("IBR") I currently hold the position of New England Development Director.

Q. Please summarize your educational and professional background and experience.

A. I hold a B.A. from Syracuse University and a Masters of Public Administration from Virginia Tech University. I have worked on renewable energy projects since 2000, including numerous wind and hydropower projects. Since March of 2007, I have been employed at Iberdrola Renewables, and have responsibility for New

England wind development activities. Prior to working for Iberdrola, I was employed at environmental and engineering companies, working on renewable energy projects in New England and elsewhere in the United States. My current responsibilities include project management, wind project development, the coordination of permitting and engineering activities, and coordination with local officials, boards, and citizens. I have also had responsibility for contract management, construction management, and negotiating agreements related to local operations, power purchases, and interconnection. For the Lempster Wind Project, I led the final permitting activities, and served as the Project Manager during the construction phase with responsibility for all phases of the project's construction.

Q. Please describe your current employment responsibilities.

A. My current responsibilities include directing all development activities for the Groton Wind Project proposal, early-stage development activities for other potential New England wind projects, and some remaining tasks for the Lempster Wind Farm.

Q. How do your past and current responsibilities for the Lempster Wind and/or any other wind energy projects bear upon the Groton Wind Project?

A. My responsibilities and experience with the Lempster Project, in addition to my involvement with other wind projects in New England and elsewhere, inform and support my work on the Groton Wind Project, and provide the experience base necessary for a disciplined and comprehensive approach to development. IBR is the only company that has obtained a Certificate of Site and Facility from the New Hampshire Site Evaluation Committee ("SEC" or "Committee"), constructed the certificated project, and

is now successfully operating the same project. My managerial role and experience with the successful Lempster Project has provided valuable lessons and experience which will greatly assist the Groton Wind Project.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to provide the Committee with background information about the Applicant and the Project, and with information on the following topics that are contained in Groton Wind, LLC's Application: alternatives to the Project that were considered; the Project's consistency with the orderly development of the region; consideration of the views of municipal and regional planning commissions and the Groton Board of Selectmen; the Project's anticipated impacts on local land use, the local economy and local employment; the Project's consistency with the objectives of RSA 162-H and with other public policies; and the Project's impacts on air quality. In addition, my testimony is intended to support and sponsor information contained in the Application that is not specifically addressed or supported by other witnesses.

Applicant Information

Q. Please provide information about the Applicant and the companies with which it is affiliated.

A. The entity that has submitted an application to the Committee for a Certificate of Site and Facility for the Groton Wind Project is Groton Wind, LLC ("the Applicant"). Groton Wind, LLC is a limited liability company registered to do business in the State of Delaware. Groton Wind, LLC was organized for the development and

ownership of this Project and is 100% owned by IBR which is headquartered in Portland, Oregon, and has offices in several United States locations, including: Radnor, PA; Concord, NH; Portland, ME; Houston, TX; New York, NY; Chicago, IL and elsewhere in the United States. IBR has successfully financed, constructed and now operates 36 wind energy facilities in the United States, including the Lempster Wind Project in New Hampshire. IBR's parent company is Iberdrola Renovables, a company that is publicly traded on the Madrid stock exchange and the largest owner of renewable energy projects in the world. Iberdrola Renovables, in turn, is 80% owned by Iberdrola, SA, the second largest integrated utility company in Spain engaged in the generation, transmission, distribution and marketing of electricity and natural gas. Iberdrola Renovables has over 10,000 MWs of installed wind capacity worldwide, including within the United States. IBR has over 3,000 MWs of installed wind capacity in the United States at 36 wind farms located in 19 different states. In 2008, IBR installed 1,337 MWs of wind power in the U.S. Iberdrola's strategy includes a commitment to the long term ownership and operation of wind power facilities worldwide.

More information about the Applicant and its affiliated companies is contained in Sections B and H.5 of the Application. In addition, Mr. Pablo Canales' prefiled testimony provides further details on Groton Wind's and IBR's financial capabilities to construct and own the Groton Wind Project in continuing compliance with the terms and conditions of any certificate that the Committee may issue as the result of this proceeding. Also, Mr. Kevin Devlin's prefiled testimony addresses Groton Wind's and IBR's technical and managerial capabilities.

Site Information

Q. Please describe the location and basic characteristics of the proposed Project site.

A. The Project site includes approximately 4,000 acres of privately-owned land, all of which is located in the Town of Groton, New Hampshire in Grafton County, approximately 5.3 miles southwest of downtown Plymouth. Groton Wind, LLC has entered into long term leases with the owners of this property. The leased property is bounded by Route 25 to the north, Tenney Mountain Ski Resort to the east, the New Hampshire Forest Society's Cockermouth Forest to the south, and Halls Brook Road to the west. Newfound Lake is approximately 3 miles south of the Project area. The Project site is situated along two ridge features known as Tenney Mountain and Fletcher Mountain. These ridges are separated by a valley known as Groton Hollow. Both ridges are oriented in a northeast/southwest direction and range in elevation from 1,520 to 2,300 feet. As indicated in Figure 3 of the Application, twelve (12) of the Project's wind turbines are proposed to be located along Tenney Ridge in a north-south direction. Six (6) turbines will be similarly oriented on the southern knob of Fletcher Mountain and six (6) additional turbines will be located on the northeast knob of Fletcher Mountain. The Project site will be accessible via the existing Groton Hollow Road. Access roads within the Project area will follow a central, existing logging road from Groton Hollow Road. Locations within the site will also be accessed by using other existing logging roads, skidder trails and landings to the extent practicable.

The Project area is forested and primarily consists of a mix of northern hardwood and conifers. The primary activity within the Project area is timber harvesting which has occurred since the 1800s. In addition, some recreational activity occurs there, including hunting and snowmobiling. More detailed information about the location and characteristics of the Project site and surrounding area is found in Sections C (1) through C (5) of the Application. In addition, Section I of the Application provides information about the natural and other resources at the Project Site.

Facility Information

Q. Please provide information about the basic design of the proposed wind energy facility.

A. The Groton Wind Project is a 48 megawatt ("MW") facility that will consist of 24 wind turbine generators manufactured by Gamesa Energy USA, of Ebensburg, Pennsylvania, each with a capacity rating of 2.0 megawatts ("MW"). In addition to the turbines, the Project will consist of access roads, crane pads at each turbine location, staging areas, an electrical collection system composed of underground and overhead power lines, an electrical switchyard, an operations and maintenance building, a meteorological tower and associated support facilities. More detailed information about the type and size of each major part of the Project is contained in Sections E.3 and H.1 of the Application. In addition, a map showing the locations of the major components of the Project is contained in Figure 3 of the Application.

Q. Please explain how the power produced by the Project will be delivered to the electricity grid.

A. The Project is expected to deliver electricity via standard distribution system level, three-phase power (34.5 kV), via an on-site switchyard. The power is expected to be conveyed on the New Hampshire Electric Co-Operative ("NHEC") and Public Service Company of New Hampshire ("PSNH") local electrical distribution grid via two dedicated 34.5 kV distribution line circuits. This line will be approximately 13 miles long, and is expected to interconnect the Project's output to the PSNH Beebe River substation.

A Feasibility Study analysis was performed by PSNH evaluating six (6) different interconnection alternatives. PSNH evaluated alternatives that would interconnect the Project into the Ashland Substation, the Beebe River Substation, or both substations. The Feasibility Study was performed to determine the feasibility, maximum project size, and operating constraints for the various interconnection alternatives. For the Feasibility Study, PSNH performed steady state and transient analysis to verify the Project does not adversely impact the PSNH system. As part of the study process, the results were shared and reviewed with the Independent System Operator of New England ("ISO-NE") and NHEC. It was determined that the Project could feasibly interconnect into either the Ashland or Beebe River substations, given certain conditions.

Following completion of the Feasibility Study, the Project has elected to proceed with plans to interconnect the Project at the Beebe River 34.5 kV Substation. This option

is currently undergoing a more detailed interconnection study, including stability, power flow and short circuit analysis.

Q. Please describe the Project's anticipated capability to produce electricity.

A. Based on on-site wind data collected since 2004, it is anticipated that the Project's net capacity factor will be 33.0%-36.0%. Based on this projected capacity factor, the Project is expected to produce approximately 144,375 to 157,680 Megawatt hours (MWh) per year. Translated to residential electricity consumption, the Project will produce enough electricity, on average, for approximately 19,000-21,000 New Hampshire homes, and approximately 58,000 New Hampshire homes during periods of peak production.

Consideration of Available Alternatives

Q. Did Groton Wind consider any other available alternatives to the proposed site for this Project? If so, please describe those alternatives and explain why they were not selected.

A. The criteria used by Groton Wind, LLC to select the site for this Project are described in Section H.2 of the Application, and the alternatives considered are described in Section H.2.a. Among the alternatives to the instant Project which were considered was a larger project (i.e. up to 80 MW) in Groton, in which more turbines would be placed along Fletcher Mountain and additional parcels. Groton Wind had brief discussions with other landowners to explore this alternative; it also performed a desktop evaluation of wind resources for this larger project. This alternative was ruled out for

several reasons. First, the proposed location for this larger project would have involved very difficult engineering for some portions of the access roads. Second, the larger project would have required a much greater length of access roads thereby creating additional expense and potential environmental impacts. In addition, one of the owners of land that would have been needed for this alternative project decided not to participate in the Project. Lastly, an 80 MW facility would have required a different interconnection approach which preliminary analysis revealed would be very limited and expensive. Groton Wind desired to keep the Project at a level that would permit interconnection via the local electric distribution system, which would not have been possible with a larger project.

Within the land parcels which have been leased for the proposed Project, a number of alternative layouts or designs were considered. The Project's current design is preferred to all of the other alternatives that were considered because it provides for more efficient and economic use of resources with fewer environmental impacts.

Orderly Development of the Region

Q. Please state whether you believe the Project will unduly interfere with the orderly development of the region and explain your position.

A. I believe the Project is consistent with the orderly development of the region and therefore will not unduly interfere with it. The land within the Project area is primarily used for commercial timber harvesting and has been logged since the 1800s. Other activities in the immediate area include hunting and snowmobiling. Within the surrounding region, activities include: skiing and hiking (at the Tenney Mountain

Resort); sand and gravel excavation; seasonal camping; tourism; wood product production (e.g. wood chips, pellets and logs); commercial enterprises along Route 25; and some scattered agricultural activity. The general area also includes residences and undeveloped forests.

The activities mentioned above can easily co-exist with the Project. In particular, based on my experience with the Lempster Wind Project and anecdotal information from local residents regarding the number of tourists that the Lempster Project is attracting, it is expected that the Groton Wind Project will encourage additional tourism in the area.

The Project is consistent with a number of the goals articulated in the Town of Groton Master Plan. The Plan's vision statements include promotion of new commercial development, and reducing Town reliance on residential property tax revenues.

The Project is also consistent with and complementary to North Country Council ("NCC") planning documents, including the NCC-supported four-state Sustainable Economy Initiative; and the North Country Comprehensive Economic Development Strategy, released in January 2009. Both of these key regional planning documents highlight the opportunities for renewable energy in northern New Hampshire, and promote both new renewable energy developments and economic diversification.

In addition, the Project is consistent with and complementary to the goals of the Grafton County Economic Development Council, which seeks to encourage and support new business growth in Grafton County.

Groton Wind has coordinated with these local and regional planning organizations (in addition to others), by providing information and updates on the proposed Project, responding to questions, and reviewing planning documents.

Outreach Activities/Consideration of The Views of Municipal and Regional Planning Commissions and Municipal Governing Bodies

Q. Please indicate whether the Applicant has considered the views of municipal and regional planning commissions and municipal governing bodies with respect to the Project, and the extent to which the Applicant has considered those views.

A. In addition to considering the goals of the North Country Council referred to above, the Project has carefully and comprehensively taken the views of the Town of Groton into consideration during the development phase of this Project. The Project has attended and presented (and responded to inquiries) at eight (8) different public, noticed meetings in Groton, including before the Zoning Board of Adjustment, Planning Board, and Board of Selectmen. The Project has also coordinated with Groton Selectmen, the Town Administrative Assistant, Safety Officer, Road Agent, and the Police and Fire Departments. The noticed public meetings attended by representatives of Groton Wind have included a detailed discussion of the proposed Project and lengthy question and answer sessions, a project open house, a bus tour for Groton Area residents of the Lempster Wind Farm, and a joint ZBA-Planning Board-Board of Selectmen meeting for discussion of an agreement between Groton Wind and the Town of Groton regarding decommissioning, setbacks, use of roads, emergency response, and other issues. The

Project has also met with numerous abutters to the Project site, and other community leaders. An overview of the proposed Project has been posted on the Town of Groton's website, including contact information. Outside of Groton, the Project has met with the Town of Hebron Board of Selectmen, the Town of Rumney Road Agent and Police Chief, the Town of Plymouth Board of Selectmen, Executive Councilor Ray Burton, Plymouth State University, the Grafton County Economic Development Council, District 8 and District 9 State Representatives, State Senator Deborah Reynolds, Tenney Mountain Ski Resort, and a substantial number of area businesses.

Anticipated Impacts on Local Land Use, Local Economy and Local Employment

Q. Please describe the Project's anticipated impacts on local land use, the local economy and local employment.

A. After the Project is constructed, additional impacts on land use should be infrequent and minimal. Cleared areas around the access roads will be re-vegetated and restored to the maximum extent possible. Other than daily, weekday maintenance and repair activities, the Project will not interfere with on-going land uses. The land will continue to be commercially logged. In addition, the Project has coordinated with the Society for the Protection of New Hampshire Forests ("SPNHF") as part of the Society's larger plans to obtain conservation easements over some 6,000 acres in the area, including approximately 3,000 of the acres under lease for the Project. The Project's proposed mitigation measures will support SPNHF in this endeavor, and include providing professional survey data and extensive digital data files for the property, and supporting the necessary stewardship of the easements. This represents an opportunity

for a large amount of land on two ridgelines to remain free from further commercial or residential development.

The Project engaged Professor Ross Gittell of the UNH Whittemore School of Business and Economics, to conduct a study of the estimated economic impact of the proposed GrotonWind Project. (*See* Appendix 36 to the Application.) The study concluded that the Project will have an estimated regional economic benefit of approximately $81.5 million over 20 years. The study estimates that during construction, the Project will provide $24.5 million in local area benefits and a total of 229 total local jobs (including direct employment, indirect jobs, and induced jobs). These economic benefits include direct expenditures on labor, materials, and services during construction and operations, payments to landowners, and payments to the Town of Groton and State of New Hampshire. Given the current economic climate, these are significant benefits for the local area and State of New Hampshire.

The Lempster Wind Project construction and operations have demonstrated the economic benefits of wind farms in New Hampshire. Many local businesses in the Lempster, Goshen, and Newport area reported that they enjoyed big increases in sales as a result of wind farm construction labor and materials. From local restaurants and hotels, to labor and materials, the Lempster project injected substantial amounts of money into the local economy. The Lempster Wind Farm is also a significant source of local revenue to landowners and to the Town of Lempster.

Project's Consistency with the Objectives of RSA 162-H and With Other Public Policies

Q. What is your understanding of the objectives of RSA 162-H?

A. My understanding of the objectives of RSA 162-H is informed by the language in the purpose section of the statute found at RSA 162-H:1. There, the Legislature recognized "that the selection of sites for energy facilities…will have a significant impact upon the welfare of the population, the location and growth of industry, the overall economic growth of the state, the environment of the state, and the use of natural resources." Based upon that recognition, the Legislature found that:

> [I]t is in the public interest to maintain a balance between the environment and the need for new energy facilities in New Hampshire; that undue delay in the construction of needed facilities be avoided and that full and timely consideration of the environmental consequences be provided; that all entities planning to construct facilities in the state be required to provide full and complete disclosure to the public of such plans; and that the state ensure that the construction and operation of energy facilities is treated as a significant aspect of land-use planning in which all environmental, economic, and technical issues are resolved in an integrated fashion, all to assure that the state has an adequate and reliable supply of energy in conformance with sound environmental principles.

Q. Do you believe that the objectives of RSA 162-H would be best served by the issuance of a certificate of site and facility for this Project?

A. Yes. Allowing this Project to go forward will further the objectives of RSA 162-H by enabling a new, clean, renewable energy resource with low environmental, health and safety impacts, and significant economic development benefits, to meet the growing demand for electricity in the region. On average, the power

generated from the Project will be sufficient to provide electricity to approximately 19,000-21,000 New Hampshire homes. The Project will maintain an appropriate balance between the environment and the need for new renewable energy facilities. It can also be constructed relatively quickly, without undue delay, and will help to ensure that the state's energy supply is adequate, reliable and conforms to sound environmental principles. Through the SEC process, there is a complete and full disclosure to the public of the Project's impacts and benefits. Thus, all of the objectives of RSA 162-H will be met if the Project is certificated.

Q. Is the Project consistent with public policies relating to renewable energy and climate change?

A. Yes. The Project is consistent with and promotes several public policy goals such as those reflected in RSA 362-F, New Hampshire's renewable portfolio standard ("RPS") law, which requires that 25% of the electricity sold by retail suppliers in New Hampshire come from renewable sources by 2025. The Project is consistent with the purpose of the RPS statute articulated in RSA 362-F:1: it provides fuel diversity to the state and the region's generation supply through the use of a local renewable resource that is completely emission-free (i.e. the wind) which can displace and lower regional dependence on fossil fuels, thereby stabilizing volatile energy costs; the Project will aid the local and state economy as indicated above; and because it will emit no air pollutants, it will help to reduce the amount of greenhouse gases, nitrogen oxides and particulate matter emissions generated in the state, thereby improving air quality, public health, and mitigating against the risks of climate change.

Because the Project will produce electricity without producing greenhouse gases, it is consistent with the state's Regional Greenhouse Gas Initiative ("RGGI") set forth in RSA 125-O:19 *et seq.* which is aimed at reducing greenhouse gas emissions resulting from energy use in New Hampshire. The Legislature has determined that global climate change is a significant environmental problem that can be addressed through reducing greenhouse gases such as carbon dioxide which is produced by electricity generators that combust fossil fuels. By generating electricity without using fossil fuels, the Project will assist in addressing the issue of climate change.

Project's Impact on Air Quality

Q. Will the Project have an unreasonable adverse impact on air quality?

A. No. Unlike other electricity generators that use gas, oil or coal to produce electricity, the Project will not combust fuel and therefore will produce no air emissions. The turbine blades will be powered entirely by the wind, which is a clean, renewable and free source of energy. This means that the Project will add a new power supply to the region without adding any new air pollutant or greenhouse gas emissions. Not only does the Project not have an unreasonable adverse effect on air quality, it offers significant and long-term benefits. In addition to providing a new, clean source of electricity, the Project has the potential – depending on what resources are contributing to the regional power grid at the time the Project is operating - to displace the production of electricity from existing fossil fuel plants, thereby reducing air emissions. Thus, overall, the Project will have a positive effect on air quality.

The fact that wind power is an emission-free energy source is often overlooked in the broader siting debate. However, the benefit of a generation source that adds new power supply without adding any new air pollutants or greenhouse gas emissions should not be understated or taken for granted. The statistics on the positive impact that wind power has on clean air are compelling. Wind farms emit no carbon dioxide. A 2 MW wind turbine displaces nearly 3,600 tons of carbon dioxide each year, which is equivalent to planting nearly 2 square miles of forest. Compared to using fossil fuels, to generate the same amount of electricity as a single 2 MW wind turbine for 20 years would require burning 58,000 tons of coal (a line of 10-ton trucks 22 miles long) or 184,000 barrels of oil. For a 24 MW project, that equates to 700,000 tons of coal or 2.2 million barrels of oil over a 20 year period. A document produced by the American Wind Energy Association entitled *Comparative Air Emissions of wind and Other Fuels,* which is contained in Appendix 27 to the Application, contains more details and statistics about the clean air impacts of wind as compared to other sources of energy. In addition, a study published by the National Academy of Science in 2009 entitled "Electricity from Renewable Resources: Status, Prospects, and Impediments" indicates that renewable electricity technologies have inherently low life-cycle CO2 emissions as compared to fossil-fuel-based electricity production, with most emissions occurring during manufacturing and deployment. *See* http://www.nap.edu/catalog.php?record_id=12619.

The bottom line is that the long-term environmental and public health problems associated with fossil-fueled power plants (i.e. air emissions) are severe, the statistics are compelling, and it is clear that wind energy does not add to those problems and can be a

significant part of the solution. We believe that the Project's positive effects on clean air and climate change are factors that should be given significant consideration in examining the balance between energy production, environmental protection and public health.

Q. Does this conclude your testimony?

A. Yes.

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THE STATE OF NEW HAMPSHIRE
BEFORE THE
NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-__

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF PABLO CANALES
ON BEHALF OF
GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name and business address.

A. My name is Pablo Canales. My business address is 1125 NW Couch Street, Suite 700, Portland, Oregon 97209.

Q. Who is your current employer and what position do you hold?

A. I am the Senior Vice President & Chief Financial Officer of Iberdrola Renewables, Inc.

Q. What are your background and qualifications?

A. I have more than 14 years of experience in the power generation sector. Prior to joining Iberdrola Renewables, I held the positions of CFO for Iberdrola, SA activities in South America. I hold degrees in Business Administration and Finance from Universidad de Deusto in Spain.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address Groton Wind, LLC's ("Groton Wind") financial capability and that of its parent company, Iberdrola Renewables, Inc. to assure construction and operation of the proposed Groton Wind Project ("the Project") that is the subject of this Application, in continuing compliance with the terms and conditions of any certificate of site and facility that may be issued by the New Hampshire Site Evaluation Committee as the result of this proceeding.

Financial Capability to Construct and Operate the Project

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as CFO of IBR I am aware of the Project. My formal involvement is to evaluate the Project's economics and make the investment recommendation to our corporate parent. Going forward, I will be managing the accounting and fiscal management for the Project. The Project is a 48 MW project located in Grafton County, New Hampshire. It will utilize Gamesa G87 turbines that have been procured pursuant to a turbine supply framework agreement that our corporate parent, Iberdrola Renovables S.A. has executed with Gamesa Corporación.

Q. Please describe the corporate relationship between Iberdrola Renewables, Inc. and Groton Wind, LLC.

A. Groton Wind, LLC is a limited liability company organized for the development and ownership of this Project. It is 100% owned by IBR. IBR's parent

company is Iberdrola Renovables, a company that is publicly traded on the Madrid stock exchange and the largest owner and operator of renewable energy projects in the world. As of the third quarter of 2009, Iberdrola Renovables had 10,477 megawatts of installed wind capacity worldwide, with 3,459 MW of that capacity located in the United States. Approximately 49% of Iberdrola Renovables' installed capacity is in Spain, with the rest located in the United States, the UK and other countries in the European Union. This represents 1/12 of the total world's wind capacity. Iberdrola Renovables also maintains the world's largest development pipeline, with over 57,000 MW of sites in various stages of development. Iberdrola Renovables is in turn 80% owned by Iberdrola, SA, the second largest integrated utility company in Spain engaged in the generation, transmission, distribution and marketing of electricity and natural gas. Iberdrola, SA is based in Madrid, Spain, operates in more than 40 countries and has over 45,000 megawatts (MW) of installed capacity, including the wind generation capacity of Iberdrola Renovables.

As the owner of Groton Wind, LLC, IBR finances the construction costs of its wind farms through equity investments provided by Iberdrola S.A.. Iberdrola S.A maintains a corporate bond rating of A- from Standard and Poor's and A3 from Moody's. IBR also maintains world-leading expertise in managerial and technical capabilities related to wind power projects. IBR has the capability to provide adequate assurances, guarantees, financing and insurance for the Project's development, construction and operation. It currently funds all development activities for the Project, and through

Iberdrola S.A., will arrange for the capital needed for construction finance, equipment orders, and long-term investment in the Project.

Q. Please describe the financial capability of Groton Wind, LLC and IBR to construct and operate the proposed Project in compliance with the terms and conditions of any certificate that may be issued as the result of this proceeding.

A. IBR has the financial capability to build, own, and operate all of its wind farms, including the one that is subject of the Application in this proceeding. IBR is focused on developing, financing, constructing, owning and operating its wind farms. Its parent, Iberdrola Renovables, remains well capitalized with total assets of €21.5 billion as of the third quarter of 2009. A detailed summary of Iberdrola Renovables balance sheet as of September 30, 2009 has been submitted as part of the Application at Figure 1.

Renewable energy is the primary driver behind Iberdrola's strategy for growth, which has a target of achieving 18,000 MW of renewable energy in operation by the end of year 2012. Wind power is the predominant component of that growth strategy, building on Iberdola's success in Spain and Europe and expanding to international markets including the United States. The United States wind energy market has grown from 10,000 MW in 2006 to over 32,000 MW by the end of 2009. IBR is the second-largest owner and operator of wind power in the United States because of its strategic vision of the industry, complemented by the competencies necessary to execute that vision. IBR was formerly known as Iberdrola USA, and was formed in order to expand the company's growth into the United States market. In June 2006, Iberdrola USA entered the United States energy market by acquiring Community Energy, Inc., the

original developer of the Lempster Wind Project which was certificated by the New Hampshire Site Evaluation Committee in 2007 and which commenced operations in 2008. Appendix 21 of the application contains a list of all wind energy projects as well as a breakdown of Iberdrola Renovables operating wind farms by country, as of September 30, 2009.

Iberdrola's corporate strategy includes a commitment to the long-term ownership and operation of wind power facilities worldwide, and the company intends to be involved in the United States market for the long-term.

The Groton Project is currently estimated to require approximately $117 million in capital, depending on final equipment and construction costs. The Project will be financed by IBR, through equity investments by our corporate parent, Iberdrola S.A. Investment in the Project by Iberdrola and others will be supported by long-term contracts for the purchase of power and renewable energy credits from the Project, as well as by a cash grant in lieu of investment tax credit from the federal government, as provided by the American Recovery and Reinvestment Act of 2009.

The Project and its construction contractors will carry adequate insurance to provide coverage against liability or damage resulting from the construction or operation of the Project. Types of insurance and coverage levels will be comparable to other projects of the same size and character that are currently operated by IBR and/or its affiliates. Groton Wind is also working with the Town of Groton to develop an agreement for financial guarantees related to decommissioning and road repairs. Iberdrola will provide the appropriate financial support for that agreement.

Q. In your opinion does Groton Wind/Iberdrola have the requisite financial capability to own and operate this Project?

A. Yes. As indicated above, IBR has successfully financed, constructed and operated 36 wind energy facilities in the United States including the Lempster Wind Project in New Hampshire.

Iberdrola's proven track record as a successful participant in the wind energy market in New England, the United States and abroad clearly demonstrates that it has the financial capability to construct and operate this Project in conformance with the terms and conditions of any certificate that may be issued by the New Hampshire Site Evaluation Committee.

Q. Does this conclude your pre-filed testimony?

A. Yes.

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THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF JOHN D. HECKLAU ON BEHALF OF GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name and business address.

A. My name is John D. Hecklau. My business address is 217 Montgomery Street, Suite 1000, Syracuse, New York 13202.

Q. By whom are you employed and what position do you hold?

A. I am the Environmental Division Manager with Environmental Design & Research, P.C. ("EDR").

Q. Please describe EDR.

A. EDR is a design and planning firm with offices in Syracuse, Rochester, and Buffalo, New York. Founded in 1979, EDR is committed to providing appropriate and innovative design and planning services to communities, institutions, corporations, developers and private individuals throughout the Northeast. Over the years, EDR has developed a wide range of experience and specialized expertise in land planning, community design, site design, environmental management, and visual impact

assessment. EDR's multidisciplinary staff of landscape architects, civil engineers, ecologists, planners and computer specialists work with clients to craft creative approaches to project design and implementation.

Q. What are your responsibilities with EDR?

A. As Environmental Division Manager, I oversee all of EDR's permitting, environmental inventory and management projects. I am responsible for visual impact analysis, resource management planning, environmental impact analysis, wildlife management and recreation planning on behalf of EDR's clients. I have extensive experience reviewing environmental impacts, including visual impacts. I have worked on numerous electric power development and transmission line projects in which I have been responsible for conducting/coordinating the visibility analysis and the visual/aesthetic impact assessments.

Q. Please describe your education, training and experience.

A. I hold a Master of Science degree in Environmental and Forest Biology, specializing in Wildlife Biology, from the State University of New York, College of Environmental Science & Forestry. I hold a Bachelor of Arts degree in Biology from Middlebury College. I have more than 10 years of experience conducting visual impact assessments and have prepared several publications and presentations regarding the visual impact of wind power projects. Examples of projects on which I have conducted/coordinated such assessments include the E-183 Transmission Line Relocation Project (RI), Rhode Island Reliability Project, Southern Rhode Island Transmission Project, Howard (NY) Wind Power Project, Buckeye (Ohio) Wind Project, Alabama

Ledge (NY) Wind Power Project, Jordanville (NY) Wind Power Project, Cohocton (NY) Wind Power Project, Marble River (NY) Wind Power Project, Hardscrabble (NY) Wind Power Project, Dairy Hills (NY) Wind Farm, Fenner (NY) Wind Power Project, Statewide (NY) Wireless Network Project, Tompkins County (NY) Public Safety Communications System Project, PG&E Athens (NY) Generating Project, ANP Ramapo (NY) Energy Project, Reliant Astoria (NY) Repowering Project, Maple Ridge (NY) Wind Power Project, Flat Rock 230 kV Transmission Line Project (NY). TransEnergie Cross Sound (NY and CT) Cable Electric Transmission Project, and Neptune Regional (NY) Transmission System Project.

Q. Does your curriculum vitae, Attachment JDH 1 to this testimony, fairly and accurately represent your experience with respect to study and evaluation of visual impacts?

A. Yes, it does.

Q. Have you previously testified before state permitting agencies?

A. Yes, I provided testimony before the Rhode Island Energy Facility Siting Board (EFSB) regarding visual impacts of the Rhode Island Reliability Project and the Southern Rhode Island Transmission Project. I also provided testimony to the New York State (NYS) Public Service Commission regarding the visual impacts of the Ramapo and Astoria Generating Projects and the Flat Rock Transmission Line Project. A listing of additional projects about which I have testified is included in my curriculum vitae which is attached hereto as Attachment JDH 1.

Q. Are you familiar with the proposed Groton Wind Power Project (the "Project")?

A. Yes, EDR was engaged by Groton Wind, LLC to assess the aesthetic/visual impact of the Project.

Purpose of Testimony

Q. What is the purpose of your testimony in this proceeding?

A. My testimony addresses the aesthetic/visual impact of the Project and summarizes the Visual Impact Assessment ("VIA") which EDR prepared for the Project. The VIA was filed with the Application in this proceeding and is labeled Appendix 24. I will also address the Shadow Flicker Study prepared by EDR for this Project. The Shadow Flicker Study was filed with the Application in this proceeding and is labeled Appendix 25.

Visual Impact Assessment

Q. Please describe the methodology that was used for conducting an assessment of the Groton Project's visual impacts.

A. A VIA is used to determine the extent of a Project's potential visibility and to assess the significance of visual impacts associated with a Project using an accepted impact assessment methodology. For the Groton Project, EDR used standard analyses of potential project visibility, and evaluated visual impact using a simple rating system based on methodology developed by the U.S. Department of Interior Bureau of Land Management (BLM) (1980). The VIA prepared for the Groton Wind Power Project includes identification of visually sensitive resources, characterization of landscape

similarity zones, identification of viewer groups, viewshed mapping, line of sight cross-sections, confirmatory visual assessment fieldwork, visual simulations, and visual impact evaluation.

The VIA methodology used on this Project provides a comprehensive means of evaluating existing visual character and aesthetic quality and the ability of a landscape to accommodate visual change. Visual simulations with and without Project conditions have been used to determine changes in visual resources, and the acceptability or compatibility of the visual impacts with existing landscape and physical surroundings.

Q. What is the extent of the defined study area that was evaluated in your analysis?

A. The study area for the VIA consisted of a 10-mile radius around the location of the proposed turbines. This study area includes a total of approximately 257,730 acres, or 400 square miles.

Q. Please describe the contents of the VIA.

A. The VIA for the proposed Groton Wind Power Project addresses:

1. Visually sensitive sites and intensive land uses within the study area;
2. Landscape Similarity Zones within the study area;
3. Viewer groups within the study area;
4. Visibility of the proposed wind turbines within the study area;
5. Appearance of the proposed wind turbines upon completion of the Project, based on photographic simulations;
6. The nature and degree of visual change resulting from construction of

the Project; and

7. The need for mitigation and the feasibility of mitigation alternatives.

Q. Please describe the specific analytical techniques utilized in the VIA.

A. The VIA for the proposed Groton Wind Power Project includes:

1. The identification of public resources of state and local significance within a 10-mile radius of the proposed turbines. Public resources considered to be of state significance include sites and districts listed on the National Register of Historic Places, New Hampshire State Parks, the White Mountain National Forest, state designated scenic byways, state forests, state wildlife management areas, major water bodies, and designated trails. Local recreational/natural areas, cemeteries, schools, heavily used roads and areas of concentrated human settlement are considered resources of local significance. Landscape character within the study area was also defined, based on the existing pattern of land cover (as indicated in the U.S. Geological Survey [USGS] National Land Cover Dataset [NLCD]), and observed land use and user activity. This analysis resulted in the definition of nine distinct landscape similarity zones (LSZ) within the study area. LSZs are areas of similar landscape/aesthetic character based upon patterns of landform, vegetation, water resources, land use, and user activity.

2. Specific user groups within the study area were identified to evaluate viewer sensitivity and assure the selection of appropriate representative viewpoints during the visual impact evaluation.

3. As an initial step in evaluating potential Project visibility, a topographic viewshed analysis was performed for the proposed wind turbines. The topographic

viewshed analysis utilized USGS digital elevation model (DEM) data, the height of the proposed turbines, and a computer program (ESRI ArcView® with the Spatial Analyst extension) to determine locations where the Project would be potentially visible. The ArcView program defines the viewshed (using topography only) by reading every cell of the DEM data and assigning a value based upon visibility from observation points throughout the 10-mile study area. The resulting topographic viewshed maps define the maximum area from which any portion of any turbine within the completed Project could potentially be seen within the study area during both daytime and nighttime hours (ignoring the screening effects of existing vegetation and structures). Potential daytime visibility was based on a blade tip height of 399 feet, while potential nighttime visibility was based on the FAA obstruction warning light height of 259 feet (only for those turbines proposed to be lighted).

4. To more accurately account for the screening effect of forest vegetation, a vegetation viewshed analysis was also prepared for the proposed turbines. The vegetation viewshed analysis involved creation of a vegetation layer based on the location of mapped forest vegetation as indicated in the USGS NLCD, with an assumed elevation of 40 feet. This layer was added to the digital elevation model to produce a base layer for the viewshed analysis, as described above. Once the viewshed analysis was completed, the areas covered by the forest vegetation layer were designated as "not visible" on the resulting data layer to reflect the fact that views from within mapped forested areas will generally be screened by mature overstory trees.

5. To further illustrate the screening effect of vegetation and structures within the study area, four line-of-sight cross sections (ranging from 13.4 to 18.2 miles long) were cut through the visual study area. Cross-section locations were selected to allow evaluation of potential Project visibility from sensitive sites such as trails, water bodies, historic sites, residential areas, recreational areas, and other areas of intense land use.

6. To more accurately evaluate potential visibility of the proposed Project, areas within a 10-mile radius of the turbines were visited in the field. Photo documentation of potential Project visibility was obtained from 180 representative viewpoints within the study area. Existing communication and meteorological towers on the Project site were used as locational and scale references when verifying potential Project visibility in the field.

7. From the 180 viewpoints documented during field review, photos from 11 viewpoints were selected for use in the development of visual simulations. Viewpoints were selected because they provided open views of the turbines from identified aesthetic resources, and/or were representative of the viewer/user groups and LSZs within the study area that are most likely to have views of the proposed Project.

To illustrate the anticipated visual changes associated with the proposed Project, digital models of the proposed turbines were prepared based on plans and specifications provided by Groton Wind. The models were used to create realistic photographic simulations of the completed Project (i.e. the turbines and associated vegetation clearing) from each of the selected viewpoints using AutoCAD® and AutoDesk 3D Studio Max®

software. Aerial photographs and GPS data collected in the field were used to create an AutoCAD 2010® drawing of the Project. The two dimensional AutoCAD data was then imported into 3D Studio Max 9.0®, and three-dimensional components (cameras, modeled turbines, etc.) were added. These data were superimposed over photographs from each of the viewpoints, and minor camera changes (height, roll, precise lens setting) were made to align all known reference points within the view. This process ensures that Project elements are shown in proportion, perspective, and proper relation to the existing landscape.

8. At this point in the analysis, a "wire frame" model of the facility and known reference points was included in each of the photographs. The proposed exterior color/finish of the turbines was then added to the model and the appropriate sun angle was simulated based on the specific date, time and location (latitude and longitude) at which each photo was taken. This information allows the computer to accurately illustrate highlights, shading and shadows for each individual turbine shown in the view. All simulations show the turbines with rotors oriented toward the northwest, which is generally the prevailing wind direction in the area. Hazing was added to the turbines in some of the more distant simulations to match background conditions.

9. The visual impact assessment methodology utilized on this Project involved completion of a simple visual contrast rating form developed by EDR based on methods developed by the U.S. Department of the Interior BLM. This visual contrast rating form is attached to my prefiled testimony. *See* Attachment JDH2. The procedure involves using a numerical contrast rating system to compare representative views with

and without the proposed Project in place and quantifying visual impact. The form also provides for the description of existing scenic quality, viewer sensitivity, and variable effects such as viewing angles and atmospheric conditions, in addition to the actual rating of contrast between the proposed Project and the existing view. A registered landscape architect (from EDR's staff) evaluated the visual impact of the proposed Project using the simplified BLM methodology. The VIA evaluation involved viewing and rating 11"x17" color prints of the views with and without the Project in place from each of the selected representative viewpoints.

Q. What conclusions did you reach as a result of the VIA analysis?

A. From the VIA, we concluded that the proposed Project is likely to be visible from only 4 % of the visual study area. However, it will be visible from several identified aesthetic resources. While it is likely that the Project will have an effect on the visual/aesthetic character of some mid-ground views within the study area, we do not believe that those effects are unreasonably adverse.

Our specific conclusions are as follows:

- Topographic viewshed analysis (which assumes no trees or vegetation) indicates that the maximum area of potential visibility for the proposed turbines is approximately 49% of the 10-mile radius study area, discounting the screening provided by existing forest vegetation and buildings.
- Vegetation viewshed analysis, which considers the screening effect of mapped forest vegetation and more accurately reflects the likely extent of Project

visibility, indicates that only 4% of the study area should have potential views of the proposed turbines.

- Line-of-sight cross section analysis indicates that existing vegetation, structures and topography will be effective in screening views of the proposed turbines along representative lines of sight within the study area (including views from visually sensitive aesthetic resources). Visibility along the selected lines of sight was typically restricted to very limited areas, with total visibility in the range of 1.6% to 7.6% of each cross section.
- Field review confirmed the results of the vegetation viewshed analysis and cross section analysis, and revealed that views of the proposed Project site are largely restricted to open road corridors, agricultural fields, water bodies, areas of exposed rock, and the cleared yards of some rural homes. From the north, views of a portion of the Project site are available from several locations on Routes 25 and 3A between West Rumney and Plymouth. Views are also available from other roads in the Baker River valley, including Quincy Road and Fairgrounds Road. Other locations north of the Project site where open views were documented included Rattlesnake Mountain in the town of Rumney, the residential cluster area of Rumney, a short stretch of Stinson Lake Road (near Stone Hill Road), and a few open sites along Rumney Road. Although the actual shoreline could not be accessed, field review indicated that views of portions of the Project from the north shore of Loon Lake are also likely.

- Open views of a portion of the Project site from the east are available from portions of Interstate Route 93, portions of Route 3A near Tenney Mountain, and a small section of Route 175 between Holderness and Plymouth. Views are also available from some homes with open yards on local roads in the Towns of Plymouth and Holderness. No open views toward the site were documented in the village center areas of Plymouth or Ashland. Distant views from the south are available from the southern and western shores of Newfound Lake including Wellington State Park, some roads through agricultural areas west of the Village of Bristol, and on the outskirts of the hamlet of Hebron. Views from the west of the Project site, including the Town of Groton, were essentially non-existent.
- Visual simulations prepared from sensitive sites and representative landscape settings within the study area showed a range of Project visibility and visual contrast. Evaluation of these simulations by a licensed EDR landscape architect indicates that the Project's overall contrast with the visual/aesthetic character of the area will generally be "moderate" when rated on a scale of 0 (insignificant) to 4 (strong). Six of the 11 simulations received a contrast rating of less than 2.0. However, appreciable contrast was noted in near mid-ground views (i.e., under 2.0 miles), where turbines span the field of view, and/or where the turbines appear out of context/character with the landscape (i.e., in undeveloped forested areas). Based on experience with currently operating wind power projects elsewhere, public reaction to the Project is

likely to be highly variable based on viewer proximity to the turbines, the affected landscape, and the viewer's personal attitude regarding wind power.

- Based upon nighttime observations of existing wind power projects, the red pulsing lights on the turbines could result in a nighttime visual impact on certain viewers. The actual significance of this impact from a given viewpoint will depend on how many lighted turbines are visible, what other sources of lighting are present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. However, night lighting could be negatively perceived by some rural residents and vacationers that currently experience dark nighttime skies. It should be noted, however, that nighttime visibility/visual impact will be limited by the abundance of mature deciduous and coniferous trees that screen the Project from many homes, the concentration of residences in what the VIA refers to as villages or hamlets, and along highways where existing lights already compromise dark skies and compete for viewer attention, and the fact that the Project will only be visible from 4% of the entire study area.

Q. Have mitigation measures been implemented to reduce the Project's visual impact?

A. Yes. The following measures have been incorporated into the Project design:

- The Project will be located in a remote forested area that essentially eliminates the opportunity for foreground views from public vantage points.

- The white color of the turbines generally blends well with the sky at the horizon and eliminates the need for daytime FAA warning lights.
- All turbines will have uniform design, speed, height and rotor diameter.
- Towers will include no exterior ladders or catwalks.
- FAA lighting will be limited to 11 of the 24 proposed turbines.
- New road construction will be minimized by utilizing existing forest roads whenever possible.
- Forest clearing along access roads and at turbine sites will be minimized to the extent practicable.
- The placement of any advertising devices on the turbines will be prohibited.
- The proposed switchyard and operations and maintenance ("O&M") building will be located on a lightly used private road that is well removed from any sensitive aesthetic resources.
- To provide connection with the grid, most of the collection lines on the site will be underground, and connection to the electrical grid will be via an existing overhead distribution line route, which will be upgraded, rather than building a new line in a different location.

Shadow Flicker Analysis

Q. Please describe "Shadow Flicker."

A. Shadow flicker refers to the shadows that a wind turbine casts over structures and observers at times of the day when the sun is directly behind the turbine rotor from an observer's position. Shadow flicker is most pronounced in northern

latitudes during winter months because of the lower angle of the sun in the winter sky. However, it is possible to encounter shadow flicker anywhere for brief periods after sunrise and before sunset. During intervals of sunshine, wind turbine generators will cast a shadow on surrounding areas as the rotor blades pass in front of the sun, causing a flickering effect while the rotor is in motion. Shadow flicker does not occur when fog or clouds obscure the sun, or when turbines are not operating.

Q. What is the concern relative to shadow flicker?

A. Shadow flicker can be experienced by residents living near wind turbines when the turbine is located in proximity to a residence (i.e., within 10 rotor diameters, approximately 870 meters or 2,854 feet for this Project), and the turbine rotor is between low angle sunlight and the residence. The distance between a wind turbine and a potential shadow flicker receptor affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine will be more intense, distinct and focused. This is because a greater proportion of the sun's disc is intermittently blocked by the turbine. Obstacles such as terrain, vegetation, and/or buildings occurring between residences and wind turbines may significantly reduce or eliminate shadow flicker effects. The primary concern with shadow flicker is the annoyance it could cause for the occupants of premises adjacent to the turbines.

Q. How is the amount of shadow flicker from a wind power project calculated?

A. Predicted shadow flicker effects are expressed in terms of frequency (hours per year) at receptor locations. The location of shadow flicker can be predicted

quite accurately using computer modeling programs and input data defining a "worst case" scenario. A worst case scenario would occur only when there are no clouds or fog, wind conditions allow continuous turbine operation, and the turbine rotor is continuously perpendicular to the sun and between the observer/residence and the sun. This analysis is thus very conservative (i.e. a “worst case” scenario), because it is not what residents would actually experience given that the turbines are not in continuous operation, are not always aligned perpendicular to the sun, and are not always between the residence and the sun. In addition, sunlight conditions vary daily and seasonally, sun intensity and duration varies seasonally, and obstacles that block shadows (terrain, vegetation and buildings) exist in the landscape.

Q. How was the Groton Wind Power Project’s potential shadow flicker evaluated?

A. The Groton shadow flicker modeling analysis was conducted using *WindPRO 2.6 Basis* software (WindPro), and associated shadow module, which is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Input variables and assumptions used in the analysis are outlined on page 4 of the Shadow Flicker Report included as Appendix 25 submitted with the Application in this proceeding. Based on these variables, WindPro was used to calculate the theoretical number of hours per year that shadow flicker would occur at any given location in the vicinity of the proposed Project. It should be noted that at a distance beyond 10 rotor diameters (maximum of 870 m or 2,854 feet for this Project), shadow flicker effects are essentially undetectable. Therefore, the analysis presented herein is

expected to be an inclusive (and conservative) projection of the shadow flicker effects of the proposed Groton Wind Power Project.

Q. What were the results of this evaluation?

A. Output from the model is presented in the Shadow Flicker Report, and includes the following information:

- Calculated shadow-flicker time (hours per year) at receptors ("receptors" as used herein means structures) within 1,000 m of a proposed turbine.
- Tabulated and plotted time of day that receptors receive shadow flicker.
- Map showing proposed turbine locations, identified shadow-flicker receptors, and projected shadow-flicker time (hours per year).

In summary, of the 207 structures identified and evaluated for effects from shadow flicker in this study:

- 204 (98.5%) will not be affected at all;
- 1 (.5%) may be affected less than 1 hr/yr;
- 2 (1%) may be affected 1-3 hrs/yr;
- none will be affected more than 3 hrs/yr.

As indicated by these results, the shadow flicker impact for this Project is almost non-existent. This can be attributed to the fact the shadow receptors are, for the most part, quite distant from the proposed wind turbines, and shadows are often blocked by the mountainous terrain. It should also be reiterated that these calculations do not take into account the screening effects associated with existing site-specific conditions such as vegetation and/or buildings. Furthermore, this analysis assumes that there are windows

on every side of the identified structures, and all identified structures are receptors/residences. Therefore, although already very low, the predicted levels of shadow flicker at these three receptors are almost certainly higher than the actual level that will be experienced.

Q. How do these results compare to established regulations and thresholds for shadow flicker from wind power projects?

A. No existing national, state, county, or local standards exist for frequency or duration of shadow flicker from wind turbines at the Project site. However, international regulations, studies, and guidelines from Europe and Australia have suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance (Klepinger, 2007; Sustainable Energy Authority Victoria, 2003; Dobesch and Kury, 2001). Accordingly, a threshold of 30 hours of shadow flicker per year was used in this analysis to evaluate potential shadow flicker impacts to area residences from the proposed Project. As indicated above, none of the 204 receptors are predicted to approach this threshold. Of the three receptors predicted to potentially receive any impact, none will exceed 3 hour per year.

Q. In your opinion, will this Project have an unreasonable adverse effect on aesthetics?

A. No. Based upon the results of EDR's VIA and Shadow Flicker Study discussed above, the Project will not have an unreasonable adverse effect on aesthetics. As noted in the answer to the immediately preceding question, the aesthetic impact

associated with the Project's anticipated shadow flicker will be negligible. Although evaluation of visual simulations from 11 representative landscape settings (including several public resources of state and local significance) within a 10 mile radius of the Project indicated that the Project's contrast with visual/aesthetic character of the region generally would be in the "moderate" range, the VIA as a whole does not indicate that the Project will have an unreasonable adverse impact on aesthetics. As discussed in this prefiled testimony and in greater detail in the VIA report, viewshed analysis indicates that only a small percentage (4%) of the locations within a 10-mile radius of the Project will have the potential to view portions of one or more turbines. Cross section analysis and field review confirmed that forest vegetation effectively screens views in most areas, and that where open views are available, only a portion of the Project will generally be visible. The 11 simulations prepared for this Project illustrate a wide range of turbine visibility and visual impact. EDR's evaluation indicates that, while appreciable to strong visual contrast could occur in a few locations within the 10-mile radius study area, from the majority of sites where open views are available, the impact is likely to be minimal to moderate. Moreover, it is difficult to predict how all of the viewers within that small area will perceive the Project's aesthetic effects. Based upon EDR's experience with currently operating wind power projects, opinions regarding the Project's impact on aesthetics are likely to be highly variable and will be influenced by the viewers' location, activity, and personal attitudes regarding the turbines' appearance and wind power generally. However, even with this uncertainty, the overall conclusion that I draw from

EDR's studies of this Project, and my experience with other wind projects, is that the Groton Project will not have an unreasonable adverse effect on aesthetics.

Q. Does this complete your testimony?

A. Yes it does.

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ATTACHMENT JDH 1

CURRICULUM VITAE OF JOHN D. HECKLAU

ATTACHMENT JDH 2

VISUAL CONTRAST RATING FORM

638432_1.DOC

John Hecklau, Environmental Division Manager

Mr. Hecklau serves as EDR's Principal-in-Charge of Environmental Services. In this capacity, he has been involved in numerous environmental inventory and impact assessment projects, many focusing on power generation and transmission. He has been involved in the environmental review and permitting of over 30 commercial wind power projects. Mr. Hecklau's 25+ years of experience include natural resource management planning, wetland delineation and permitting, environmental impact analysis, wildlife management, visual impact analysis, and recreation planning.

EDUCATION:

- State University of New York, College of Environmental Science and Forestry, Syracuse, New York, *Master of Science in Environmental and Forest Biology,* Specializing in Wildlife Biology, 1982.
- Middlebury College, Middlebury, Vermont, *Bachelor of Arts in Biology*, 1979.

EMPLOYMENT HISTORY:

- *Principal/Senior Ecologist*, Environmental Design & Research, Syracuse, New York, 1995 to Present.
- *Ecologist*, Environmental Design & Research, Syracuse, New York, 1989 - 1994.
- *Self-Employed Environmental Consultant*, John D. Hecklau, Clinton, New York, 1988.
- *Resource Manager*, Environmental Programs Division, New York State Power Authority, Marcy, New York, 1984 - 1987.
- *Wildlife Biologist*, Connecticut Department of Environmental Protection, Burlington, Connecticut, 1983 -1984.
- *Wildlife Consultant*, Central Park Conservancy, New York, New York, 1982 - 1983.

PROFESSIONAL AFFILIATIONS:

- *Member*, The Wildlife Society.
- *Certified Wildlife Biologist,* The Wildlife Society.
- *Planning Board Member/Chairman*, Town of Kirkland, New York.
- *Member*, American Wind Energy Association
- *Member,* Alliance for Clean Energy New York

PUBLICATIONS AND PRESENTATIONS:

Hecklau, J. and J. Gagliano. *Local Review of Commercial Wind Power Projects.* Presentation at Onondaga County Planning Federation Conference. January 21, 2009, Syracuse, NY.

Hecklau, J. and M. Scipioni. *Measuring Success of Wetland Mitigation & Monitoring*. Presentation at Sustainable Solutions. June 12, 2008, Rochester, NY. American Society of Landscape Architects, New York Upstate Chapter Annual Conference.

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PROFESSIONAL EXPERIENCE:

New York Regional Interconnect – Oversaw the preparation of a Visual Impact Assessment (VIA) for a proposed 190-mile long 400 +/- kV DC transmission line extending from Marcy (Oneida County) to New Windsor (Orange County), New York. The VIA utilized a modified version of the Bureau of Land Management methodology, and was included in the project's Article VII Application to the NYS Public Service Commission. Prepared VIA reports and responses to interrogatories regarding visual issues.

New England East-West Solution Project – Coordinated preparation of Visual Impact Assessments (VIAs) for four National Grid projects in Massachusetts and Rhode Island, including the Rhode Island Reliability and Interstate Reliability 345 kV projects. Prepared VIA reports for each project, including an evaluation of project visibility, visual impact, and possible mitigation options. Scheduled to provide expert witness testimony at the Rhode Island and Massachusetts Electric Facility Siting Board hearings.

Blenheim-Gilboa Pumped Storage Project – Oversaw design, construction, and post-construction monitoring of 6+ acres of wetland mitigation areas to compensate for impacts associated with slope stabilization activities at the New York Power Authority's Blenheim-Gilboa Pumped Storage Power Project in Schoharie County, New York. Mitigation plans required installation of an impervious bentonite liner, and incorporated a pedestrian path and bridge system to provide enhanced recreational and educational opportunities at the Power Authority's visitor's center. Performed five years of follow-up monitoring to document successful development of wetland characteristics.

Southern Rhode Island Transmission Project – Oversaw preparation of the Visual Impact Assessment (VIA) and Supplemental VIA prepared for the proposed upgrade and extension of approximately 26 miles of an existing National Grid 115 kV transmission line in southern Rhode Island. The effort consisted of fieldwork, definition of landscape similarity zones and viewer groups, identification of sensitive resources/receptors, development of viewshed maps and visual simulations, impact evaluation, and preparation of the VIA report. Also provided expert witness testimony to the Rhode Island Electric Facility Siting Board.

Cohocton and Marble River Wind Power Projects – Coordinated State Environmental Quality Review Act (SEQRA) compliance for these commercial wind power projects in Steuben County and Clinton County, New York. Work on these projects included project layout/environmental field review to assure that impacts on wetlands, agricultural land and ecological resources were minimized. Conducted or oversaw all environmental support studies on these projects and incorporated the results of these studies into Draft Environmental Impact Statements. Prepared Supplemental Draft Environmental Impact Statements to address project changes, and Final Environmental Impact Statements to address all public and agency comments on both of these projects. Also completed state and federal wetland permitting for the Cohocton Project.

Commercial Wind Power Project Visual Impact Assessments – Coordinated preparation of Visual Impact Assessments (VIAs) for 15 commercial wind power projects in Upstate New York. The VIAs for these projects the visual character and significant aesthetic resources with a 5 or 10 mile visual study area. Viewshed analysis, line-of-sight cross sections, field review, and computer-assisted visual simulations were used to evaluate the potential visibility and visual impact of these projects. Notable projects include the Madison, Fenner, Maple Ridge, Jordanville, Hardscrabble, Cohocton, Dutch Hill, Dairy Hills, Howard, Munnsville, Alabama Ledge and Roaring Brook projects, totaling over 1,400 MW of proposed wind power.

Tompkins County Public Safety Communications System – Supervised preparation of Visual Impact Assessment (VIA) component of the Draft Environmental Impact Statement prepared for the siting of nine new towers for wireless communications in Tompkins County, New York. Coordinated fieldwork, defined landscape similarity zones and viewer groups, identified sensitive resources/receptors, supervised the development of viewshed maps and visual simulations, and oversaw preparation of the VIA report.

New York State Statewide Wireless Network – Oversaw preparation of the Generic Visual Impact Assessment (GVIA) report included as an appendix to the Draft Environmental Impact Statement prepared for the siting of wireless communications towers throughout New York State. Defined landscape similarity zones and viewer groups, identified sensitive resources/receptors, supervised the development of visual simulations, and participated in the preparation of the GVIA report.

Maple Ridge Wind Power Project – Coordinated State Environmental Quality Review Act (SEQRA) compliance, including preparation of Draft and Final Environmental Impact Statements (DEIS/FEIS) for the largest commercial wind power project in the Northeast. Oversaw production of all support studies and directly prepared ecological, wetlands, agricultural, and visual studies for 300 MW wind power project on the Tug Hill Plateau, Lewis County, New York. Incorporate study results into the DEIS and responded to all public and agency comment in the FEIS. Also assisted with state and federal wetland permitting on the project.

Maple Ridge 230 kV Transmission Line Project – Oversaw preparation of Article VII Application to New York State Public Service Commission for a 10.3-mile-long 230 kV transmission line corridor in Lewis County, New York. Conducted ecological, wetland, and visual fieldwork, prepared Visual Impact Assessment report, and provided expert witness testimony on ecological and visual issues.

Munnsville, Fenner, and Madison Wind Power Projects – Prepared expanded Environmental Assessment Forms (EAFs) for these three commercial wind power projects in Madison County, New York. Work on the projects included project layout/environmental field review to assure that wetland impacts were avoided and impacts to agricultural and ecological resources minimized. Conducted or coordinated support studies addressing potential visual, cultural, noise, ecological, avian and agricultural impacts. Summarized results into expanded EAFs. On each of these projects the Lead Agency issued a Negative Declaration under SEQRA, indicating that no significant adverse environmental impacts were anticipated.

LIPA Offshore Wind Park – Coordinated preliminary visual studies associated with a 150 MW offshore wind power project being proposed by the Long Island Power Authority (LIPA). Project included preparation of visual simulations from heavily used beaches and state parks on the South shore of Long Island, New York. Graphics were used for public information and outreach efforts.

Cape Wind Project – Oversaw production of visual simulations and other graphics/analysis for proposed 130-turbine offshore wind power facility near Cape Cod, Massachusetts. Prepared visual methodology write-up for project Environmental Impact Review and presented methodology at a public/agency forum sponsored by the Massachusetts Technology Forum. The project's visual impact was a sensitive issue, subject to intense scrutiny. Graphics for project were featured in New York Times Magazine article.

E-183 115 kV Transmission Line Relocation Project – Oversaw preparation of a Visual Impact Assessment (VIA) of the proposed relocation of approximately 1.2 miles of existing overhead transmission line in the cities of Providence and East Providence, Rhode Island. VIA included viewshed analysis of existing and proposed towers, line-of-sight cross sections, field evaluation/photo documentation, preparation of visual simulations, and visual impact evaluation using the ACOE VRAP methodology.

Conjunction Empire Connection Transmission Line Corridor -Oversaw preparation of ecological and visual inventories and impact evaluations undertaken in support of the Article VII Application for a proposed DC transmission line running parallel the New York State Thruway from south of Albany to New York City. The visual study assessed potential impacts of proposed overhead segments as well as converter stations for proposed underground transmission line segments. Met extremely tight 30-day schedule for completion of studies.

Reliant Energy Astoria Repowering Project – Conducted Visual Impact Assessment for proposed repowering of the existing Astoria Generating Project in Queens, New York. The study involved identification of landscape similarity zones and viewer groups, viewshed mapping, cross sections, and visual simulations. Assisted with development of visual impact mitigation options, and provided expert witness testimony.

TransEnergie Cross-Sound Cable Project – Coordinated study and prepared Visual Impact Assessment (VIA) report assessing visual impacts of submarine cable crossing of Long Island Sound. VIA focused on the visual impact of above-ground transition stations and associated structures in New Haven, Connecticut and Shoreham, New York.

Neptune Regional Transmission System Project – Coordinated study and prepared Visual Impact Assessment (VIA) report assessing visual impacts of aboveground components of submarine/underground transmission line in New York City metropolitan area. VIA focused on the visual impact of transition stations in Manhattan and on Long Island.

Ramapo Energy Project – Coordinated preparation of comprehensive visual impact analysis for a proposed 1,100 MW gas-fired power plant proposed by American National Power in Rockland County, New York. Study involved background data collection, viewshed mapping, line-of-sight cross sections, field evaluation, visual simulations, evaluation of visual impacts using the U.S. Army Corps of Engineers methodology, and exploration of various visual mitigation measures. Wrote the Visual Impact Assessment report and assisted with preparation of the visual section of the Article X Application and provided expert witness testimony. Also assisted with ecological investigations, and preparation of Application text and testimony dealing with wildlife issues.

Towpath Environmental and Recycling Center – Oversaw the preparation of a Draft Environmental Impact Statement for a proposed landfill and recycling center in the Town of Albion, New York. Responsible for specific studies including the visual impact analysis, vegetation and wildlife inventory, community services, land use and zoning, and economic analysis. Also presented results of studies at public meetings and before an Administrative Law Judge at the SEQRA Issues Conference.

St. Regis Mohawk Reservation Wetland Protection Program – Identified and evaluated of wetlands on the 15,000-acre St. Regis Mohawk Indian Reservation (Akwasasne) in Franklin County, New York. Project involved refining wetland mapping, developing a quantitative system for the evaluation of wetland functions, and providing recommendations for implementation of a wetland protection plan on the Reservation.

Town of Pittsford Greenprint – Developed, field tested, and implemented a townwide ecological inventory and evaluation procedure for the Town of Pittsford, New York. The procedure evaluated a site's ecological value based on the presence and quality of various features including wildlife habitat elements, botanical resources, and water resource features. Project involved field review and ranking of 94 separate properties totaling over 3,430 acres. Property rankings were then used to develop the Town of Pittsford "Greenprint", a comprehensive, town-wide resource protection program that was awarded a 1998 National Planning Award from the American Planning Association.

Black Creek Park – Assisted with the development of a master plan for a largely undeveloped 1,500 acre County park, one third of which is made up of wetlands. Responsible for comprehensive study of the park's ecological resources, including field inventory of all wildlife, wetlands, and natural communities within the park, and an evaluation of the ecological significance/sensitivity of various areas. Also oversaw wetland delineation and state and federal wetland permitting.

Athens Power Project – Evaluated visual resources and visual impacts associated with construction of a 1,080 MW power plant proposed by PG&E National Energy Group. Also delineated state and federal wetlands and documented ecological conditions on the project site and along proposed off-site utility (gas, water, and electric transmission) corridors associated with the project. Assisted with field data collection, agency liaison, and preparation of a wetland delineation report and functional analysis.

Oversaw preparation of the Ecological Resources and Visual Resources sections of the Article X Application, and provided expert witness testimony on potential ecological imapcts. Project was the first permitted under New York's Article X power plant siting regulations.

City Center Drive Industrial Park – Prepared a Draft and Final Generic Environmental Impact Statements for a proposed industrial park on a 128-acre site in the City of Watertown, Jefferson County, New York. Also conducted a Phase I Environmental Site Assessment and state and federal wetland delineation on the project site.

Canal Ponds Business Park – Prepared portions of a Generic Environmental Impact Statement for a proposed 305-acre office park in the Town of Greece, Monroe County, New York. Also conducted a vegetation and wildlife inventory, an on-site wetland delineation, and assisted with preparation and submittal of wetland permit applications and mitigation plans.

St. Lawrence Gas – Prepared Environmental Impact Assessment Reports for proposed natural gas distribution systems in Lewis County and St. Lawrence County, New York. Reports included an inventory of environmental resources within the proposed franchise areas, as well as assessment of anticipated impacts and proposed mitigation measures. Lewis County project involved wetland delineation and permitting, and assistance with preparation of construction drawings.

Comprehensive Environmental Plans – Developed comprehensive environmental protection and enhancement plans for the upper Hudson, Sacandaga and Raquette River corridors. These corridors include 29 hydroelectric developments, 22 of which were owned and\or operated by Niagara Mohawk Power Corporation. Reports were prepared to assist with utility planning and relicensing efforts involving several of these projects.

Clay Source Development – Evaluated environmental impacts of a clay mining operation proposed by Waste Management of New York on a 570-acre site in the Towns of East Bloomfield and West Bloomfield, Ontario County, New York. Study involved a federal wetland delineation, a vegetation and wildlife inventory (including identification of endangered species/critical habitats), and preparation of the Terrestrial and Aquatic Ecology section of the Draft Environmental Impact Statement for the project.

Albany Pine Bush Preserve – Developed and updated a comprehensive management plan for a unique inland pine barrens community in Albany County, New York. Project involved extensive data collection, public participation, and close coordination with members of the Albany Pine Bush Preserve Commission. Plan included resource inventory, management recommendations, an implementation plan, and a Environmental Impact Statement that addressed the potential impacts of plan implementation, including land acquisition, fire management, and increased public use.

Avoca Natural Gas Storage Project – Evaluated the environmental impacts of a proposed natural gas storage project in Steuben and Schuyler Counties, New York. Project included wetland delineation, vegetation, fish and wildlife inventory (including identification of endangered species and critical habitats), viewshed/visibility analysis and preparation of ecological resource reports for the Federal Energy Regulatory Commission (FERC) license applications. Reports described ecological resources within study area, along with potential impacts to these resources resulting from construction and operation of the project, and proposed means of mitigating adverse impacts.

Mendon Ponds Park Ecological Study - Prepared ecological study of a County park in the Town of Mendon, Monroe County, New York. The park is a designated National Natural Landmark, well known for its variety of rare species and unique natural communities, including fens, bogs, oak openings, and prairie remnants. Study involved species inventory, analysis of ecological value of various areas of the park, and management recommendations for the protection and enhancement of the park's ecological resources. Coordinated botanical surveys with the New York State Botanist.

Route 332 Environmental Studies – Prepared studies for the NYS Department of Transportation that examined the environmental impacts of the proposed widening of 7 miles of State Route 332 in

Canandaigua, New York. Specific tasks included visual impact analysis, delineation of wetlands, quantitative evaluation of wetland functions and values, and inventory of vegetation and wildlife resources within the corridors. Environmental impact evaluation, agency liaison, and public presentations were also included as part of these projects.

Niagara Mohawk Hydro Relicensing – Provided assistance to Niagara Mohawk Power Corporation with FERC relicensing of various hydroelectric projects throughout New York State. Prepared a variety of plans, reports, position papers, studies, and responses to agency inquiries. Topics addressed included land use and recreation, fisheries protection and enhancement, whitewater boating, open space conservation, aesthetic/visual impacts, and cultural resources management.

Wetland Studies – Conducted numerous projects involving the delineation of wetlands in accordance with the procedures outlined in the 1989 *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* and the 1987 *Corps of Engineers Wetlands Delineation Manual*. These projects have been conducted throughout New York State, and have typically involved state and federal jurisdictional determinations, wetland permitting, wetland mitigation, and/or wetland monitoring.

John D. Hecklau (self-employed)

Provided environmental/ecological consulting services to landscape architecture and planning firms Specific projects included preparation of 12 vegetation and wildlife inventories, four wetland studies, and three environmental damage assessments. Gathered ecological resource data for two regional land use plans, and wrote a Draft Environmental Impact Statement for a 28 lot residential subdivision in Dutchess County, New York.

New York State Power Authority

Provided environmental support and supervision during the planning, licensing and construction of a major 345kV transmission line. Specific duties included 1) conducting baseline environmental surveys and inventories, 2) reviewing and revising environmental/construction specifications, 3) providing liaison with state regulatory agencies, and 4) monitoring compliance with environmental regulations and commitments during construction.

Assisted with ongoing right-of-way management program, including revision of existing vegetation management specifications and criteria, field evaluation of vegetation inventory and management techniques, and assistance with development of computerized right-of-way database. Other responsibilities included initiation of various wildlife management programs and studies. These included 1) programs to improve wildlife habitat on right-of-ways and at generating facilities, 2) studies to assess impacts of transmission line construction on wildlife, and 3) an endangered species survey for a proposed 200 mile-long transmission line.

Connecticut Department of Environmental Protection

Prepared a comprehensive development and operation plan for a newly acquired 450-acre wildlife management area and proposed educational facility. Project included coordination of a wildlife species survey, analysis of habitat improvement needs, and conducting of a nationwide survey of existing conservation education facilities and programs.

Central Park Conservancy

Prepared fish and wildlife section of a master plan for the restoration and management of Central Park in New York City. Project included conducting an inventory of species and significant habitat areas within the 830-acre park. Report of findings was prepared, which included analysis of habitat value and recommendations for preserving and enhancing park wildlife habitats.

Manomet Bird Observatory

Assisted Director of Environmental Education with preparation and teaching of field and classroom courses regarding ornithology and marine biology. Also assisted research personnel with studies investigating songbird territoriality and shorebird migration.

Minnesota Department of Natural Resources

Conducted research project involving trapping and transplanting of radio-tagged wild turkeys. Investigated mortality, dispersal, and reproduction of birds in three separate populations. Also assisted DNR biologists in wildlife research projects involving trapping and tagging of whitetail deer, and surveys of ruffed grouse and waterfowl.

Visual Impact Rating Form

Project:		
Rating Panel Member:	Date:	VP#:

VIEWPOINT DESCRIPTION: *please describe this view in your own words*

_____

_____

_____

SCENIC QUALITY: *please rate existing scenic quality low, medium or high* _____

VIEWER TYPE: *check as many as apply.*
☐Resident ☐Traveler ☐Recreational ☐Other _____

CONTRAST RATING: *Rate the level of contrast between the proposed structures and the existing view.*

Component	*SCORE*	*DESCRIPTION OF CONTRAST*
Landform		
Vegetation		
Land Use		
Water		
Sky		
Viewer Activity		
TOTAL		
AVERAGE		

Variable factors that may have influenced rating (atmospheric conditions, season, etc.):

_____

Perceived effect on scenic quality / viewer enjoyment: _____

_____

_____

_____

Contrast Rating Score Chart	
0	Insignificant
0.5	
1	Minimal
1.5	
2	Moderate
2.5	
3	Appreciable
3.5	
4	Strong

THE STATE OF NEW HAMPSHIRE
BEFORE THE
NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF HOPE E. LUHMAN ON BEHALF OF GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name and business address.

A. My name is Hope E. Luhman. My business address is: The Louis Berger Group, Inc., 20 Corporate Woods Blvd., Albany, New York 12211.

Q. Who is your current employer and what position do you hold?

A. I am employed by The Louis Berger Group, Inc. ("Berger") as an Assistant Director for Cultural Resources and Senior Archaeologist.

Q. What are your background and qualifications?

A. I have more than 25 years of experience in historic preservation and cultural resource management. I have a Ph.D. in Anthropology from Bryn Mawr College, an M.A. in Anthropology from Bryn Mawr College, an M.A. in Social Relations from Lehigh University, and a B.A. in Anthropology from Muhlenberg College. I am a Registered Professional Archaeologist (RPA) and worked on the Deerfield Wind project

in Vermont in the 1990s, the proposed Searsburg Wind project in Vermont, and the Coos County Wind project in New Hampshire.

Q. Have you testified before the New Hampshire Site Evaluation Committee previously?

A. Yes. I provided prefiled and live testimony in Docket 2008-04 regarding the impacts of the Granite Reliable Wind Project on historic resources.

Purpose of Testimony and Overview of the Project

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the potential impacts on historic properties of the Groton Wind, LLC Project ("the Project") in Grafton County.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as Project Manager for the cultural resource surveys, I am supervising the work of the Architectural Historian and the Archaeologist who have completed the preliminary phase of the historic architectural survey and Phase IA archaeological survey, respectively, for purposes of compliance with Section 106 of the National Historic Preservation Act ("NHPA").

Impact on Historic Sites

Q. Have you studied the impact this Project will have on historic sites?

A. Yes, we have initiated our survey work and have completed a historic architectural survey and a Phase 1A archaeological survey.

Q. Please describe your studies.

A. The historic architectural survey has identified those historic properties listed on the National Register of Historic Places ("NRHP") and the New Hampshire State Register of Historic Places within a 3-mile area of potential effects ("APE") for visual effects or viewshed. For this Project, and in consideration of the proposed turbine height, an APE of three (3) miles has been proposed for the study area in which the proposed Project has the potential to insert visual effects that could diminish the setting of an historic property where the property's setting is a central feature of NRHP eligibility. As part of the work, Berger completed a site file check at the New Hampshire Division of Historic Resources ("NH DHR") to research previously identified historic properties listed and/or eligible for listing on the National Register and New Hampshire State Register within the APE.

For the purposes of compliance with Section 106 of the NHPA, the United States Army Corps of Engineers ("USACE") is acting as the lead federal agency for this undertaking. The USACE is consulting on an appropriate APE and scope of work for any architectural field survey within the APE.

The Phase IA archaeological survey provides an initial review of the Project to assess areas of archaeological sensitivity and potential resource management issues. This report has been completed and will be reviewed by the USACE and the NH DHR. A copy of this report has been included with the Application as Appendix 25 .

Q. Please explain the results of your studies.

A. The preliminary perspective of the historic architectural survey suggests that a number of National Register-eligible properties may be located in the Project's APE (defined by the three-mile viewshed). Thus, the nature and extent of potential visual impacts of the proposed Project on historic buildings, structures and/or districts is still under review. The review of any potential visual impacts will continue by the USACE, in consultation with the NH DHR. It is important to note that no buildings or structures will be acquired or physically altered or removed by the Project, and thus impacts, if any, would be limited to those resulting from the visibility of the Project from the historic property.

Based on the findings of the Phase IA archaeological survey, Berger recommends that a Phase IB archaeological survey of the area associated with ground disturbance be conducted to identify archaeological resources that could be affected by project construction. It is proposed that this work will be conducted during spring/summer 2010 in consultation with the USACE and the NH DHR and that the Applicant will provide information as to whether archaeological sites are present within the archaeological APE or the area associated with any proposed ground disturbance once the Phase 1B survey is complete. Such information will provide the basis for determining the need for further work or mitigation (e.g., Phase II/site evaluation investigation, Phase III/data recovery excavation).

Q. In your opinion will this Project have an unreasonable adverse effect on historic sites?

A. Based on the preliminary survey findings and our current understanding of the Project, we do not believe that this Project will have an unreasonable adverse effect on historic sites. Although our investigations are not yet complete, based upon available information, Berger's experience at other projects, and the manner in which similar potential impacts have been addressed by state and federal regulators in the past, it is our opinion that:

The proposed Project is unlikely to have an unreasonable adverse effect on any known historic properties. No historic structures will be physically impacted, and at present it appears unlikely that the visibility of the Project would demonstrably diminish any aspects of setting that might contribute to the significance of such historic properties.

In addition, the proposed Project is unlikely to have an unreasonable adverse effect on any significant archaeological resources as any potential effects will be mitigated through data recovery excavation designed in consultation with the USACE and the NH DHR.

Q. What steps has Groton Wind, LLC taken to insure that the impact of the Project on historic properties will be mitigated?

A. Should mitigation be required due to the proposed Project's impact on historic properties, it is possible that vegetative screening around the affected property would limit the extent to which the Project is visible from the resource. Other forms of mitigation may also be employed, as appropriate.

Should future studies determine that the Project may adversely affect archaeological resources, data recovery excavations are an accepted mitigation measure.

Q. Are there any other comments you would like to make at this time?

A. No.

Q. Does this conclude your prefiled testimony?

A. Yes.

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THE STATE OF NEW HAMPSHIRE
BEFORE THE
NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-__

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF NANCY B. RENDALL
ON BEHALF OF
GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name and business address.

A. My name is Nancy B. Rendall. My business address is 6 Bedford Farms Drive, Suite 607, Bedford, New Hampshire, 03110

Q. Who is your current employer and what position do you hold?

A. I am employed by Vanasse Hangen Brustlin, Inc. ("VHB"). I presently hold the position of Senior Environmental Scientist.

Q. What are your background and qualifications?

A. I have more than 26 years of experience in the soil and wetland science fields including environmental assessment, permitting, and monitoring of energy- related projects. Prior to joining VHB, I was the sole owner of a small environmental consulting firm (Blue Moon Environmental, Inc.) for 12 years. Prior to forming my own business, I was employed by New England Environmental Associates as a Senior Wetland

Scientist/Program Manager for 12 years. I worked for a short period of time for the New Hampshire Governor's Energy Office in the early 1980's. I hold a Master's Degree in Land Resources with a Program Certificate in Energy Analysis and Policy from the University of Wisconsin, and a Bachelor of Science degree in Forest Hydrology from the University of Minnesota. I am a Certified Soil Scientist and Certified Wetland Scientist in New Hampshire and currently serve as the Vice President of the New Hampshire Association of Natural Resource Scientists, as well as the Vice Chair of the New Hampshire Joint Board of Natural Resource Scientists, which is the state licensing board for wetland and soil scientists. I also Chair the Aquatic Resources Mitigation Fund – Site Selection Committee. This Committee was established under RSA 482-A:32 (the NH Wetlands Dredge and Fill Act) to identify projects to be funded from the state's aquatic resource compensatory mitigation fund.

Purpose of Testimony and Overview of the Project

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to support the information in Groton Wind, LLC's Application that pertains to the Project's potential effects on the natural environment, particularly wetlands and wildlife habitat. In addition, my testimony summarizes the actions that were undertaken to review, map and inventory the Project site's natural resources and to analyze the Project's anticipated effects on natural resources. My testimony also describes the plan for mitigating the Project's impacts on wetlands and wildlife habitat.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as an environmental consultant to the Project, I have reviewed Project maps and visited the site numerous times to perform wetland delineations and assess wetland impacts at proposed turbine locations. Additionally, I have coordinated the wetland delineation for the Project, assessed the Project's wetland impacts, assisted in developing a plan to mitigate those impacts, and prepared the wetland permit application that is contained in Appendix 1 to the Application.

Q. Please describe the design of and location of this Project.

A. The entire Project is located within 4,180 acres of leased property in Groton, New Hampshire. It consists of the construction of 24 wind turbines, each with a capacity of two megawatts. The turbines will be located in three strings atop ridgelines in the Clark Brook watershed, identified as Fletcher Mountain (West Ridge), Tenney Mountain (East Ridge) and an unnamed ridge (Northwest Ridge). The Project will include the use of approximately 2.4 miles of existing private gravel roads that have historically been used for logging operations. It will also involve the construction of approximately 9.3 miles of new gravel roads to access the turbine sites.

Wetland Impacts

Q. Please describe the consideration that the Applicant and its consultants have given to wetland issues associated with the Project.

A. Avoiding and minimizing wetland impacts has been a priority from the beginning of this Project. Representatives of the Applicant and VHB have held several meetings with state and federal regulatory and resource agencies to discuss wetland issues. The most recent meetings were held on October 6 and 15, 2009 with representatives from the New Hampshire Department of Environmental Services ("NHDES") Wetlands Bureau, the United States Environmental Protection Agency ("USEPA"), the United States Fish and Wildlife Service ("USFWS"), the New Hampshire Fish and Game Department ("NH Fish and Game"), and the United States Army Corps of Engineers ("USACE") to discuss the proposed Project design, the potential impacts to wetlands and other natural resources, the permitting requirements and potential mitigation measures.

As discussed below, the wetlands were field delineated within a 425 acre corridor study area. During the course of VHB's study and evaluation of the Project's wetlands, the Project's impacts on wetlands have been carefully considered and have resulted in numerous design changes in an effort to avoid and minimize impacts to the wetlands on the Project site. VHB has also worked with the Applicant to develop a mitigation plan to offset the wetland impacts.

Q. Please describe your study of the Project's impact on wetlands.

A. The study included several components, including: 1) delineating and mapping wetlands; 2) classifying wetlands and vernal pools; 3) preparing an evaluation of wetland functions and values; and 4) identifying and analyzing wetland impacts.

Wetlands were delineated in the spring, summer and fall of 2009 by a team of N.H. certified wetland scientists in accordance with NHDES and USACE wetland delineation standards found in the report *Corps of Engineers Wetlands Delineation Manual, 1987*. The delineated wetlands are located at the proposed turbine sites, laydown area, substation area, switchyard area, and along the existing and proposed roadways that will be used to construct and maintain the Project. A map showing the locations of the delineated wetlands is contained in Appendix 1 submitted with the Application. Those wetlands were also classified according the USFWS wetland classification system found in the report *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin, et al. 1979).

In addition to the delineation and classification of wetlands, a vernal pool study was completed in the spring of 2009. This included field documentation of vernal pools and collection of data relative to pool types and characteristics using methods as described in the document, *Identification and Documentation of Vernal Pools in New Hampshire,* 2nd Ed. 2009, published by the New Hampshire Fish and Game Department. The Project study involved carefully surveying a 550 acre swath along conceptual corridors to document vernal pools that could be potentially impacted by the Project. The

study was conducted in the spring because this is the critical period for the amphibians that depend on the vernal pools. The animals are active in the spring time and use the pools for breeding. Sampling the pools allowed us to identify the egg masses that occur in each potential pool, which enabled us to determine if the pool actually supports vernal pool wildlife. It also allowed us to measure the presence of various species and the ecological richness of the pool.

We also conducted an assessment of wetland functions and values for representative wetlands using a method developed by the New England Corps of Engineers detailed in a report entitled *The Highway Methodology Workbook Supplement* (USACE, 1999). More specific information about the wetlands and streams on the Project site is contained in the wetlands permit application submitted as Appendix 1 to the Application.

Q. Please summarize the results of your wetland studies.

A. Delineated wetlands for the Groton Wind Farm are dominated by Palustrine forested wetlands, seasonal intermittent streams and small perennial streams. Historically, a large percentage of the delineated wetlands have been impacted by logging, including the construction of haul roads and log yards, and log skidder operations. Many of the wetlands to be impacted are on sloping basal glacial till or bedrock landscapes with low vegetative interspersion. A qualitative assessment of 13 wetland functions and values on wetlands on the Project site found that many of the wetlands on site have limited functions due to their small size and disturbed nature.

However, even the small wetlands provide for some functions such as wildlife habitat and sediment retention.

Based on our study, the Project will result in unavoidable permanent impacts to approximately 1.63 acres of wetlands and streams. The details of these impacts are reported in the wetlands permit application, which is included in Appendix 1 to the Application. Nearly all of the wetland impacts, which range in size from a few square feet to just over 5,500 square feet, are related to the construction of the access roads to and along the ridgelines. About 0.3 acre of impact will result from the upgrading of the private portion of Groton Hollow Road. No wetlands will be impacted by the Operations and Maintenance facility, the switchyard or the overhead lines. Many of the wetland impacts involve filling a very small portion of a small wetland. One of the most common impacts involves crossings of the numerous narrow forested drainages on the side slopes of Tenney and Fletcher Mountains. In these cases, the engineers have incorporated either small culverts or "stone mattress" structures into the roadway which will allow water to continue to flow down the drainage as it currently does. This will help to minimize the potential effect on downslope wetlands.

Given that the Project will occupy about 116 acres within the 4,180-acre Project area, and taking into consideration the type and scope of the Project, 1.63 acres of permanent wetland impact is relatively minor and represents less than 1% of wetlands within the Project area and less than 0.1% of the total Project area.

The spring vernal pool survey found a total of 11 vernal pools and 6 potential vernal pools on the Project site. No direct impacts are proposed to the documented breeding habitat of any of these pools. There will be indirect impacts to Vernal Pool ER-VP1 (@ Wetland ER-47) associated with the clearing for Turbine E-3. Other indirect impacts involve one wetland along Groton Hollow Road in which a vernal pool is located that will be impacted directly by the Project (GH-20), however the proposed impacts are located outside of the documented vernal pool breeding habitat. GH-20 is very small and has lower quality vernal pool habitat due to previous logging, a very shallow basin and its close proximity to Groton Hollow Road. Overall, long term impacts to vernal pools within the Project area have been minimized by the Project design. In addition, the construction of the gravel access roads will have a low potential to generate pollutants and/or traffic levels that would endanger amphibian species. The proposed access roads will not serve to block amphibian travel and will not be salted during the winter, thus reducing the likelihood that the water quality within the vernal pools will change.

Wildlife Habitat Impacts

Q. Please describe the assessment of wildlife habitat completed for the Project site.

A. Our assessment focused on general habitat types as well as evidence of wildlife use. Other studies were conducted on bird and bat species, so we focused on potential habitat for mammals, reptiles and fish. In order to develop a preliminary habitat map for the site, we used digital data from the NH Wildlife Action Plan ("NHWAP"),

which was produced by the NH Fish and Game Department in 2006. The NHWAP provides a statewide mapping of vegetative habitat cover types using Landsat images, as well as data from other sources including the US Geological Survey's 30-meter digital elevation models, "Ecological Land Units" created by The Nature Conservancy, the National Wetlands Inventory (US Fish and Wildlife Service) and the county soils mapping from the Natural Resource Conservation Service.

We also developed a list of probable species using the NEWILD computer program developed by the US Forest Service. The program generates a list of individual wildlife species based on long standing relationships with particular plant communities or habitat types that are found on an existing property.

Field data was collected during the spring, summer and fall of 2009. Our biologists compiled field observations and documented wildlife use along several random transects on the Project site. Evidence of wildlife signs including observation (visual and audio), feeding activity (e.g., browse), mating activity, travel paths/corridors, borrows or dens, and scat were inventoried. In addition to general habitat features, the field reconnaissance concentrated on identifying priority wildlife habitat components for wood turtle, brook trout and identifying potential deer wintering yards.

Q. Please describe the wildlife habitat that occurs on the Project site.

A. The site contains approximately 4,180 acres of undeveloped habitat, albeit modified substantially by the timber harvesting operations that have occurred on this site since the 1940s and earlier. Moose and bear sign (sighting, tracks and scats) were

observed especially in areas previously disturbed by logging. Evidence of well-established wildlife trails indicates both historical and continuing moderate to heavy use by a variety of wildlife species. Both the logging roads and established trails provide travel corridors through the property's interior and to adjacent properties and their respective habitats.

An interspersion of four upland plant communities (Hemlock-Hardwood-Pine Forest, Northern Hardwood–Conifer Forest, Lowland Spruce-Fir Forest and Rocky Ridge/Talus Slopes Habitat) contributes to general habitat quality on the Project site. These communities offer a variety of cover types. A range of diameter classes and varied height classes of trees provide good horizontal and vertical density. This characteristic in forest structure increases the range of wildlife diversity. The thick understory American beech saplings, striped maple, mountain maple, and hobble bush provide another essential requirement of wildlife cover. (Vulnerability to predation and/or hunting pressures are reduced with adequate cover.)

The abundance of hard mast contributes substantially to the food value of this largely forested acreage. Beech trees (>12 inches diameter) found throughout the property and a limited number of red oak trees located within lower elevations of the property produce hundreds of pounds of beech nuts and acorns per tree. When available, these nuts provide a food source as both small and large mammals prepare for the long winter season.

Supplementing the yield of beech nuts and acorns is the overall abundance and availability of white pine seed. Although rather small in size, the seeds contain fat producing oils and are considered highly nutritious. White pine is found interspersed in the larger conifer stands and due to its relative maturity and large size, the production capability is high. Other feed sources contribute to overall abundance but also provide a good range of variety and may also fill some nutritional requirements of individual wildlife species.

Also notable are the rock outcrops observed on the Project site, especially sites located on the on the south and west facing slopes. These sites provide potential cover, denning sites or sunning spots for a variety of wildlife including bobcats, snakes, porcupine, coyote, and black bear.

Lowland Spruce-Fir forest and other conifer stands, especially the ones located on the west and south-facing slopes, provide potential wintering habitat for white tail deer. However, as observed during the field investigations, only one of three such areas on the Project site appears to provide good deer yard habitat currently. Certain areas which might have once functioned as deer yard, have been disturbed by heavy cutting and no longer provide cover for deer. Other conifer stands were also observed and thinning from logging has lowered or eliminated the potential value of the deer wintering yards. By removing the overstory, the snow accumulates and the deer habitat cover is lost.

With regard to the potential occurrence of wood turtle on the site, we found that there was very little of the turtle's preferred habitat - riparian area associated with low

gradient streams and rivers with sandy bottoms and heavily vegetated stream banks. Given this observation, it seems unlikely that any resident population of wood turtle exists on the site and it was concluded that the risk to this species from this Project is negligible.

Several perennial and intermittent stream systems are found in the property and complement overall habitat. Although most are small and seasonal in nature, these water courses support additional niche habitats for a variety of macroinvertebrates. These "niche" habitats are relatively free of predators due to their location in the upper reaches of a watershed. This allows these macroinvertebrate populations to later provide feed to upper level populations from amphibians to birds to mammals. Lower in the valley, we found that Clark Brook and its associated tributaries provide habitat (including clear and cold water temperatures, riffles, deep pools, a forested canopy, and associated feed sources) which can support native brook trout. In fact, our biologists observed brook trout within the Clark Brook mainstem on a few occasions during our field work in 2009.

Mitigation of Wetland and Wildlife Habitat Impacts

Q. What steps has Groton Wind, LLC taken to mitigate the impact of the Project on wetlands and wildlife?

A. The first step in mitigating impacts is to avoid and minimize impacts and this has been a key component of the design for this Project. The Project has worked with its engineers to make design changes to avoid proposed wetland impacts where

possible. In addition, the Project has developed a mitigation plan for addressing unavoidable wetland impacts. Both of these issues are discussed below.

VHB employs experts in a variety of disciplines and provides the resources and work space for these professionals to work in a collaborative manner. For this Project, collaboration between the wetland scientists, the design engineers and other civil engineers was an ongoing and integral part of the design and helped to achieve dual Project goals, that of optimizing the roadway alignments and cross-sections to limit wetland impacts to the absolute minimum while maximizing adherence to the Applicant's design constraints and criteria.

The design of the Project began in earnest in the summer of 2009, and was an iterative process through to the completion of the design. The initial roadway was laid out conceptually by using National Wetland Inventory maps (NWI), USGS topography, aerial orthophotos and other GIS-based data. The conceptual road layout provided a reasonable result in terms of avoiding GIS-delineated wetlands. However, further avoidance occurred as fieldwork was completed and wetlands were located on site. The layout of the access roads and turbines was continuously refined to move towers and other structures away from wetlands. The proposed location of the turbines on ridge lines avoids impacts to some of the larger forested wetland complexes and perennial streams located in the valleys, which are some of the most ecologically important wetlands on the Project site. As the VHB wetland scientists gained new information about wetlands through our field studies, we were able to work directly with Mike Leo (the lead VHB

civil engineer for the Project) and his engineering team to make dozens of changes and refinements to the Project layout to further avoid and minimize impacts. This process has worked well and has resulted in a total permanent impact to wetlands and streams of only 1.63 acres, which is reasonable given the scope of the Project.

The measures that have been incorporated into the Project design to minimize impacts include concept plans, and the continuous adjustment of proposed road layouts, tower locations and other structures in order to opt for sites having fewer wetland impacts. New access roads have been located to avoid wetlands entirely or to cross wetlands at or near their narrowest points if they cannot be avoided. The width of access roads has been limited to the minimum required for construction access and safety. The roadway design uses sideslopes of 1:2 in rock cuts and 1.5:1 constructed stone slopes to further minimize slope impacts (1.5:1 slopes are the steepest non-mechanically stabilized earth slopes practical). At some locations where existing roadways already cross wetland areas, the existing culverts will be replaced with improved culverts or small spans to create more favorable conditions for fish, macro-invertebrates, herptiles and other aquatic organisms to use and access habitat on both sides of the roadway.

In addition to these design efforts, work is on-going to develop final erosion control plans. These measures include the installation of temporary erosion and sedimentation controls such as silt fence, siltsox, rock check dams, erosion control matting, pervious berms consisting of shredded bark and/or stump grindings, hydro-seeding, soil tackifiers, stone drainage mattresses and stabilized rock slopes. Areas of

exposed soil will be kept to a minimum and a permanent vegetative cover or other forms of stabilization will be established as soon as practicable. Prior to and during construction of the proposed development, the contractor shall be responsible for installation, inspection and maintenance of temporary sedimentation and erosion control measures to prevent off-site tracking and the loss of earth sediment, trash, and construction debris.

A Stormwater Pollution Prevention Plan that will outline all of the measures that will be implemented during construction to minimize potential impacts to wetlands and surface waters is required by the USEPA and will be completed and implemented prior to construction.

Q. Please describe the mitigation plan that has been prepared.

A. Because the Project involves greater than 10,000 square feet of permanent impacts to wetlands, NHDES rules state that compensatory mitigation is required to offset these impacts. A mitigation assessment plan was prepared in consultation and conceptual discussions with representatives of NH DES, NH Fish and Game, US EPA, USFWS, and USACE. These discussions have included Lori Sommer, the NH Wetlands Bureau Mitigation Specialist, and Mark Kern of the US EPA, both of whom are frequently involved in development of mitigation plans in New Hampshire.

The central feature of the mitigation proposal is the Applicant's collaboration with the Society for the Protection of NH Forests (the Forest Society) to assist in their effort to protect up to 6,578 acres owned by Green Acres Woodlands, a private

timberland company, in Groton, Hebron, Rumney, Dorchester and Plymouth. Under a proposed conservation easement, the land would continue to be privately owned and managed for forest products, but could never be subdivided or developed. The Forest Society has been fortunate enough to have secured funding through the US Forest Service's Forest Legacy Program ("FLP") for the acquisition of the conservation easement on the Green Acres Woodlands. This funding is expected to cover the cost of the easement on all Green Acre Woodlands parcels. The State of New Hampshire will hold the conservation easement over these lands. In addition to the land easement value, however, there are a number of other costs involved which are not covered by the FLP. These additional costs, which can be a significant barrier to completion of the conservation project, must be paid by the landowner, the state, or the Forest Society. These costs include: 1) land surveys of the parcel involved in the conservation project; 2) appraisal of the land value, required by the FLP; 3) legal fees for developing the easement documents and deed records; 4) stewardship funds to monitor and maintain the easement; and 5) Forest Society staff costs expended in pursuing landowner agreements, developing grant applications, etc.

The Applicant's role in the conservation project will be to support the Forest Society's efforts by providing technical as well as financial assistance for such things as providing survey and deed research on some of the properties involved in the larger conservation project, providing ecological data including wildlife habitat surveys and similar documents, and providing a financial donation to help endow the stewardship

fund. The Applicant will continue to work with the Forest Society to advance the Green Acre Woodlands conservation project.

In addition to the conservation easement project, mitigation measures include upgrading a number of stream crossings along Groton Hollow Road which will benefit riparian conditions in the Clark Brook watershed. There are more than two dozen existing culverts along the road, many of which do not meet current guidelines for stream crossings advocated by NHDES and the NH Fish and Game Department. The existing undersized stream culverts have an impact on the stream hydrology because their small size increases the likelihood of ponding upstream and erosion and sedimentation downstream. In some cases, undersized culverts or sub-standard installations can create barriers to the passage of stream organisms, including fish. Through this Project, the Applicant plans to replace these sub-standard culverts with new stream crossings which meet the *New Hampshire Stream Crossing Guidelines*, published by the University of New Hampshire, May 2009. These new crossings will be appropriately sized to accommodate flow patterns for their drainage area, will be more consistent with natural physical stream processes and will help to improve the connectivity of the riparian habitat associated with Clark Brook. Just as the Applicant has discussed the idea of assisting the Forest Society with their conservation project with the resource agencies, the idea of improving culverts was discussed as a mitigation strategy with NHDES.

Q. In your opinion will this Project have an unreasonable adverse effect on wetland and wildlife resources?

A. No. The Project will not have unreasonable adverse effect on wetlands or wildlife habitat natural resources. Wetland impacts have been minimized by siting turbines and infrastructures out of wetlands whenever possible, utilizing existing logging roads for access during construction and operation of turbines whenever possible, constructing any new access roads to avoid wetland impacts, and mitigating unavoidable wetland impacts in a manner that meets all state or federal minimum standards.

Q. Does this conclude your prefiled testimony?

A. Yes.

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THE STATE OF NEW HAMPSHIRE
BEFORE THE
NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-__

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF ADAM J. GRAVEL
ON BEHALF OF
GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name and business address.

A. My name is Adam Gravel. My business address is 30 Park Drive, Topsham, Maine, 04086.

Q. Who is your current employer and what position do you hold?

A. I am employed by Stantec Consulting ("Stantec") as a Project Manager. I am responsible for coordinating and conducting wildlife use and impact assessment surveys, with a specific focus on large-scale avian and bat studies associated with wind power projects.

Q. Please describe Stantec and its experience in conducting avian and bat studies, including risk assessments.

A. Stantec is an environmental consulting company that provides services to

a variety of sectors, including the wind industry. Between 2002 and 2008, Stantec[1] has conducted over 180 distinct seasons of pre-construction avian and bat studies on behalf of proposed wind projects in twelve states, from Texas to Maine, including New Hampshire. The Groton Wind Project ("Project") is the third utility-scale project in New Hampshire for which Stantec has conducted pre-construction avian and bat studies. Pre-construction surveys typically include nocturnal radar surveys, acoustic bat monitoring, diurnal raptor surveys, breeding bird surveys, and targeted rare species surveys, depending on specific requests from state and federal resource agencies. Based on the results of on-site field surveys, Stantec has also prepared screening-level avian and bat risk assessments for a variety of wind projects and has also designed and conducted agency-approved post-construction surveys. Stantec has completed post-construction bird and bat mortality surveys at existing wind projects in Maine, New York, and Pennsylvania. The post-construction efforts have allowed Stantec to further refine its survey methodology to provide more comprehensive data sets to the regulatory agencies and the regulated community. Post-construction surveys are particularly helpful to determine if any relationships exist between pre-construction and post-construction survey results and overall impacts to bird and bat species that result from wind energy projects.

Stantec maintains regular contact with state and federal resource agencies and seeks involvement with regional and national organizations whose sole purpose is to better understand and minimize potential wind energy-associated wildlife impacts.

[1] All field work, reporting, and permitting activities for the Groton Wind Project performed prior to October 1, 2007, were conducted by Woodlot Alternatives, Inc. ("Woodlot"). On October 1, 2007, Woodlot was acquired by Stantec. Unless otherwise noted, references to Stantec include both Woodlot and Stantec.

Stantec has directly participated in the development and review of proposed guidelines and monitoring protocols sponsored by several state and federal agencies.

Q. What are your background and qualifications?

A. In 2003, I earned a Bachelor of Science degree in Wildlife Management from the University of New Hampshire. I was hired by Woodlot Alternatives, Inc. (now Stantec) in 2004 as a Project Technician and radar ornithologist and was promoted to Project Manager in 2006.

I have conducted and coordinated environmental studies as part of state and federal permitting requirements for over 60 wind energy projects from Maine to Virginia. The subjects of these studies include daytime raptor migration, nocturnal radar migration, acoustic bat detector, and breeding bird surveys designed to assess potential direct impacts from proposed wind energy projects. I have also assessed the potential indirect (non-collision related) impacts of projects on wildlife, including habitat impacts and fragmentation effects, impacts to rare species, and impacts to common, local wildlife communities.

My experience in New Hampshire includes managing and conducting several nocturnal radar and acoustic bat surveys, diurnal raptor migration and breeding bird surveys, rare plant and natural community surveys, and winter tracking surveys for state-listed species. I have consulted with state and federal agencies to identify and discuss potential resources of concern at proposed projects and also have developed field surveys to address agency concerns about wildlife. I have conducted these studies for the only two permitted wind projects in the State of New Hampshire.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to briefly explain and summarize the results of bird and bat field surveys conducted by Stantec in 2006, 2008, and 2009 on behalf of Groton Wind, LLC ("Groton Wind") for this Project. Complete presentations of the methods, analysis, and results of each survey are contained in the following six (6) reports, which are included as Appendices to Groton Wind's Application:

- Summer, and Fall 2006 Wildlife Surveys at Tenney Mountain, New Hampshire (Appendix 29);
- Spring 2008 Radar Survey Report (Appendix 30);
- Fall 2008 Radar Survey Report (Appendix 31);
- 2009 Spring, Summer and Fall Avian and Bat Survey Report
- (Appendix 32);
- Summer and Early-Fall 2009 Peregrine Falcon Use Survey Report (Appendix 33) and;
- Groton Wind Bird and Bat Risk Assessment: A Weight-of-Evidence Approach to Assessing Risk to Birds and Bats at the Proposed Groton Wind Project, New Hampshire (Appendix 28).

My testimony includes a brief description of the methodology, investigations, and consultations related to the individual bird and bat studies and bird and bat risk assessment. In addition, my testimony describes the results of those studies related to:

(1) threatened and endangered species; (2) nocturnal migration activity; (3) raptors; (4) bats; and (5) breeding birds.

Q. Are you familiar with the Project site that is the subject of this Application?

A. Yes, I am familiar with the Project site. Stantec, acting as a Project consultant, conducted a number of avian and bat surveys within the Project area. The avian and bat surveys were conducted as part of state and federal permitting processes and included investigations of the Project area ridgelines and areas proposed for wind turbines. These avian and bat investigations occurred over three years starting in 2006 and involved several Stantec biologists and ecologists, including myself. I have spent a significant amount of time at the Project site selecting survey locations, and setting up field surveys and equipment, as well as conducting some of those surveys. Over the course of these surveys, I have visited nearly all areas along the ridgelines where the turbines are proposed to be sited.

Bird And Bat Studies

Q. Explain how Stantec developed survey methods for the on-site bird and bat studies.

A. The State of New Hampshire does not currently have any guidelines for pre-construction bird and bat surveys for proposed wind projects. Therefore, the types, length, and timing of surveys are based principally on Stantec's extensive experience conducting these types of surveys for proposed wind projects. These surveys are

consistent with studies conducted at certificated wind projects in New Hampshire to date. In addition, survey effort and methods were consistent with recommended guidelines used in other states (e.g., Vermont and New York).

Because of the lack of New Hampshire-specific guidelines, Stantec and Groton Wind worked with state and federal resource agencies to confirm that planned surveys would address agency concerns. Accordingly, a work plan was developed by Stantec and Groton Wind for submittal to state and federal agencies for discussion and comment. The work plan was developed based on two previous documents: Iberdrola's Avian and Bat Protection Plan, which the U.S. Fish and Wildlife Service ("USFWS") has endorsed, and the Groton Wind Farm Phase 1 Avian Risk Assessment, which was produced by Curry & Kerlinger in June 2008.

On March 4, 2009, Groton Wind discussed the Project and proposed scope of work for bird and bat studies with staff from the New Hampshire Fish and Game Department ("NHFGD") and USFWS at a meeting held in Concord, New Hampshire. The details of that discussion were incorporated into the *Proposed Work Plan for Avian and Bat Studies at the proposed Groton Wind Project.* See Appendix 17 to the Application. No written comments on this proposed work plan were received from USFWS. The NHFGD recommended several additional wildlife studies which are submitted as part of the Habitat Assessment performed by VHB Consultants. *See* Appendix 20 to the Application. Additionally, NHFGD recommended that Groton Wind and Stantec also consult with New Hampshire Audubon to discuss a proposed work

scope for conducting peregrine falcon (*Falco peregrinus*) use surveys at the Project. Groton Wind, Stantec, and NHFGD met with New Hampshire Audubon on April 15, 2009 to discuss potential survey designs to address concerns for locally-breeding peregrine falcons using the Rattlesnake Mountain nest location (approximately two miles north of the Project) and Bear Mountain nest location (approximately five miles south of the Project). Based on discussions with New Hampshire Audubon and NHFGD, Stantec developed a work plan for peregrine use surveys, which New Hampshire Audubon approved on June 3, 2009. Subsequent field surveys and reporting were conducted by New Hampshire Audubon and Stantec collaboratively.

Q. Please provide a brief description of the bird and bat studies conducted at the Project site.

A. Stantec conducted pre-construction bird and bat surveys at the Project to document various aspects of migratory and resident bird and bat activity within the Project area. These surveys were conducted to assist Groton Wind in project design and to inform the permitting process for the Project. Surveys were conducted in:

- Fall 2006;
- Spring and Fall 2008; and
- Spring, Summer and Fall 2009.

Together, Stantec and New Hampshire Audubon conducted 20 days of peregrine falcon use surveys at the Project during the post-fledgling season from June 21 to

September 6, 2009. The surveys included two staff from Audubon and two staff from Stantec. The two Audubon staff covered the Rattlesnake and Bear Mountain aerie sites, and Stantec covered the ridgeline sites during each survey day for a total of four observers at four different survey locations. While field survey results were analyzed by Stantec, the report was prepared jointly by Audubon and Stantec.

The 2006 acoustic bat surveys were conducted to document bat activity and species composition at heights below and above tree canopy, as well as near the lower end of the turbine rotor zone. Surveys were conducted from the southern end of Tenney Mountain to take advantage of the only installed meteorological measurement tower ("met tower") on site at that time. This allowed for the deployment of bat detectors at a range of heights, including heights near the lower end of the rotor zone. Also in 2006, a screening-level field survey of peregrine falcon activity was conducted to document activity around the Rattlesnake Mountain nest and the potential use of the Project area by peregrine falcons. However, due to the distance away from the Project area and the small sampling effort, the result of this survey was limited. However, the survey produced some limited results regarding the Project, including documenting use of the nest location by adult peregrines. The 2009 peregrine use surveys were more robust and involved a much greater survey effort and coverage of the Project area.

In spring and fall 2008, Stantec used marine surveillance radar to survey and document nocturnal migration activity within the Project area, including the location,

numbers, and flight patterns of nocturnal migrants during spring and fall seasonal migration.

The 2009 surveys were similar, but broader in scope, and targeted spring and fall raptor migration activity, the species composition of breeding birds, use of the Project area ridgelines by local adult and juvenile peregrines from the Rattlesnake and Bear Mountain aeries during the summer and early fall, and species composition and levels of bat activity in the Project area at different locations and heights within the Project area during late summer and fall.

Specific details of the methods and results of studies conducted during each year are provided in Appendices 30 to 33 of the Application. Table 2-1 in the Groton Wind Bird and Bat Risk Assessment (Appendix 28 to the Application) provides a comprehensive listing of specific periods during which each survey was carried out.

Bird & Bat Risk Assessment

Q. Please provide a general description of the bird and bat risk assessment.

A. Following completion of the 2006, 2008, and 2009 bird and bat surveys, Stantec prepared a bird and bat risk assessment for the Project. This document combined the results of the 2006, 2008, and 2009 bird and bat surveys with additional regional information on local and migratory bird and bat populations, and then compared results of on-site surveys to those of similar regional surveys. The bird and bat risk assessment ultimately used these data to predict levels of risk presented by the

Project to various bird and bat communities. The risk assessment followed what is known as a "weight-of-evidence" approach, which simultaneously evaluates multiple, diverse survey methods and considers the strengths and weaknesses of each. Level of risk for each species or group evaluated was predicted by taking into account its abundance in the Project area, the likelihood of exposure to wind turbines, and patterns of impacts to the particular species or groups as documented at existing wind power facilities. The analysis also presented confidence levels in individual lines of evidence used to determine levels of risk. The ultimate conclusion reached as the result of the risk assessment is that the Project is not expected to have an unreasonable adverse impact to any bird or bat populations.

Threatened Or Endangered Species

Q. Were any State or Federally-listed threatened or endangered species documented during on-site bird and bat field surveys?

A. Yes. Two state-listed endangered species and three state-listed threatened species were observed during the 2009 raptor migration and peregrine use surveys. These include the state-endangered golden eagle (*Aquila chrysaetos*) and northern harrier (*Circus cyaneus*), and the state-threatened bald eagle (*Haliaeetus leucocephalus*), peregrine falcon, and common loon (*Gavia immer*). While each of these species was observed during the 2009 surveys, neither the golden eagle nor the northern harrier was observed over any of the Project area ridgelines.

Two state-listed threatened species were observed during the spring 2009 raptor migration surveys. These include the bald eagle (n= 4) and common loon (n=1). The

common loon was incidentally observed on May 6, 2009, prior to starting the surveys for that day. This individual circled five or six times southwest of Tenney Mountain before flying north along the spine of the ridge at a height of 250 meters. Of the four bald eagle observations during the spring migration season, only one occurred within the Project area. On May 13, 2009, a sub-adult bald eagle was observed crossing Tenney Mountain just north of the Tenney Mountain Ski Resort and soared southwest at a height of 200 meters.

During the 2009 peregrine surveys, two state-endangered species, the golden eagle and northern harrier, were observed during field surveys. The golden eagle was observed outside of the Project area flying at approximately 500 meters over the Groton Hollow valley. *See* Peregrine Survey Report, Figure 2-9, Appendix 33 to the Application. There were six total observations of northern harrier, none of which were in the Project area. *Id.*

Unlike raptor migration surveys, the summer and fall 2009 peregrine use survey targeted local individuals and likely included several observations of the same bird. During these surveys, three peregrine falcons were observed over the Tenney Mountain portion of the Project area. No observations of peregrine falcon occurred over the Fletcher Mountain portion of the Project area. Only one (1) peregrine falcon observation occurred below the maximum height of the proposed turbines (121 meters). One additional state-listed threatened species, the bald eagle, was observed during the peregrine survey. There were eleven observations of bald eagle during the peregrine field

surveys, six of which occurred within the Project area, *id.*, and only one occurred below the height of the proposed turbines (i.e. 121 meters).

The fall 2009 migration surveys documented one state-listed threatened species within the Project area. A total of five bald eagles were observed flying at multiple heights over Tenney Mountain. Four of the five observations occurred on August 25, 2009, and one occurred on September 9, 2009. Of the four bald eagles observed on August 25, 2009, three occurred within the Project area. Flight heights of the bald eagles observed on August 25, 2009, ranged from 60 to 100 meters above the Tenney mountain ridgeline. The bald eagle observed on September 9, 2009, was flying at a height of 700 meters above Tenney Mountain. It is important to note that the survey on August 25, 2009, was conducted during the peregrine use survey, so the bald eagles observed on this date were also included in the peregrine data.

No federally-listed threatened or endangered species were observed during any of the on-site surveys.

Q. Are state or federally-listed threatened or endangered bird and bat species expected to breed, reside in, or use the Project area as primary habitat?

A. No. Although state-listed threatened species (mentioned above) were observed in the Project area during the spring and fall 2009 raptor migration survey and 2009 peregrine use survey, they were observed infrequently and for brief periods of time indicating that they were just passing through the area and likely do not reside there. The bald eagle and common loon observations occurred during the migration season when birds encountered the Project area while migrating to their breeding or wintering grounds.

These migrating species generally were observed flying in a linear flight direction and passed through the area relatively quickly. Furthermore, bald eagles' and loons' breeding and primary habitat consists of large open water bodies, which are not present within the Project area. The closest resource to the Project area with these habitat conditions is Newfound Lake, approximately 2.5 miles south of Tenney Mountain at its closest point.

Approximately half of the peregrine falcon observations occurred outside of the migratory periods in early and late July. The observed individuals may have been residents of the nest sites nearby on Rattlesnake Mountain or Bear Mountain foraging in the Project area. While these observations recorded the individuals using the Project area, actual time spent in the Project area was documented to be very low. The 2009 peregrine use survey is discussed in further detail below.

There were no federally-listed threatened or endangered species observed in the Project area during any of the bird and bat field surveys. As discussed below, the Project is not expected to have an unreasonable adverse impact on threatened or endangered species.

Nocturnal Migration Activity

Q. Please describe nocturnal migration at or near turbine heights documented during the spring and fall 2008 nocturnal radar migration surveys.

A. The spring 2008 marine radar surveys at the Project documented generally northeasterly migration (77°), which is typical for spring migration. This is nearly perpendicular to the ridgelines of the Project area, with a mean overall passage rate of

234 ± 20 targets per kilometer per hour (t/km/hr). Fall 2008 radar surveys documented generally southwesterly migration (260°), also nearly perpendicular to the ridgelines of the Project area, with a mean overall passage rate of 470 ± 17 t/km/hr. Spring and fall 2008 radar surveys were conducted from the southern met tower clearing near the highest point on the ridgeline of Tenney Mountain, with the radar mounted on an 8-meter (26') high tower. The clearing was approximately 100 meters in diameter and surrounded by second growth sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), beech (*Fagus grandifolia*), and red spruce (*Picea rubens*) approximately 10 meters (33') in height. This resulted in a good "radar view," which permitted the radar to detect targets at and in some areas below the horizontal plane of the radar, thus sampling the majority of the surrounding airspace within the radar's range setting. This location provided favorable conditions for unobstructed views of the surrounding airspace within the range settings used for the radar surveys.

With respect to the height of migration activity, flight heights of nocturnal migrants were consistently above the proposed turbines' maximum height of 121 meters. During the spring 2008 survey, the overall mean flight height was 321 ± 16 meters above the radar site, and the mean percent of targets flying below the maximum turbine height was 12 percent. Flight heights of nocturnal migrants during fall 2008 were very similar, with an overall mean flight height of 342 ± 16 meters above the radar site and a mean percent of targets flying below the maximum turbine height of 13 percent. More details of the methods and results of the spring and fall 2008 radar surveys are contained in Appendices 30 and 31 to the Application.

Q. Please describe the conclusions you have reached in the bird and bat risk assessment regarding nocturnal migrants.

A. Radar surveys at the Project documented typical numbers of nocturnal migrants in the air space above the ridgeline as compared to other publicly available radar surveys conducted on forested ridgelines in the northeast (*see* Table 2-1 of the Spring and Fall 2008 Radar Survey Reports, Appendices 30 and 31 to the Application). Radar surveys at the Project documented that nocturnal migrants pass through the Project area in numbers typical for this region of the country, and migrants are typically flying at altitudes that are well above the height of the proposed wind turbines. In general, passage rates during spring and fall 2008 radar surveys at the Project were at the lower end of the range of those studies. Results of the pre-construction radar surveys are similar to comparable surveys conducted at the only two permitted wind projects in New Hampshire, the Lempster Wind Project and the Granite Reliable Wind Project ("GRP"). The Lempster Wind Project is located approximately 39 miles southwest of the Project, and the GRP Project is located approximately 70 miles northeast of the Project.

During the fall of 2006 and spring of 2007, Stantec conducted nocturnal radar surveys at the Lempster Wind Project on 32 nights and 30 nights, respectively. Comparing the spring migration seasons, passage rates were consistently higher at the Lempster Wind Project than at the Groton Wind Project, but the more significant result of the comparison is that the trends in flight heights between sites were nearly identical for the spring migration seasons. *See* Figure 4-1 of Appendix 30 to the Application. The fall

migration season results for Lempster and Groton also were similar in passage rate and in flight heights. *See* Figure 4-2 of Appendix 31 to the Application.

During the spring and fall of 2007, Stantec conducted nocturnal radar surveys at the GRP site on 30 nights and 29 nights, respectively. Comparing the spring migration seasons, the overall mean passage rates for the GRP Project (342 t/km/hr) were similar to this Project (234 t/km/hr). More significantly, as with Lempster, the trends in flight heights at the sites were almost identical for a spring migration season. The mean flight height observed during the spring season at the Groton Project was 321 meters while the mean flight height at the GRP Project was 332 meters. Because we believe that flight heights are an important factor in assessing collision risks, it is significant to note that these flight heights are well above the turbine height of 121 meters.

The fall migration season results for the Groton and GRP Projects also were similar in passage rate and in flight heights. Although the overall mean passage rate at the Groton Project was higher (470 t/km/hr) than at the GRP Project (366 t/km/hr), it was not orders of magnitude higher. More important is the similarity between flight heights. The overall mean flight height for the fall season at this Project was 342 meters and 343 meters at the GRP Project. This pattern is similar across radar surveys in New Hampshire and the northeast, and suggests that birds may be moving across the state and region at similar heights and do not appear to be influenced by topography. Overall, this pattern suggests that factors influencing rates of nocturnal migration are occurring on a more regional scale than a project-specific scale, such that trends in flight heights would

be nearly identical at sites located approximately 40 miles (i.e. the Lempster Wind Project) and approximately 70 miles (i.e. the GRP Project) from the Groton Project site.

Results from an ever-increasing number of post-construction mortality surveys at active wind projects suggest that mortality of nocturnally migrating songbirds is highly variable and episodic, apparently related more to random events such as unusual weather patterns or facility design features such as the presence of bright lights, rather than predictable, seasonal migration events. For example, although not a wind project, a mortality event documented at Backbone Mountain, in Tucker County, West Virginia, on September 29, 2008, in which nearly 500 songbirds collided with a school building within a period of a few hours, apparently was related to the presence of newly installed lighting and foggy conditions. This demonstrates that other developments can pose collision risk to nocturnal migrants and that these collision events are related to random weather events and design features such as incandescent lights.

Although nocturnally migrating passerines are expected to pass over the Project area during spring and fall migration periods, most of these individuals are flying at consistently high altitudes above the height of the proposed turbines, as has been documented in the vast majority of recent radar surveys conducted at proposed wind facilities in the northeast. A literature review also suggests that, while impacts to nocturnally migrating passerines occur at most wind energy facilities, very small numbers of birds have collided with turbines relative to the large numbers of nocturnally migrating passerines. For example, the first year of post-construction monitoring at the Lempster

Wind Project, which had higher pre-construction radar passage rates than those at the Groton Project site, documented very low bird mortality.

The Risk Assessment—the literature review and the on-site radar surveys—predicts the potential for collision mortality to exist, but that the magnitude of impact is likely to be low. Thus, we have concluded that the Project is not expected to have an unreasonable adverse impact to nocturnally migrating passerines.

Raptors

Q. Please summarize the results of the raptor and peregrine surveys.

A. A series of surveys specifically targeting resident and migrating raptors were conducted in the spring, summer, and fall of 2009.

- Spring 2009 raptor surveys took place on 11 days (125 observation hours) between March 26 and May 23, 2009.
- Summer/early fall 2009 peregrine use surveys occurred on 20 days (311 observation hours) between June 23 and September 10, 2009.
- Fall 2009 raptor surveys occurred on 10 days (157 observation hours) between August 24 and October 26, 2009.

Raptor Surveys

The spring and fall survey efforts were timed to sample peak migration periods. The surveys targeted days with weather conditions favorable for migration: fair days with thermal development and winds from a southerly direction in spring and northerly direction in fall. To maximize the amount of coverage of the Project area, surveys were conducted simultaneously with two observers, one on the Tenney Mountain portion of

the Project area and one on the Fletcher Mountain portion of the Project area. Simultaneous surveys occurred on five days during the spring survey and on all ten days during the fall survey. In the spring, a total of 175 raptors representing 11 species were observed, yielding an observation rate of 1.40 birds per hour surveyed. Of these, a total of 76 observations occurred within the Project area. During fall surveys, 696 raptors were observed, or 3.21 birds per hour surveyed, of which 417 observations occurred within the Project area. A total of 14 species were observed during the fall survey. It is not uncommon that the total number of observations and species identified during the fall survey exceeded those from the spring due to the recruitment of that year's young into the migrating population as well as seasonal weather conditions which include the passage of cold fronts in fall. In fact, those results follow a general pattern of raptor migration passage rates. *See* Appendix B, Table 2 of Appendix 32 to the Application.

A total of 14 species were observed during the spring and fall raptor surveys at the Project. In addition, some observations identified genus but did not identify species including unknown accipiter, unknown buteo, and unknown raptor. Turkey vultures (*Cathartes aura*) were the most commonly observed species during spring, and broad-winged hawks (*Buteo platypterus*) were the most commonly observed in the fall. Red-tailed hawks (*Buteo jamaicensis*) were the next most frequently observed species during both the spring and fall surveys.

Daily passage rates at the Project ranged from 0 to 10 in the spring and from 0.56 to 15.81 in the fall. In comparison to surveys at regional hawk watch sites, and despite similar levels of effort in some cases, passage rates at the Project were relatively low. No

"large" migration events were observed. It is important to note that not many proposed projects have conducted simultaneous raptor surveys during pre-construction raptor surveys, nor do many established Hawk Migration Association of North America's ("HMANA") sites have two observers in different areas conducting surveys simultaneously. Thus, the raptor migration study effort at the Groton site exceeds that which is typically expended during other pre-construction raptor surveys. In addition, it is noteworthy that the results of the pre-construction raptor surveys documented at the Project were similar to pre-construction survey results found at the Lempster Wind Project at which no raptor fatalities were observed during the first year of post-construction monitoring in 2009.

The majority of raptors observed within the Project area during surveys at the Project area were flying above the maximum turbine height. Twenty-five (25) percent of raptors observed in the Project area during spring and 33 percent of raptors observed in the Project area during fall were estimated to be flying below turbine height. Most raptor movement in the Project area occurred along or off the ridgeline of Tenney Mountain, as birds migrated northward or southward using the ridgeline and adjacent valleys for thermal lifts to facilitate dynamic soaring. Spring surveys documented north and northeastward flight, with birds occasionally crossing the ridgeline from southwest to northeast. Fall surveys generally documented southward movement, with some birds crossing the ridgeline from northwest to southeast. For complete details of the methods and results of the spring and fall 2009 raptor surveys, see Appendix 32 to the Application.

Peregrine Surveys

In 2009, the summer/early fall peregrine survey efforts were timed to sample the post-fledgling period for peregrines (June 21 to September 6, 2009). The surveys targeted days with weather conditions favorable for observation (mainly clear days with good visibility). To maximize the amount of coverage of the Project area, surveys were conducted simultaneously with four observers. Two Stantec observers were on or near the summits of the Project area ridgelines, one on the Tenney Mountain portion of the Project area and one on the Fletcher Mountain portion of the Project area. Two observers from New Hampshire Audubon covered the nest locations on Rattlesnake and Bear Mountains. Simultaneous surveys occurred on all 20 survey days.

The Rattlesnake and Bear Mountain nest site locations documented the greatest peregrine falcon activity, with a total of 81 and 37 peregrine observations respectively. The observers at these locations documented daily activity of the adult and fledgling peregrines at the nest sites. Very few peregrine falcon observations occurred from the ridgeline sites. A total of four peregrine observations were documented at each of the ridgeline sites. Only three of the peregrine observations occurred within the Project area and were above Tenney Mountain at heights below 121 meters, the height of the proposed turbines.

Q. Please describe the conclusions you have reached in the Bird and Bat Risk Assessment with regard to raptors including peregrine falcons.

A. On-site raptor surveys documented relatively low levels of raptor migration in comparison to other regional sites at which monitoring has taken place.

Specifically, daily raptor observation rates at the Project were lower than those documented at other regional hawk watch sites monitored during the same season. While some raptors were observed flying at relatively low altitudes, and while raptors were observed crossing the ridgelines of the Project area, raptors appear to be at low risk of collision with modern wind turbines based on the results of publicly available post-construction monitoring surveys at active wind projects in the eastern United States. According to a 2005 GAO report, raptor fatalities outside Altamont Pass, California have ranged from 0 to 0.07 raptors per turbine per year whereas rates in Altamont Pass ranged from 0.05 to 0.24 raptors per turbine per year. The use of mortality rates observed at older facilities in California, such as Altamont Pass Wind Resource Area, to predict levels of mortality at this Project are untenable, given considerable differences between the design of each site, the types of turbines used, the numbers of turbines, and the raptor and prey density of each site. Significantly, no raptor fatalities were documented during the first year of post-construction studies conducted in 2009 at the Lempster Wind Project.

Field surveys and literature review did not identify features of the Project that suggest an increased risk to raptors. Although small numbers of eagles and peregrine falcons appear to use the Project area during fall and spring, and limited telemetry data suggest that individual golden eagles may pass through the vicinity of the Project, eagles are not known to nest within the Project area, and eagle mortality has not been documented at any other existing facility in the eastern United States. Few peregrine falcon fatalities have been documented in available post-construction studies. These

studies include the Altamont Pass Wind Resource Area in California, the Atlantic City Wind Project in New Jersey, and a project on Ornkey Islands in Scotland. These projects are within landscapes quite different than the forested ridgelines of the Groton Project. The Altamont Pass Wind Resource Area is located in open uplands and the New Jersey and Scotland facilities are in and around open wetlands. During the non-migratory period, peregrine falcons typically forage in open areas such as in cities, rivers, streams, lakes, and coastal bays. They likely choose open areas over forested areas as they prey on other bird species and kill their prey in the air (which would be difficult in forested areas).

Based on the field surveys conducted on-site and the results of the risk assessment, the Project is not expected to have an unreasonable adverse impact to raptors, including peregrine falcons.

Bats

Q. Please describe the acoustic bat surveys conducted as part of the on-site surveys.

A. Stantec conducted acoustic bat surveys at the Project in the fall of 2006 and the fall of 2009. Additional surveys will occur during the spring and summer of 2010. Acoustic bat surveys took place at the Project between July 27 and October 16, 2006, and August 11 and October 22, 2009. During the 2006 surveys, a total of three detectors were deployed within the Project area. Two detectors were deployed within the southernmost met tower at heights of 25 meters and 10 meters. A third detector was placed in a tree at the edge of the met tower clearing at a height of five meters. During

the fall 2009 acoustic bat surveys, a total of eight detectors were deployed within the Project area, three in the northern met tower and three in the middle met tower on Tenney Mountain (at heights of approximately 45, 22, and 2 meters), one in a portable tower at the southern end, and one in a portable tower at the northern end of Fletcher Mountain at heights of approximately 15 meters.

Acoustic surveys in 2006 recorded a total of 62 call sequences over the course of 162 detector nights for an overall average of 0.4 recordings per detector night (r/d/n). Acoustic surveys in the fall of 2009 recorded 2,104 call sequences over the course of 466 detector-nights for an overall average of 4.5 r/d/n. Overall bat activity levels at all detectors were highest in August. Activity levels of bats varied between detectors and between nights, as is typical in acoustic surveys, ranging from 0.1 to 0.4 r/d/n among detectors in 2006 and from 1 to over 11 r/d/n in 2009. For the most part, call volumes were highest at the ground-level detectors when compared to met tower detectors, suggesting greater levels of bat activity near the ground than above the tree canopy. An exception was the 22-meter detector at the met tower on Tenney Mountain, which recorded the most call sequences of all detectors in 2009. Activity levels between ground and met tower detectors were more comparable during September and October, when bat activity declined, likely as a result of cooler nightly temperatures.

Species composition of bats recorded during acoustic surveys at the Project varied between detectors near the ground and those mounted in portable towers or on met towers. Notably, species with low frequency calls, such as silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), and big brown bat (*Eptesicus*

fuscus), were detected more often at the high detectors. Species with high frequency calls, such as those in the *Myotis* genus, were detected mostly by the two-meter detectors.

Patterns in acoustic bat survey results documented at the Project, including differing species composition and activity levels between ground-level (i.e., 2-meter detectors) and met tower detectors, variability in activity levels between detectors and nights, and seasonal patterns in activity levels, were similar to those documented in many acoustic bat surveys conducted by Stantec in the Northeast. *See* Appendix C Table 12 of the 2009 Avian and Bat Survey Report, Appendix 32 to the Application. Acoustic surveys at the Groton Project were more thorough and informative than surveys conducted at many sites that have been certificated, as detectors were distributed throughout the various ridgelines of the Project area.

Q. Has Stantec researched or analyzed the effect of wind projects on bats generally? If so, please describe that research and/or analysis.

A. Stantec conducted a review of available literature addressing potential impacts of wind power development on bat species. This review focused on literature that addressed impacts from projects proposed in the eastern United States. Unfortunately, impacts to bat species vary considerably at the regional level. Thus conclusions to be drawn from the literature review should be considered with this variation in mind.

Mortality of eight different bat species has been documented at wind energy facilities in the eastern United States (Kunz *et al.* 2007a), with most fatalities occurring during what is generally considered the fall migration period of August to November

(Cryan 2003, Cryan and Brown 2007, Johnson *et al.* 2005), with more significant mortality events occurring in the mid-Atlantic states than in the northern states. Species documented in the east include little brown myotis, northern myotis, tri-colored bat (*Perimyotis subflavus),*[2] hoary bat, silver-haired bat, red bat (*Lasiurus borealis*), and big brown bat. With the exception of tri-colored bat, the species subject to the highest impact are long-distance migrants that travel dramatically greater migration distances than other North American species (Cryan 2003, Cryan *et al.* 2004, Cryan and Brown 2007). Hoary, red, and silver-haired bats are closely related members of the Lasiurus and Lasionycteris genera, and it has been hypothesized that the migratory behavior of these species leads to their propensity to strike wind turbines (Cryan and Brown 2007; Kunz *et al.* 2007a, 2007b).

While uncertainty and a considerable range exist in total estimates of mortality at wind projects, at least one published article suggests that bat biologists are concerned about the possibility that collision mortality (including all mortality related to collision with turbines, turbine towers, or as the result of potential barotrauma—pressure differences near moving turbine blades) could contribute to cumulative impacts to populations of certain bat species (Kunz *et al.* 2007a). Further, in July 2008, the North American Symposium on Bat Research ("NASBR") drafted a resolution expressing concern that utility-scale wind energy facilities "could pose biologically significant cumulative impacts for some species of bats unless solutions are found." While not opposed to wind power, the NASBR stressed the importance of transparent, hypothesis-

[2] The eastern pipistrelle is now called the tri-colored bat.

based monitoring and research at sites with the highest potential to impact bats in order to better understand patterns and causes of bat collision mortality and to develop methods to mitigate these impacts. Although the Groton Project is not in a region or area having rare bats and is not considered an area with the highest potential to impact bats, the studies conducted at the Project were thorough and final turbine placement recommendations were based on discussions with a leading expert on bats, Mr. Ed Arnett of Bat Conservation International ("BCI"), and information described in Kunz et al 2007b which has been accepted in the regulatory and scientific community. Furthermore, a formal Risk Assessment was prepared using the best available information from on-site surveys as well documented data from post-construction studies at developed projects, which is not typically required for projects in New England.

Q. Please describe the conclusions Stantec has reached regarding the Project's anticipated impacts on bats.

A. The bird and bat risk assessment concludes that potential impacts to bats at the Project likely will follow patterns similar to those documented at other facilities, particularly those in New England, and mortality is expected to be lower than that observed at wind projects in mid–Atlantic states. To the extent there are impacts to bats, the risk assessment concludes that those impacts likely will consist principally of collision mortality during the spring and particularly the fall migration seasons. Long-distance migratory species are expected to be the most vulnerable to collision mortality, as they appear more vulnerable to collision mortality than other species based on available post-construction survey results and were well represented in the results of

acoustic surveys conducted at the Project. The risk assessment ultimately concludes that the Project is not expected to have an unreasonable adverse impact to bats.

The only state-listed bat species that may occur within the vicinity of the Project is the small-footed bat (*Myotis leibii*). Since species within the genus *myotis*, including the small-footed bat, are not distinguishable from each other based on acoustic surveys alone, it can not be determined if this species is present in the Project area. However, the small-footed bat roosts in habitats defined by rocky talus slopes or cliff faces, none of which were documented in the Project area. *Myotis* species, including the eastern small-footed *myotis*, are thought to primarily feed and fly below the tree canopy based on their small size and foraging habits. As such, collision mortality is not expected to constitute as great a risk to these species in comparison to migratory species, which appear more prone to collision. To date, no fatalities of threatened or endangered bat species have been documented during post-construction monitoring surveys at existing wind projects, including the Lempster Wind Facility, located approximately 40 miles south of this Project. Furthermore, no mortality of eastern small-footed *myotis* has been reported in any publicly available post-construction mortality survey results.

Breeding Birds

Q. Please explain the results of the breeding bird survey conducted in the Project area.

A. Breeding bird surveys took place along the ridgelines of the Project, as well as within a control area. A total of 34 species were documented in the Project area at 21 point-count locations, which were distributed across all major habitat types present

in the Project area. A total of 33 species were detected in the control areas at 10 point count locations. Within both the Project area and control area, the most commonly observed species were the ovenbird (*Seiurus aurocapillus*), black-throated blue warbler (*Dendroica caerulescens*), hermit thrush (*Catharus guttatus*), and dark-eyed junco (*Junco hymealis).* Species diversity was relatively uniform throughout the Project area and control area, matching the generally uniform mixed forest habitat found in most of the Project area. The most commonly detected species were those typically found along forest edges, and in dry forest types, including a variety of wood warblers common to the region. Of all species detected at the Project, no state or federally-listed threatened or endangered species were observed.

Q. What conclusions have you drawn based on the field surveys and risk assessment with respect to breeding birds?

A. Breeding bird surveys documented a relatively low diversity of breeding birds within the Project area, with the most frequently detected species being those that are common in the region. There were no unusually high species diversity or large numbers of birds documented during surveys. Species associated with forest edge or early successional habitats were generally the most commonly detected which is consistent with the fact that these types of habitat are widespread in the Project area. While development of the Project would result in habitat loss and clearing along the ridgelines, these types of impacts currently exist within the Project area in the form of historic timber clearing and an existing road network. Development of the Project is therefore not expected to cause dramatic shifts in the abundance, diversity, or distribution

of the breeding bird population. Indirect impacts to breeding birds are expected to vary based on the habitat needs of individual species; those associated with forest interior habitats will be affected more, and those associated with edge or disturbed habitats will be affected less.

Although collision mortality has been documented for breeding birds at existing facilities, birds seem to be less prone to collision during the breeding season than during the spring and fall migration. Likelihood of collision is presumably related to a combination of overall abundance and species-specific flight behaviors. Results of on-site surveys suggest that the Project area does not support any rare bird species, and that while a small number of breeding birds may collide with turbines, the magnitude of these impacts is expected to be minor, and population level impacts for any single species are not anticipated as a result of the Project. Thus, the Project is not expected to have an unreasonable adverse impact to breeding birds.

Conclusion

Q. Please describe in general the conclusions you reached in the bird and bat risk assessment?

A. The primary forms of ecological risk associated with the Project are direct collision mortality of birds and bats, and indirect impacts associated with habitat loss, fragmentation, or displacement. Ecological risk to birds and bats associated with the Project is likely to vary by species group and time of year, among many other factors. Foremost among the potential impacts are collision mortality of nocturnally migrating songbirds and long-distance migratory bats. The severity of these impacts is expected to

be influenced by weather variables and timing of migration events and will likely fluctuate seasonally, with the greatest levels of mortality occurring during the late summer/fall migration period.

Impacts to raptors are expected to be minimal at the Project, given the low rates of raptor collision mortality documented in the eastern United States. Although bald eagles and peregrine falcon were documented in the Project area during surveys, no eagle mortality and low peregrine mortality have been documented at any wind facility in the eastern United States. Furthermore, there were very few observations of these species over the Project area ridgelines during the peregrine use surveys and raptor migration surveys. Potential direct and indirect impacts to breeding birds are also expected to be minimal. On-site surveys documented relatively low breeding bird diversity, and construction of the Project is not expected to eliminate any types of habitat. Collision mortality of breeding birds is also expected to occur at low levels.

The ultimate conclusion reached in conducting the risk assessment is that the Project is not expected to have an unreasonable adverse impact to any bird or bat populations.

Q. Are the projected impacts to the groups of species studied unique to the Project area as compared to projected or actual impacts for wind projects in the northeast?

A. Wind facilities generally have the potential to impact birds and bats in the form of direct collision mortality and indirect displacement or habitat loss. The degree to which a particular wind facility is expected to impact birds and bats is largely related to

the abundance of birds and bats in the Project area, the potential for these species to be exposed to wind turbines, and the sensitivity of habitat present within the site to disturbance. Habitats and species composition of birds and bats observed at the Project are likely typical of those found on other moderate elevation forested ridges in New Hampshire.

In comparing potential impacts at the Project to nearby sites such as Lempster and Mars Hill, Maine, it is expected that bird and bat mortality will be similar, but will be lower than those found in mid-Atlantic States, particularly for bats.

Q. Does this conclude your testimony?

A. Yes.

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THE STATE OF NEW HAMPSHIRE
BEFORE THE
NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010_-__

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF MICHAEL J. LEO
ON BEHALF OF
GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name and business address.

A. My name is Michael J. Leo. My business address is 6 Bedford Farms Drive, Suite 607, Bedford, New Hampshire, 03110-6532.

Q. Who is your current employer and what position do you hold?

A. I am employed by Vanasse Hangen Brustlin, Inc. ("VHB"). In my present position I am a Senior Project Manager / Civil Engineer for the company.

Q. What are your background and qualifications?

A. I have more than 25 years of experience in the civil engineering field. I have been employed at VHB since February 1998, and am currently a Licensed Professional Engineer in the states of New Hampshire and Maine. I hold a Bachelor of Science Degree in Structural Design and Construction Engineering Technology from the Pennsylvania State University (1981). Prior to joining VHB, I was employed with

Holden Engineering & Surveying in Concord, NH from 1985 until 1997 as a Project Engineer / Project Manager. During 1985, I was employed by Swanson Engineering & Surveying in Nashua, NH as a surveyor, and from 1981 until 1985, I was employed by the Township of Scotch Plains, NJ as the Assistant Township Engineer. In addition to my qualifications as an engineer, I am also a Licensed Land Surveyor and a Licensed Subsurface Disposal Systems Designer in the State of New Hampshire.

Purpose of Testimony and Overview of the Project

Q What is the purpose of your testimony?

A. The purpose of my testimony is to describe the design and construction of Groton Wind, LLC's ("the Applicant") wind power project ("Groton Wind Farm") in Grafton County, NH ("the Project"). I will also discuss the Project's impacts on water quality and the proposed mitigation of those impacts. In addition, I will discuss the Project's impacts on public health and safety during the construction phase.

Q. Are you familiar with the Project that is the subject of this Application?

A. Yes, I am. In my role as the senior civil engineer for the Project, I have been involved in the site planning from the beginning of the Project and have conducted a field review of the site. The civil engineering plans bear my stamp as a professional engineer, meaning that I take responsibility for the civil engineering design work such as the roadway layout and the stormwater management system design. My engineering team and I have been and will continue to be involved in all aspects of the Project, including survey, civil design and permitting of the access roads, lay-down areas,

operation and maintenance area and switchyard area, the electrical interconnect corridor, wind turbine sites and stormwater management. As the engineer of record, I will also be involved in the construction phase of the Project.

Q. Please describe the design of this Project.

A. The Project consists of the construction of 24 wind turbines, each with a capacity of two megawatts. The turbines will be located on three strings atop ridgelines in the Clark Brook watershed, identified as Fletcher Mountain (West Ridge), Tenney Mountain (East Ridge) and an unnamed ridge (Northwest Ridge). The Project will include the use of approximately 2.4 miles of existing private gravel roads and the construction of approximately 9.3 miles of new roads to access the turbine sites.

Water Quality Impacts

Q. Please describe the consideration that the Project has given to water quality issues.

A. The Project will require permits including, among others, a NHDES Alteration of Terrain Permit, a NHDES Wetlands Bureau Dredge & Fill Permit, a U.S. Army Corps Section 404 Permit, and an Environmental Protection Agency National Pollution Discharge Elimination System Construction General Permit. In addition, as part of the Army Corps' permits process, the Project will require a Section 401 Water Quality Certification issued by NHDES. Information supporting the NHDES permits and certification is contained in Appendices 1, 2, and 3 to the Application. These permitting processes will involve comprehensive plans which address potential construction-related impacts as well as an evaluation of the effects of the Project after construction.

Q. Have you studied the water quality impact this Project will have?

A. Yes. This Project does not involve any new point source discharge, but the civil engineering design involves the development of stormwater runoff analysis and plans to handle both the quantity and quality of non-point source stormwater runoff. In particular, the new access roads are designed to be stable, but will not be paved. This avoids the creation of new impervious surfaces, which will substantially limit the potential for water quality effects. Additionally, the drainage design has been very carefully engineered to maintain existing drainage patterns as much as possible to minimize potential changes to streams on the site.

This Project differs from typical land development projects in that the intensity of use after construction is expected to be quite low. The wind turbines are designed to be efficient and reliable and can be remotely monitored for performance. Access to the turbines after construction will generally only be required for inspection, maintenance and repairs. There are expected to be impacts during construction for upgrades of the portions of Groton Hollow Road located on private land, for new access roads to the ridge lines, turbine pad sites, storage and staging areas, switchyard and the operations and maintenance area. Post-construction impacts are expected to be minimal as a result of the low intensity of use.

Q. What steps will the Applicant take to address the water quality impact of the Project?

A. The Applicant will take a number of steps to reduce and mitigate water quality impacts associated with the Project. The Project site is the location of an active

timber harvesting operation with continuing logging operations that includes a large network of logging roads and timber processing areas. The Applicant proposes to re-use the main access road into the site (Groton Hollow Road) for access to the Project. The access roadway widths will be the minimum required to provide safe and adequate access during the construction phase and portions of the wider crane access roads will be allowed to become re-vegetated after construction to reduce the post-construction roadway widths. Finally, the Applicant will employ erosion control measures including the use of erosion control barriers, rock check dams, erosion control matting, pervious berms consisting of shredded bark and/or stump grindings, hydro-seeding, soil tackifiers, stone drainage mattresses and stabilized rock slopes.

Q. In your opinion will this Project have an unreasonable adverse effect on the natural environment, more particularly water quality?

A. The Project has been designed to minimize and mitigate adverse water quality impacts. With proper implementation of temporary and permanent erosion control measures, sufficient construction monitoring, and proper implementation of remedial actions as may be required, the Project, in my opinion, will not have an unreasonable adverse effect on water quality.

Public Health and Safety During Construction

Q. Please describe how the construction phase of the Project will be handled.

A. The Applicant will retain an experienced general contractor who will have overall responsibility for construction of the Project in accordance with the plans and

technical specifications prepared by VHB and in accordance with all applicable codes, standards and permit conditions. VHB will develop final construction plans and assist the Applicant as necessary throughout the construction process to ensure the work is completed in conformance with the approved plans, to interpret the design intent, to provide field review of the work and to ensure that permit conditions are followed carefully.

Q. Please describe how the turbine components are transported to the site?

A. Because of the size of the turbines, components are shipped separately and assembled on site. Turbine blades, nacelles, and tower sections will likely be transported by truck for delivery to the site. Components will primarily be delivered directly to turbine locations, where possible. Specialized hauling vehicles will be used for over-the-road and on-site transportation. The haulers contracted for this work will obtain NH DOT permits and use approved routes and escort vehicles when operating on public roads. Assembly of the turbine components will occur at each turbine site at the time of installation.

Q. In your opinion will this Project have an unreasonable adverse effect on public health and safety, particularly during the construction phase?

A. Contractors and consultants working on the site will be required to abide by applicable Federal OSHA and state health and safety regulations. The Project is located on private property in a remote area with a single access point (i.e., Groton Hollow Road) where public access is restricted by existing gates installed by the

landowners. Restrictions on access will be employed to ensure that the public is not exposed to health and safety hazards associated with construction, including construction vehicle traffic, earth moving operations, blasting, etc. In my opinion this Project will not have an unreasonable adverse effect on public health and safety during the construction phase.

Q. Does this complete your testimony?

A. Yes.

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THE STATE OF NEW HAMPSHIRE
BEFORE THE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF ROBERT D. O'NEAL
ON BEHALF OF
GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name, position and business address.

A. My name is Robert O'Neal, INCE, CCM. I am a Principal at Epsilon Associates, Inc. ("Epsilon"). My business address is 3 Clock Tower Place, Maynard, Massachusetts.

Q. On whose behalf are you testifying?

A. I am testifying on behalf of Groton Wind, LLC ("Groton Wind" or "the Applicant").

Q. Please summarize your professional and educational background and experience.

A. I received a Bachelor of Arts degree in Engineering Science from Dartmouth College in 1983. I earned a Masters Degree in Atmospheric Science from Colorado State University in 1987. I am a Certified Consulting Meteorologist, and have over twenty years experience in the areas of community noise impacts, meteorological data collection and analyses, and air quality modeling. My noise impact evaluation

experience includes the design and implementation of sound level measurement programs, modeling of future impacts, conceptual mitigation analyses, and compliance testing. I am a member of the Institute of Noise Control Engineers (INCE), the Acoustical Society of America, the American Meteorological Society, and the Air & Waste Management Association.

From 1987 until 1997, I was employed by Tech Environmental, Inc. where I was a Project Manager responsible for noise impact assessments and air quality modeling studies. In 1997, I joined Earth Tech, Inc. as a Program Director. In that capacity, I was responsible for community noise studies for electric generating stations, as well as meteorological analyses, and air quality modeling. In 2000, I joined Epsilon Associates, Inc. as a Senior Consultant. In 2004, I was made a Principal of the firm. My practice at Epsilon continues to focus on community noise impact assessments and meteorological analyses for power generation facilities in the Northeast, Mid-Atlantic region, the Midwest, and the Southwestern United States. Since 2004, my noise impact assessment work has focused on wind energy generation facilities. A copy of my resume is provided as Attachment A to this prefiled testimony.

Q. Please identify any regulatory proceedings in which you have testified.

A. I have testified in Massachusetts as an expert witness before the Energy Facilities Siting Board regarding noise issues for the NSTAR 345-kV 18-mile underground electric transmission line and substation project in the Boston metropolitan area, the 350 MW Billerica Energy Center, and the 350 MW Brockton Clean Energy Center. In addition, I have testified as an expert witness regarding: (1) a 735 MW wind turbine farm in the 42nd District Court of Texas; (2) a cogeneration power plant, hard rock

quarry, and two sand and gravel excavation sites before the New York Department of Environmental Conservation; (3) solid waste transfer stations in Lowell, Marshfield, Oxford, and Holliston, MA; (4) a proposed sand and gravel pit, an existing concrete batch plant, and a proposed cross-dock distribution center before the Massachusetts Land Court; (5) several ski areas and a proposed sand and gravel excavation site before the Act 250 Commission in Vermont; and (6) construction of an asphalt plant before the Massachusetts Department of Environmental Protection.

Q. What is your involvement and responsibility with respect to the proposed Groton Wind Project?

A. As one of the environmental consultants for Groton Wind, I have responsibility for evaluating and assessing the noise impacts associated with the operation of Groton Wind's proposed Project.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the potential noise impacts related to the Groton Wind Project and to convey the results of Epsilon's sound level assessment technical report which is contained in Appendix 35 to Groton Wind's Site Evaluation Committee ("SEC") Application.

Q. Are you familiar with the site of the proposed Groton Wind facility?

A. Yes. I have reviewed the site plans and discussed the Project with the developer. In addition, I visited the site to note some of the closest potentially sensitive receptors in all directions around the wind farm that might be impacted by Project noise emissions as provided by Groton Wind. For general residential locations, we relied on a

map prepared by another consultant (Vanasse Hangen Brustlin, Inc.) which identified all residences within at least one mile of each wind turbine in any direction.

Q. Have you or persons under your supervision conducted any assessments or evaluations related to the potential noise from the operation of the Groton Wind Project?

A. Yes. Epsilon measured existing sound levels at six locations at representative locations around the Project site over a 2-week period in the summer of 2009 to establish background sound levels as a function of wind speed prior to operation of the proposed wind farm. This was done in order to predict how noise from the Project would differ from existing sound levels. The selection of the sound monitoring locations was intended to be representative of nearby residences in various directions from the wind farm. Figure 5-1 of Appendix 35 to the Application shows the proposed wind turbine locations overlaid upon an aerial photograph of the surrounding area, as well as the actual measurement locations, and the residences within one mile. Each background sound level monitoring location is described below.

- Location 1 – Halls Brook Road, Groton
  - Approximately 3,700 feet to the closest proposed wind turbine (N6). This location is representative of the nearest residents to the west of the wind farm along Halls Brook Road.
- Location 2 – Groton Hollow Road, Groton
  - Approximately 4,100 feet to the closest proposed wind turbine (E1). This location is representative of the nearest residents to the north of the wind farm along Groton Hollow Road, but set far back from traffic on Route 25.

- Location 3 – Plain Jane's Diner, 897 Route 25, Rumney
  - Approximately 7,200 feet to the closest proposed wind turbine (E1). This location is representative of the nearest residents to the north of the wind farm along Route 25.
- Location 4 – Tenney Mountain Ski Area, Plymouth
  - Approximately 6,300 feet to the closest proposed wind turbine (E5). This location is representative of the nearest residents to the east of the wind farm off Route 3A – Tenney Mountain slope side lodging.
- Location 5 – NH Audubon Society, North Shore Road, Hebron
  - Approximately 15,200 feet to the closest proposed wind turbine (E13). This location is representative of the residents to the south of the wind farm, and the nature center along Newfound Lake.
- Location 6 – Groton Town Hall, 754 North Groton Road, Groton
  - Approximately 10,500 feet to the closest proposed wind turbine (W6). This location is representative of the nearest residents to the southwest of the wind farm along North Groton Road.

Q. Please describe the noise assessment studies conducted for this Project.

A. Typical noise evaluation criteria or guidelines relate to how much the Project changes sound levels over existing background (relative change), or by comparison to an absolute standard. There are no State of New Hampshire noise regulations applicable to the wind farm. However, in its certification of the Lempster

Wind Project, the SEC imposed several noise conditions set forth in the Project's Agreement with the Town of Lempster:

1. Audible sound from the project shall not exceed 55 dBA measured at 300 feet from any existing occupied building, or at the property line if the property line is less than 300 feet from an existing occupied building for non-participating landowners.
2. Sound pressure levels shall not be exceeded for more than 3 minutes in any hour of the day, for non-participating landowners.
3. If the existing ambient sound pressure level exceeds 55 dBA, the standard shall be ambient dBA plus 5 dBA.
4. Sound from the project immediately outside any residence of a non-participating homeowner shall be limited to the greater of 45 dBA or 5 dBA above the ambient sound level, for non-participating landowners.
5. These thresholds implemented via the Town of Lempster were modified by the NH SEC to a level of 45 dBA.

Two other useful guidelines for putting sound levels into perspective are described below. One is the "Guideline for Community Noise" (World Health Organization, Geneva, 1999). This document states that daytime and evening outdoor living area sound levels at a residence should not exceed an L_{eq} of 55 dBA to prevent serious annoyance and an L_{eq} of 50 dBA to prevent moderate annoyance from a steady, continuous noise. At night, sound levels at the outside facades of the living spaces should not exceed an L_{eq} of 45 dBA, so that people may sleep with bedroom windows open.

The second useful guideline for comparing sound levels is the "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety" (U.S. Environmental Protection Agency, Office of Noise Abatement and Control, Washington, DC, 550/9-74-004, March 1974). This document, often referred to as the "Levels" document, identifies an L_{dn} of 55 dBA outdoors in residential areas as the maximum level below which no effects on public health and welfare occur due to interference with speech or other activities. This level includes a 10 dBA "penalty" for sound levels at night (10 p.m. to 7 a.m.). This level will permit normal speech communication, and would also protect against sleep interference inside a home with the windows open. A constant sound level of 48.6 dBA 24 hours per day would be equal to an L_{dn} of 55 dBA.

Using software specifically designed for sound level modeling (Cadna/A), worst-case future sound levels from operation of the entire wind farm were calculated at all residences within at least one mile of every wind turbine, as well as the six background monitoring locations. Additional noise-sensitive locations such as the Groton Town Hall (2 miles), and the NH Audubon Society in Hebron (3 miles) were even further away. These locations and the results of the sound level modeling are shown on the map in Figure 7-1 contained in Appendix 35 to the Application. These results were then compared to the background sound levels measured in 2009, and criteria established during the recent permitting of the Lempster Wind, LLC wind farm.

Q. Please summarize the results of your findings with respect to the Groton Wind Project.

A. Epsilon's findings and assessment are contained in a report entitled "Sound Level Assessment Report" dated January 14, 2010 and submitted with the Application as Appendix 35. The predicted worst-case sound levels from the Groton Wind Project will be below 45 dBA at all occupied buildings. A review of Figure 7-1 shows that the two closest structures within the site along Groton Hollow Road will be approximately 41 dBA. These receptors are not residences but seasonal camps, one of which is in disrepair and not used. These locations are southeast of wind turbine W1. The closest non-participating residence is located due north of turbines N1 and N2. Worst-case sound levels at this location are predicted to be 41 dBA. All other residences will be less than 40 dBA under worst-case operating conditions. Therefore, the Groton Wind Project would easily meet the noise criteria applied to the Lempster, NH wind project.

Although not required since the Project-only sound levels are all well below 45 dBA, a summary comparison of expected future sound levels from the Project to existing background is shown in Table 8-1 for the six ambient measurement locations described above. Generally speaking, changes of 3 dBA or less are difficult for the human ear to perceive. What the results in Table 8-1 suggest is that with the wind turbines running at full power, and contemporaneous quietest L_{90} background conditions, the wind farm may be audible at a few of the closest locations at Halls Brook Road and Tenney Mountain Ski Area. At other more distant locations, such as along Groton Hollow Road, Route 25, around Newfound Lake, and along North Groton Road, the wind turbines may be inaudible, or barely audible. In all cases, sound levels from the wind farm at all locations are well below all community noise guideline criteria.

In reviewing Table 8-1, it is important to note that some of the lowest background sound levels are near or above 45 dBA (Location 2 – Groton Hollow Road; Location 3 – Plain Jane's Diner). This has nothing to do with the proposed wind farm but is due to existing sources of sound in the community.

Table 8-1 Evaluation of Sound Levels –
Wind Farm plus Background, Worst-case Wind Speed (9.7 m/s)

Receptor	**Wind Farm Only (All Turbines) (dBA)**	**Lowest L_{90} Background (dBA)**	**Total: Wind Farm + Lowest L_{90} (dBA)**	**Increase Over Background (dBA)**
1 – Halls Brook Rd	39.0	33	40	7
2 – Groton Hollow Rd	38.3	44	45	1
3 – Plain Jane's Diner	31.7	49	49	0
4 – Tenney Mtn Ski Area	34.6	38	40	5
5 – NH Audubon Society	23.4	25	27	2
6 – Groton Town Hall	28.8	35	36	1

Sound levels due to wind turbine operation are expected to be less than 45 dBA at all participating and non-participating residences. These sound levels are expected to meet previously approved noise conditions from the NH SEC (limit of 45 dBA) referenced on page 6 of this testimony, the World Health Organization's 45-dBA nighttime guideline for residential locations, and the US EPA guideline of 48.6 dBA which is equal to an L_{dn} of 55 dBA. Therefore, all future sound levels during operation of the Project were predicted to be within the acceptable sound level criteria and guidelines outlined above.

Q. In your opinion, will the Groton Wind Project have an unreasonable adverse effect on public health and safety, specifically as the result of noise?

A. No. To further bolster this conclusion, a comprehensive study was recently released by the American Wind Energy Association (AWEA) and the Canadian Wind Energy Association (CanWEA) entitled "Wind Turbine Sound and Health Effects – An Expert Panel Review" (December 2009). The three fundamental conclusions of the review were:

1. There is no evidence that the audible or sub-audible sounds emitted by wind turbines have any direct adverse physiological effects.
2. The ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans.
3. The sounds emitted by wind turbines are not unique. There is no reason to believe, based on the levels and the frequencies of the sounds and the panel's experience with sound exposures in occupational settings, that the sounds from wind turbines could plausibly have direct adverse health consequences.

Q. Does this conclude your testimony?

A. Yes, it does.

ROBERT D. O'NEAL, CCM, INCE

PRINCIPAL

EDUCATION

M.S., Atmospheric Science, Colorado State University, 1987
B.A., Engineering Science, Dartmouth College, 1983

REGISTRATIONS

Certified Consulting Meteorologist, #578

PROFESSIONAL SUMMARY

A Principal of the firm, Mr. O'Neal is a Certified Consulting Meteorologist with over 20 years experience in the areas of community noise impact assessments, meteorological data collection and analyses, and air quality modeling. Mr. O'Neal's noise impact evaluation experience includes design and implementation of sound level measurement programs, modeling of future impacts, conceptual mitigation analyses, and compliance testing. Rob has performed noise measurement and modeling assessments for wind energy and fossil-fuel power generation facilities in the Northeast, the Mid-Atlantic region, the Midwest, and the Southwestern U.S. Other core industries served include hard rock quarries, aggregate handling, asphalt and concrete plants, C&D debris processing, landfills, real estate development, and mobile sources. He has also provided expert witness testimony on noise impact studies and air pollution modeling in front of local boards, courts of law, and adjudicatory hearings. His air quality background involves applying air quality dispersion models for regulatory permitting applications, as well as for general air quality impact evaluations. He has experience with the CALMET/CALPUFF modeling system used to evaluate visibility and acid deposition impacts in Class I areas.

PROFESSIONAL EXPERIENCE

Wind Energy Projects

- *FPL Energy – Horse Hollow Wind Energy Center, Taylor County, TX*. Developed and executed an extensive sound level measurement program for a 735 MW wind farm in Taylor County, TX. Concurrent sound level data, meteorological data, and wind turbine power output data were collected and analyzed. The results were used in legal proceedings as part of expert witness testimony in the case.

- *FPL Energy – Wolf Ridge Wind Farm, Cooke County, TX*. Developed and executed an extensive sound level measurement and modeling program for a proposed wind farm in Cooke County, TX. Concurrent sound level data and meteorological data were collected and analyzed. The results were used in legal proceedings as part of expert witness testimony in the case.

- *John Deere Renewables –Michigan Thumb I Wind Farm, Huron County, MI*. Developed and executed a long-term sound level measurement program for an existing 69 MW wind farm in Michigan to determine compliance with the local noise ordinance. Concurrent sound level data and meteorological data were collected and analyzed.

- *NextEra Energy Resources (formerly FPL Energy) – Ashtabula Wind Farm, Barnes County, ND*. Developed and executed a sound level measurement program for an existing wind farm in North Dakota in response to noise complaints. Concurrent sound level data and meteorological data were collected and analyzed.

- *Gamesa Energy – Barton Chapel Wind Farm, Jack County, TX*. Developed an extensive sound level measurement and modeling program for a proposed 120 MW wind farm in Jack County, TX. Concurrent sound level data and meteorological data were collected and analyzed. The results were used in legal proceedings as part of expert witness testimony in the case.

- *TCI Renewables – Crown City Wind Farm, Cortland County, NY*. Developed an extensive sound level measurement and modeling program for a proposed 80 MW wind farm in central NY. Concurrent sound level data and meteorological data were collected and analyzed. The results were used in the state-level permit applications.

- *Babcock & Brown – Allegheny Ridge Wind Farm, Portage, PA*. Developed and executed a sound level measurement program for an 80 MW wind farm in Cambria and Blair Counties, PA. Concurrent sound level data, meteorological data, and wind turbine power output data were collected and analyzed. The results were used to demonstrate compliance with the noise standard of the Development Agreement with the local Township.

- *FPL Energy – Waymart Wind Farm L.P., Waymart, PA*. Managed the post-construction community noise study for a 65 MW wind turbine facility utilizing 43 GE 1.5 MW turbines. A compliance demonstration with the local noise ordinance was done utilizing the pre-construction ambient sound level data and the on-site meteorological data.

- *State of New Hampshire, Office of the Attorney General -- Lempster Mountain Wind Power Project, Lempster, NH*. Performed an independent review of a proposed 24 MW wind turbine farm. The applicant's noise impact analysis was evaluated and comments provided to the State of NH.

- *Varian Semiconductor Equipment Associates, Inc. – Wind Farm, Gloucester, MA*. Two 2.5 MW wind turbines are proposed at a facility which manufacturers the machinery used in computer chip making. Managed the sound level impact study including existing condition measurements and future modeling using the WindPro model. The results were presented at a series of city council public hearings resulting in approval of the project.

Independent Power Projects

- *Braintree Electric Light Department – Thomas A. Watson Generating Station, Braintree, MA*. Conducted long-term continuous ambient sound level measurement program for a proposed 105 MW natural gas and oil-fired simple-cycle electric power generation facility. Acoustical modeling, including several rounds of mitigation, was performed to demonstrate compliance with the State noise policy.

- *Montgomery Energy Billerica Power Partners -- Billerica Energy Center, Billerica, MA*. Worked on noise aspects for a proposed 350 MW natural gas and oil-fired simple-cycle electric power generation facility. Acoustical modeling, including several rounds of mitigation, was performed to demonstrate compliance with the State noise policy. Expert testimony on noise issues was presented to the Energy Facilities Siting Board.

- *Advanced Power Services – Brockton Power, Brockton, MA*. Conducted a 168-hour continuous ambient sound level measurement program at multiple sites for a proposed 350 MW natural gas-fired combined-cycle electric power generation facility. Acoustical modeling, including mitigation, was performed to demonstrate compliance with the State noise policy. Expert testimony on noise issues was presented to the Energy Facilities Siting Board.

- *Besicorp-Empire Development Company – Rensselaer, NY*. Prepared interrogatory responses, and testimony for the Noise section of the Article X application for this proposed 505 MW combined-cycle gas-fired electric power generation facility, recycled newsprint manufacturing plant, and waste water treatment plant. Additional testimony was provided for Technical Conference hearings before a NYS DEC Administrative Law Judge.

- *Cornell University, Ithaca, NY*. Prepared a sound level impact assessment report for the NY SEQRA process and Article VII natural gas pipeline application for this proposed 30 MW combined heat and power generation facility.

- *Milford Power Co., LLC – Milford, CT*. Conducted post-construction ambient sound level measurements for a 544 MW combined-cycle gas-fired electric generating facility. The project utilizes two Alstom GT-24 combustion turbines, one steam turbine, and an 8-cell wet mechanical cooling tower. High-pressure steam blows and transformer noise were also measured during construction and assessed for community impacts.

- *FPL Energy – Jamaica Bay Peaking Facility, Far Rockaway, NY*. Managed the noise impact study as part of an Environmental Assessment for a 50 MW natural gas-fired peaking plant utilizing two P&W combustion turbines. A compliance demonstration with the local noise ordinance was done utilizing the ambient background data and acoustical modeling. Follow-up noise monitoring was done to evaluate vendor performance specifications.

- *FPL Energy – Bayswater Peaking Facility, Far Rockaway, NY*. Managed the noise impact study as part of an Environmental Assessment for a 55 MW natural gas-fired peaking plant utilizing two P&W combustion turbines. A compliance demonstration with the local noise ordinance was done utilizing the ambient background data and acoustical modeling.

- *Sithe Energies – Heritage Station, Oswego, NY*. Conducted ambient sound level measurements and performed sound level modeling at the 1000 MW Independence Station power plant in support of permitting a proposed 800 MW combined-cycle electric generation facility adjacent to the existing station in Oswego. The proposed project will utilize General Electric's new "H" System combustion turbine technology, and a 16-cell wet mechanical cooling tower. A compliance demonstration with the local noise ordinance was done utilizing the ambient background data and acoustical modeling. Mr. O'Neal prepared the Noise section of the Article X Application in conjunction with the New York State Public Service Law as well as expert testimony on noise for the Article X public hearings.

- *PG&E – Mantua Creek, West Deptford, NJ*. Conducted single-station CALPUFF modeling for impacts at the nearest Class I area for a proposed 800 MW natural gas-fired combined-cycle electric power generation facility. The latest IWAQM Phase 2 guidance was followed for calculating ambient concentration, wet and dry deposition, and regional haze impacts at the Brigantine National Wildlife Refuge.

- *Duke Energy Power Services, LLC -- OH, IN, IL, MO*. Conducted ambient sound level measurement programs and performed acoustical modeling for six proposed simple-cycle electric power generation facilities in the Midwest for Duke Energy. These 640 MW peaking stations were permitted for 8 GE 7EA combustion gas turbines. The results of the noise impact assessment were used to secure site plan approval from the local community.

- *Calpine Corporation – Ontelaunee Energy Center, Ontelaunee, PA*. Conducted 24-hour ambient sound level measurements at multiple sites for a proposed 543 MW natural gas-fired combined-cycle electric power generation facility utilizing two Westinghouse 501F combustion turbines. A compliance demonstration with the local noise ordinance was done utilizing the ambient background data and acoustical modeling. Post-construction sound level measurements were done on the turbines to confirm they met the vendor guaranteed noise limits.

- *AES Corporation – AES Granite Ridge Energy Facility, Londonderry, NH*. Directed a 14-day continuous ambient sound level measurement program in support of local permitting

requirements for a proposed 720 MW natural gas-fired combined-cycle electric power generation facility. The proposed project includes two Westinghouse 501G combustion turbines, two heat recovery steam generators, one steam turbine, and a wet mechanical cooling tower. Short-term daytime and nighttime sound level measurements were made with and without leaves and insects to characterize the variation in possible ambient sound levels.

Linear Siting and Transmission Projects

- *NSTAR 345 kV Transmission Reliability Project, Stoughton, Canton, Milton, Boston, MA*: Responsible for noise impact assessment for this proposed 18 mile multi-circuit underground 345 kV project. Construction noise impacts along the route and operational noise from substations in Hyde Park and South Boston were analyzed. Expert testimony before the EFSB was provided.

- *Weaver's Cove Energy, Fall River, MA*. Managed the implementation of an extensive existing condition sound level measurement program. Long-term continuous and short-term measurements were taken at multiple locations around a proposed liquefied natural gas (LNG) import terminal. Expected future sound level impacts from operation of the LNG import terminal were calculated. In addition, community sound level impacts from an associated 2.5 million yd^3 dredging project in the adjacent channel were evaluated. The FERC Resource Report 9 section on noise impacts was prepared.

- *BP/Amoco – Continental Divide EIS, WY and CO*. Performed meteorological and air quality dispersion modeling for a proposed natural gas field development project in Wyoming using the CALMET and CALPUFF models. Extensive emission inventories were developed within a large domain (200,000 km^2) using state air agency records and permit file reviews. Ambient pollutant concentrations, wet and dry deposition, and visibility impacts at eight Class I areas from long-range transport were evaluated as a result of the project and the cumulative inventory.

Industrial/Commercial Projects

- *General Electric Company, Hudson River PCBs Superfund Site, Hudson River, NY*. Prepared the Noise Impact Assessment for dredging, processing, and construction activities associated with Phase 1 of the Final Design Report. Source-specific sound level measurements of key sources were also made. Sound level monitoring was done during Phase 1 dredging and processing of the sediment to determine compliance with the Quality of Life Performance Standards.

- *Former Coal Tar Gasification Facility, Island End River, Everett, MA*. Managed an extensive sound level measurement program prior to and during a dredging operation. An existing condition measurement program over multiple seasons was conducted for one-week

intensive periods. A measurement program during a 10-day pilot study was carried out to determine key sources of dredge noise within the community. Sound level monitoring was also conducted throughout the remediation work program itself. This work was coordinated with the land-based and water-based parties on the remediation team.

- *Environmental Soil Management, Inc., Loudon, NH*. An extensive sound level measurement program was conducted for a thermal soil treatment plant in response to community noise complaints. Simultaneous overnight measurements were made at multiple locations with and without the plant operating to identify the possible sources of area noise. Digital audio tape recordings were collected and presented at the local zoning board meeting to demonstrate the low noise levels. Follow-up measurements were made to satisfy decibel limits imposed by the board in order to allow 24-hour per day operations.

- *Gordon Food Service, Brighton, MI*. Noise impacts from loading dock activity, truck traffic, yard dogs, and rooftop mechanical equipment were analyzed as part of the local approval process for a 170,000 square foot regional distribution center in Michigan. Detailed existing condition sound level measurements were made and future operational impacts modeled.

- *Eastman Gelatine Corp., Peabody, MA*. A detailed sound level measurement program was performed to identify sources of community noise concerns around an existing manufacturing facility. Long-term continuous broadband and short-term narrow band sound level measurements were collected around the site. The narrow-band measurements allowed the annoying sources of noise to be identified and a mitigation program to be established.

- *Wingra Engineering, Inc., TN*. Performed meteorological and air quality dispersion modeling in support of a multi-site evaluation for a proposed gray and ductile iron foundry project in Tennessee using the CALMET and CALPUFF models. Ambient pollutant concentrations, wet and dry deposition, and visibility impacts at four Class I areas from long-range transport were evaluated as a result of the project and background sources.

Rock Quarries

- *A. Colarusso & Son., Inc., Hudson, NY*. A sound level impact analysis was performed for a proposed rock quarry expansion at a site in Columbia County in support of the NYS DEC Mined Land Reclamation Permit and SEQRA process. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at an existing excavation site and were used to calculate future sound level impacts. Expert testimony on noise impacts will be presented before a NYS Administrative Law Judge.

- *Aggregate Industries, Peabody, MA*. A Noise Management Plan was developed as part of the Special Permit requirements at this site. A method of correlating noise complaints with

meteorological conditions were set-up. In addition, a series of Best Management Practices for noise reduction were implemented. An extensive community sound level monitoring program was developed and implemented. Mitigation measures to reduce noise from the quarry were designed and presented to city officials and the neighborhood.

- *Sour Mountain Realty, Inc., Fishkill, NY*. A sound level impact analysis was performed at the site of a proposed hard rock quarry in support of a NYS DEC Mined Land Reclamation Permit application in Dutchess County. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and processing equipment were measured at existing rock quarries and used to calculate future sound level impacts. Expert testimony on noise impacts was provided before a NYS Administrative Law Judge.

Sand & Gravel Operations

- *Okemo Mountain Resort, Ludlow, VT*. A sound level impact analysis was performed for a proposed sand and gravel excavation site in Ludlow. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were used to model future sound levels from operation of gravel extraction. Expert testimony on noise impacts was presented before the Act 250 District Environmental Commission and the local review board.

- *Dalrymple Gravel & Contracting Co., Inc., Erwin, NY*. A sound level impact analysis was performed for a proposed sand and gravel excavation site ("Scudder Mine") at a site in Steuben County in support of the NYS DEC Mined Land Reclamation Permit and SEQRA process. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at an existing excavation site and were used to calculate future sound level impacts. Expert testimony on noise impacts was presented before a NYS Administrative Law Judge.

- *Palumbo Block Co., Inc., Ancram, NY*. A sound level impact analysis was performed for a proposed sand and gravel excavation site ("Neer Mine") in Columbia County in support of the NYS DEC Mined Land Reclamation Permit process. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at existing excavation sites and used to calculate future sound level impacts. Expert testimony on noise impacts was presented before a NYS Administrative Law Judge.

- *Newport Sand & Gravel, Goshen, NH*. A sound level impact analysis was performed for a proposed sand and gravel excavation site along Route 10 in Goshen. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at existing excavation sites and used to

calculate future sound level impacts. The results of this work were presented to the local Zoning Board of Appeals.

- *Morse Sand & Gravel, Lakeville, MA*. A sound level impact analysis was performed for an existing concrete batch plant. Ambient background and operational sound level measurements were collected around the site. A mitigation program was designed and the effectiveness of various noise control options were tested. The results of this work were presented as expert witness testimony in Massachusetts Land Court in Boston.

- *Ambrose Brothers, Inc., Sandwich, NH*. A sound level measurement program was performed for an existing sand and gravel excavation site in Sandwich. A future sound level measurement program will be conducted upon the opening of a new phase of the operation to determine the sound level change due to equipment relocation.

- *P.J. Keating Co., Townsend, MA*. A sound level impact analysis was performed for a proposed sand and gravel excavation site. Ambient background sound level measurements were collected around the site. Project-specific impacts of the excavation and haul equipment were measured at existing excavation sites and used to calculate future sound level impacts. The results of this work were presented as expert witness testimony in Massachusetts Land Court in Boston.

Asphalt Plants

- *Massachusetts Broken Stone Company, Berlin, MA*. Performed an ambient hydrogen sulfide (H_2S) and meteorological monitoring program at an existing hot mix asphalt plant. Continuous measurements were made of H_2S, wind speed, and wind direction to determine if the facility may be a source of odor in the area.

- *Tilcon Capaldi, Inc., Watertown and Weymouth, MA*. Air quality impacts from two asphalt-batching plants were evaluated based on best management practices and dispersion modeling. Both fugitive sources from materials handling and ducted combustion sources were reviewed and mitigation measures were recommended. Expert testimony was provided on matters before the MA DEP and abutters of the plants.

- *Pike Industries, Inc., Henniker, NH*. Air quality dispersion modeling, control technology evaluation, best management practice review, and meteorological data analysis were conducted for an asphalt batch plant in order to address a local odor issue. The results of this work were presented in meetings with the NH ARD and the neighbors.

- *Pike Industries, Inc., Ossipee and Madison, NH*. Air quality dispersion modeling was conducted for two asphalt batch plants in order to revise the State air pollution permit to allow the burning of specification used oil.

Transfer Stations/Landfills

- *Confidential Client, ME*. Project manager for an ambient air quality monitoring plan submitted to ME DEP for two existing landfills as part of the landfill gas and odor management system. CALMET meteorological modeling and CALPUFF dispersion modeling were used to specify the continuous hydrogen sulfide (H_2S) monitoring locations and appropriate H_2S Action Levels.

- *Wood Recycling, Inc., Southbridge, MA*. Prepared an ambient air quality monitoring plan for the existing Southbridge Landfill as part of the landfill gas and odor management requirements. MA DEP approval was obtained for the sampling locations and equipment specifications of three fixed hydrogen sulfide (H_2S) monitoring systems and an on-site meteorological station. Dispersion modeling was used to specify the appropriate detection limits for the H_2S equipment.

- *Pine Tree Waste, Inc., Westbrook, ME*. Prepared a noise impact assessment for a proposed construction & demolition transfer station and processing facility. This project involved calculation of expected operational noise impacts from the processing equipment, a compliance evaluation with State and local noise regulations, and testimony before the local Planning Board.

- *Holliston Transfer Station, Holliston, MA*. Prepared a noise impact assessment for an existing C&D and MSW transfer station in Holliston, MA. This project involved ambient background noise monitoring at sensitive receptors around the site, a compliance evaluation with State and local noise regulations, and expert testimony before the Board of Health during the site assignment hearings.

- *Resource Recovery of Cape Cod, Sandwich, MA*. Prepared a noise impact and mitigation assessment for an existing 600-ton/day construction & demolition transfer station on Cape Cod. This project involved extensive ambient background noise monitoring at sensitive receptors around the site, calculation of expected operational noise impacts from the processing equipment, a compliance evaluation with State noise regulations, and mitigation calculations.

- *Valley Mill Corp., Pittsfield, MA*. Prepared a noise impact assessment for a proposed 250-ton/day C&D transfer station in Pittsfield. This project involved ambient background noise monitoring at sensitive receptors around the site, calculation of expected operational noise impacts from the processing equipment, and a compliance evaluation with State noise regulations.

- *WSI, Oxford, MA*. Prepared a noise impact assessment for a proposed 750-ton/day C&D and MSW transfer station in Oxford, MA. This project involved ambient background noise monitoring at sensitive receptors around the site, calculation of expected operational noise

impacts from the processing equipment, a compliance evaluation with State noise regulations, and expert testimony before the Board of Health during the site assignment hearings.

EXPERT TESTIMONY EXPERIENCE

Expert witness before the MA Energy Facilities Siting Board on noise issues for: 18-mile underground electric transmission line and substation project in the Boston Metropolitan area; Billerica Energy Center power plant; Brockton Clean Energy.

Expert witness in the 42nd District Court of Texas on noise issues for a 735 MW wind turbine farm.

Expert witness before NY DEC Administrative Law Judge for a cogeneration power plant, a hard rock quarry facility, and two sand and gravel excavation sites.

Expert witness for site assignment hearings on solid waste transfer stations in Lowell, MA; Marshfield, MA; Oxford, MA, Holliston, MA.

Expert witness in Massachusetts Land Court for a proposed sand and gravel pit, an existing concrete batch plant, and a proposed cross-dock distribution center.

Expert witness in Vermont Act 250 Land Use process for ski areas.

Expert witness before MA DEP Administrative Law Judge for an asphalt plant.

Expert witness before municipal boards on issues of air pollution and noise impacts from local industries.

Invited specialty speaker on noise impact assessments for Boston University's Masters of Urban Planning degree program.

PROFESSIONAL ORGANIZATIONS

American Meteorological Society - Certified Consulting Meteorologist #578
Air and Waste Management Association
Institute of Noise Control Engineers (INCE)
Acoustical Society of America

PUBLICATIONS

O'Neal, R.D., and R.L. Lampeter, 2009: Nuisance noise and the defense of a wind farm. INTER-NOISE 2009, Ottawa, Canada, August 23-26, 2009.

O'Neal, R.D., and R.L. Lampeter, 2009: Sound from Wind Turbines: A Key Factor in Siting a Wind Farm. 12th Annual Energy & Environment Conference – EUEC 2009, Phoenix, AZ, February 2, 2009.

O'Neal, R.D., and R.L. Lampeter, 2007: Sound Defense for a Wind Turbine Farm. North American Windpower, Zackin Publications, Volume 4, Number 4, May 2007.

O'Neal, R.D., 2001: The Impact of Ambient Sound Level Measurements on Power Plant Noise in Massachusetts: A Case Study. Air & Waste Management Association 94th Annual Meeting and Exhibition, Orlando, FL, June 24-28.

Hendrick, E.M., and R.D. O'Neal, 2001: A Case Study of Class I Impacts Using CALPUFF Screen. Air & Waste Management Association Guideline On Air Quality Models: A New Beginning, Newport, RI, April 2001.

Wu, Z.X., J.S. Scire and R.D. O'Neal, 1998: Comparison of One Year of MM5 and CALMET Meteorological Fields with Observations in the Western United States. Presented at the Eighth PSU/NCAR Mesoscale Model Users' Workshop, Boulder, CO, June 1998.

O'Neal, R.D., 1994: Indoor air sampling techniques used to meet workplace and ambient air toxic detection requirements. Air & Waste Management Association 87th Annual Meeting and Exhibition, Cincinnati, OH, June 19-24.

O'Neal, R.D., 1992: Estimating future noise levels from industrial noise sources. Acoustical Society of America 124th Meeting, New Orleans, LA, October 31 - November 4.

O'Neal, R.D., 1991: Predicting potential sound levels: A case study in an urban area. Journal of the Air & Waste Management Association, 41, 1355-1359.

O'Neal, R.D., 1991: Temporal traffic fluctuations and their impact on modeled peak eight-hour carbon monoxide concentrations. Air & Waste Management Association 84th Annual Meeting and Exhibition, Vancouver, B.C., June 16-21.

O'Neal, R.D., 1990: Noise barrier insertion loss: A case study in an urban area. Air & Waste Management Association 83rd Annual Meeting and Exhibition, Pittsburgh, PA, June 24-29.

McKee, T.B. and R.D. O'Neal, 1989: The role of valley geometry and energy budget in the formation of nocturnal valley winds. Journal of Applied Meteorology, 28, 445-456.

O'Neal, R.D. and T.B. McKee, 1987: Draining or pooling mountain valleys: A matter of geometry. Proceedings of the Fourth Conference on Mountain Meteorology, Seattle, WA, August 25-28.

PREVIOUS EMPLOYERS

Earth Tech, Inc. 1997-2000
Tech Environmental, Inc. 1987-1997

THE STATE OF NEW HAMPSHIRE
BEFORE THE
NEW HAMPSHIRE
SITE EVALUATION COMMITTEE

DOCKET NO. 2010-__

APPLICATION OF GROTON WIND, LLC
FOR A CERTIFICATE OF SITE AND FACILITY

PREFILED DIRECT TESTIMONY OF KEVIN E. DEVLIN
ON BEHALF OF
GROTON WIND, LLC

March, 2010

Qualifications

Q. Please state your name and business address.

A. My name is Kevin E. Devlin. My business address is 1125 NW Couch Street, Suite 700 Portland, OR 97209.

Q. Who is your current employer and what position do you hold?

A. I am employed by Iberdrola Renewables, Inc. ("IBR") as Vice President Commercial Operations.

Q. Please describe your background and qualifications?

A. I have 22 years experience in the energy industry and have been in my current position for approximately three years. I hold a degree in Mechanical Engineering from Queens University Belfast.

Q. Please describe your current employment responsibilities.

A. As Vice President Commercial Operations my responsibilities include the management of all operational wind generation facilities in the US owned by Iberdrola Renewables, Inc. or its subsidiaries.

Q. How do your current responsibilities for other wind energy projects bear upon the Groton Wind Project?

A. My current responsibilities are to ensure that existing IBR projects are operated and maintained in a safe and reliable manner, and thus ensure that they meet all the requirements of regulatory agencies with oversight responsibilities for the projects, while carrying out the operating instructions received from grid operators such as ISO-NE. These responsibilities provide me with the requisite background and experience to ensure that the Project is constructed, operated and maintained in a safe and reliable manner and in conformance with applicable regulatory requirements.

Purpose of Testimony

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to address the technical and managerial capabilities of Groton Wind, LLC ("Groton Wind" or "the Applicant") to assure the construction and operation of the proposed wind energy project that is the subject of the above-captioned docket ("the Project") in continuing compliance with the terms and conditions of a certificate of site and facility issued by the New Hampshire Site Evaluation Committee ("the Committee"). I am also providing testimony to demonstrate that the Project will not have an unreasonable adverse effect upon public health and

safety. My testimony supports Sections H. 5(b) and I. 6 (a) through (g) of the Application.

Q. Are you familiar with the Project that is the subject of this proceeding?

A. Yes, I am. I have worked with the Development and Permitting departments of IBR discussing specific project considerations.

Q. What will your role be in relation to the Project?

A. I am responsible for operations for all of IBR's wind projects; as such, Groton Wind will fall under my purview after construction.

Managerial and Technical Capability

Q. Please describe Groton Wind's technical and managerial capability to construct and operate a wind power project.

A. Groton Wind is 100% owned by IBR, which has successfully financed, constructed and now operates 36 wind energy facilities in the United States, including the Lempster Wind Project in New Hampshire. As an Iberdrola company, Groton Wind will have full access to the managerial and technical capabilities of IBR to construct and operate the Project.

Q. Please describe IBR's managerial and technical capabilities as they relate to Project construction?

A. IBR has a full in-house construction management staff, including Project Managers, Site Managers, Superintendents and Quality Assurance Inspectors, and Safety Managers, all of whom have extensive experience in the wind energy industry. This

experience and technical depth is supported by a number of standardized sequence plans to insure efficiency, shorter timelines and minimized disruption to the community during construction. As the largest wind power company in the world, we work with many different contractors and follow a rigorous process for qualifying contractors that wish to bid on project work. As part of that process, we review contractors' past performance, financial stability, safety record, and depth of technical experience. Iberdrola personnel directly manage contractors through our Project Management, Construction, and Operations groups.

Groton Wind will construct and operate the Project consistent with Iberdrola's corporate commitment to meeting all applicable state and federal requirements, including OSHA safety regulations. During construction and before the Project is fully operational, each turbine and all electrical equipment will be inspected under rigorous commissioning procedures. In addition, prior to activating the electrical lines, the interconnecting utility will also perform and require inspections, testing, and commissioning documentation for grid and system safety. This process is also coordinated through regular conference calls with the ISO-NE and local utilities.

Q. Please describe IBR's managerial and technical capabilities to operate and maintain the Project?

A. Operating and maintaining a wind power project require technical expertise in several areas, including the following: wind turbine operations and turbine design; troubleshooting of wind turbine faults or trips; wind turbine preventative maintenance; crane rigging and logistics for major component maintenance; high voltage

circuit switching and preventative maintenance; turbine safe operating procedures; preventative maintenance on transformers, distribution lines, and switchyards or substations; wind turbine SCADA systems; and predictive maintenance tools.

Q. Does IBR have the requisite technical expertise in the areas that you have outlined above?

A. Yes. IBR is the second largest operator of wind facilities in the United States and the largest worldwide. We have extensive technical expertise and experience developed over decades within the wind industry.

Q. Please describe the qualifications of the personnel available to Groton Wind to operate and maintain its wind power projects?

A. IBR will staff the site with an experienced plant manager and several technicians. These staff will oversee the maintenance being performed by the turbine vendor's staff or will perform these duties themselves. Field staff are supported by experienced operational management in the Eastern Region and technical and commercial experts at the head office in Portland, Oregon.

Q. How will the Groton Wind Project be staffed?

A. The Project will be operated and maintained by a team of approximately three IBR Staff including a plant manager. This team will be supplemented by full time staff provided by the turbine vendor during the warranty period. Post-warranty, the site will be staffed by approximately six full time IBR staff. The O&M team will staff the Project during normal working hours, with weekend shifts and extended hours as required to maintain continuous operations. IBR operates its wind projects with its own

employees who receive applicable certifications and who are trained in operational standards, and safety regulations and procedures.

Q. How will the Project be operated and maintained?

A. In addition to local staff, IBR has a control center located in Portland, Oregon (the "IBR Operations Center") that is staffed 24 hours a day, 7 days a week. The IBR Operations Center will continuously monitor and control the Groton Wind facility. The Project's central supervisory, control and data acquisition ("SCADA") system located in Portland, Oregon, provides remote operation and control of the wind turbines and collects operating and performance data 24 hours a day. Wind turbines are managed via computer controllers installed in each turbine. Under certain circumstances such as an electrical error, high winds or icing, for example, the turbines are tripped (automatically shut down) via computer. The SCADA system will send an alarm message to local O&M personnel via pager or cell phone to notify them of the outage.

During the warranty period of the wind turbines, the turbine vendor (Gamesa) will have primary responsibilities for operations and maintenance, but IBR will maintain personnel at the site to respond to situations are they arise. Turbine warranties are standard within the industry, and address the first year or two of wind farm operations, including turbine adjustments and maintenance. During the warranty period, IBR operations staff will be responsible for:

- managing and coordinating all scheduled and un-scheduled maintenance performed by Gamesa, including periodic operational

checks, regular preventative maintenance, or implementation of service bulletins issued by Gamesa or balance of plant contractors;

- operating any switch gear, relay or protection equipment or performing electrical maintenance as needed, including any remote or local resets of the turbines through the control system;
- working in coordination with the grid operator and utility to gather and analyze data from the turbines and ensure that all SCADA systems are fully operational;
- maintaining all procedures defined in the detailed operations and maintenance manuals;
- ensuring compliance with all safety plans, emergency response protocols and environmental permits;
- ensuring that spare and replacement parts inventories maintained by Gamesa and balance of plant contractors are adequate to ensure timely service in the event of a failure;
- exercising reasonable site security to prevent unauthorized access to project facilities; and
- maintaining relations with local landowners and community representatives.

After the warranty period has expired, IBR staff will assume full responsibility for all day-to-day operations and maintenance procedures, as well as maintaining an oversight role for the Project.

Q. What is IBR's record with regard to the reliability, operation and maintenance of its wind power projects?

A. IBR has a proven track record as a successful participant in the wind energy market in New England and the United States. IBR's primary goal is to operate all of its wind projects to ensure the highest level of safety to the pubic and employees and environmental protection to the site and community. IBR strives to maximize the economic performance of its wind projects. Operational efficiency of wind turbines is a critical issue, as power production affects profitability and return on the significant long-term capital investments being made by Iberdrola. Operations and maintenance excellence is what makes a wind project successful. Company-wide, Iberdrola's goal is to achieve 97% availability (defined as the number of hours that a turbine is available to produce or is producing, divided by the number of hours in the period).

Q. In your opinion, does Groton Wind possess the managerial and technical capabilities to construct and operate the proposed Project consistent with a certificate of site and facility that may be issued by the Committee?

A. Yes. I base this opinion upon my familiarity and experience with Groton Wind's parent company, IBR, which, as described above, will be providing Groton Wind

with the necessary managerial and technical resources to construct and operate the Project.

Public Health and Safety

Q. What steps are being taken to ensure that the Project will not have an unreasonable adverse impact on public health and safety?

A. At IBR and throughout all levels within the Iberdrola companies, safety is the foremost concern during every aspect of a wind project's construction and operation. Safety and environmental management systems are part of training and ongoing practices. In addition, operations and maintenance plans that include rigorous preventative maintenance and inspection, as well as repair and improvement measures, are designed to ensure a high level of safety at Iberdrola's wind projects. IBR holds itself and its employees to very high safety standards, and all of its general construction contractors are required to meet strict safety qualifications. IBR's Safety Director, Gary LeMoine, has served as the Vice Chairman of the American Wind Energy Association ("AWEA") Safety Committee for 3 years, and has received the AWEA Operations Award at the National Wind Power Conference in 2009 for his leadership in the area of safety in the wind industry.

All of IBR's technicians are trained in tower rescue, first aid and CPR. IBR has enjoyed excellent relationships with local emergency service providers in the

communities where IBR wind projects are located. IBR periodically meets with these providers to be proactive on safety issues. Some of the specific public health and safety issues that are usually raised in response to a wind project application such as Groton's include hazardous waste, ice shedding, lightning strikes, blade or tower failure, stray voltage, fire and aviation safety. I will discuss each of these subjects below.

Hazardous Waste

The Gamesa G87 turbines that are proposed for the Project will utilize small amounts of lubricant oil and other chemical materials for the routine operation of the generators. To the extent that these materials are considered "hazardous," handling and spill prevention will be dealt with in accordance with state and federal laws. Each turbine contains approximately 150 gallons of oil for cooling in the gearbox and operation of the hydraulic systems. The wind turbines are designed so that in the event of an oil leak, containment would first be attempted within the nacelle, should any leak spill over it would be contained within the inside of the tower. In the improbable event of an external leak, spill quantities would likely be minimal and relatively easy to remediate. In addition, turbine sensors are programmed to detect a drop in oil pressure or turbine performance in the event of an oil leak, which would alert operations staff to the problem.

Oil and other chemical materials are stored on site under standard operation and maintenance procedures, in an area that utilizes protective containers and a "catch basin" in the floor. The Project will develop a spill prevention control and countermeasure plan

("SPCC"), under Federal regulations, that is implemented in case of an accident or spill. The SPCC plan is also provided to local responders.

Ice Shedding

Information about the issue of wind turbine icing is provided in Section I. 6 (b) of the Application. Depending upon weather and wind conditions, ice sometimes builds up on turbine blades. As the ice begins to thaw, it will typically drop straight to the ground. Any ice that stays on the blades as they rotate could shed some distance from the tower. Such a throw will usually result in the ice breaking into pieces and falling near the base of the tower. In exceptional circumstances we have recorded ice falling as far as 500 feet from the base of a turbine. However, such a shed would require that the ice be projected from the tip of the blade when running at high rotational speed. The turbine's safety system is programmed to prevent this by sensing the imbalance in the blade weights caused by the ice and to adjust accordingly by automatically operating in a greatly slowed or stopped ("safe") mode. In addition, operations personnel closely monitor turbines in severe weather conditions and are able to manually adjust operations if needed to insure safety. When icing conditions are identified by site personnel, a safety radius around each tower base is maintained and no service personnel are allowed within the safety radius if the turbine is on-line when "ice rules" are in effect. There will be no public access to the Project site. Access roads leading to the Project site will be gated and locked, as they are now. Signs will be posted to inform the public that snowmobiles and ATVs are not allowed within the Project site. In addition, visible signs warning of the danger from falling ice will be posted on all Project access roads. Trained maintenance

personnel will enforce procedures aimed at minimizing risks to the general public from ice shedding by maintaining warning signs and closing and locking gates after passing through them, in order to keep the public at a distance from the wind turbines, particularly during the winter.

Lightning Strikes

Due to the height of the wind turbines and their metal/carbon components, lightning strikes can occur. IBR's experience with lightning strikes is that while they can occur, with turbines that have modern lightning protection systems, these incidents are infrequent. The Gamesa G87 turbines proposed for the Groton Wind Project are equipped with a lightning protection system that includes a combination of arrestors and grounding rods, rings, and/or wells. This system relies on lightning receptors and diverter strips in the blade to provide a path for the lightning strike to follow to the grounded tower. The system conducts the lightning from both sides of the blade tip down to the root joint and from there to the nacelle, tower and earthing system. Thus, blades are protected from failure and electrical component damage is avoided.

The turbines' blade monitoring system documents all critical lightning events. If the monitoring system detects a problem, the turbine will shut down automatically or be inspected to assure that damage has not occurred. When a lightning incident occurs, experienced operations and maintenance personnel will ensure that the turbine is not operating in an unsafe condition that might put the public or personnel at risk, and that the turbine is repaired quickly in order to minimize outage time for the affected unit(s).

The fact that the turbines will be sited a great distance away from privately occupied structures also mitigates risks to the public associated with lightning strikes.

Blade or Tower Failure

Failures causing the collapse of blades or towers are rare for modern wind turbines. Technological improvements and mandatory standards during turbine design, manufacturing, and installation have largely reduced such occurrences. State of the art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the risk of tower collapse and blade throw as the result of high wind speeds. The Gamesa G87 wind turbines that are proposed for the Project automatically shut down at wind speeds over 56 miles per hour, and they also cease operation when significant vibrations or rotor blade stress is identified by the turbines' blade monitoring system. As indicated above, setbacks and cautionary signage will protect the public in the event of a blade failure or tower collapse.

Stray Voltage

Stray voltage is a low level of electrical current that can occur between two points on a grounded electrical system and is a concern usually raised by livestock farmers. Stray voltage is usually caused by a damaged or poorly connected wiring system, corrosion on either end of the wires, or weak/damaged wire insulation materials. Stray voltage is largely preventable with proper electrical and grounding practices. The Groton Project's electrical collection system will be properly grounded and will not be connected to the local electrical distribution lines that provide electrical service to local homes or buildings. The collection lines will be buried in most areas and will use shielded cables

with multiple ground points. This design eliminates the potential for stray voltage. In addition, the Project's set back from private residences, safeguards to prevent public access to the site (such as gating and signage to warn of electrical facilities), and the absence of livestock nearby, will provide adequate protection to the public from any risks associated with stray voltage.

Fire

Although wind turbines contain relatively few flammable components, the presence of electrical equipment and various oils (i.e. lubricating, cooling and hydraulic) creates at least some potential for fire within the tower or the nacelle of a turbine. Other potential fire risks, although minimal, are posed by lightning strikes, short circuits or mechanical failure/malfunction. Fires at wind projects are rare and because of setbacks, they do not pose an immediate danger to the public. However, if a fire were to occur at the Project, the fire and safety sensor systems in the turbines would detect it and signal operations personnel of the event and/or shut down the turbine automatically. In the event of a fire within a turbine, local firefighters might have difficulty containing it given the height of the structure. The practical response to these types of fires is to let nacelle fires burn out. However, because there could be a risk that the fire would spread onto the ground or into forested areas, the Project will in all cases coordinate with the local fire departments so that the situation is closely monitored and any fires are quickly contained.

Groton Wind will work with local fire departments and safety officials to develop a fire protection and emergency response plan for the Project. Groton Wind will notify local fire departments and emergency responders of construction plans and will provide

them with site visits to review the location of and points of access to the Project facilities. As is usually the practice with Iberdrola projects, Groton Wind intends to establish a 911 address for the Project during construction. In addition, the Project will follow all applicable fire laws and regulations.

Aviation Safety

The installation of relatively high structures atop ridgelines has the potential to pose a risk to aviation. However, the Project's compliance with all applicable Federal Aviation Administration ("FAA") requirements will minimize that risk. Groton Wind will install the wind turbines in locations where they will present no hazard to aviation and will not infringe upon federally-protected air space. Preliminary turbine locations were provided to the FAA in June of 2009 for a determination of whether the proposed turbines would cause a hazard to aviation or federally-protected airspace. On December 6, 2009, Groton Wind received determinations from the FAA for each proposed turbine. However, because turbine locations had shifted since the original FAA filings, new turbine coordinates were submitted in January of 2010.

In accordance with federal requirements for obstruction lighting or marking for structures over 200 feet above ground surface, Groton Wind will illuminate the appropriate turbines. The FAA's guidance on standards for obstruction lighting for wind turbines requires lighting the Project as one large obstruction, such that lights may be spaced approximately 3,000 feet apart rather than lighting every turbine. White strobe lights will not be used; wind farms are lit with synchronized red pulsing lights at night. As currently proposed, 11 turbines are proposed to be lit. Concurrence with Groton

Wind's lighting plans is expected from the FAA. In addition, the proposed permanent meteorological tower will be illuminated with the same type of light. The FAA has determined that the turbines' white color is sufficient daylight marking.

Q. How will you and your staff respond to an emergency at the Project?

A. In the event of a turbine or plant emergency during normal working hours, on site personnel will respond to the situation with the primary responsibility to make the area safe and isolate any defective or hazardous equipment. Outside of normal working hours, the IBR Operations Center will contact the on call technician for primary incident response. If an emergency occurs, the local technician will take any action deemed necessary and prudent to isolate any failed piece of equipment to ensure the safety and reliability of the Project. After the situation is safe, the technician will call local or regional management to report the nature of the emergency and we will perform any follow-up action as necessary. In the case of other emergencies, the Project will comply with applicable internal emergency procedures and/or with plans developed with the Town of Groton and/or other safety officials.

Q. In your opinion, will the Project have an unreasonable impact upon public health and safety?

A. No. Based upon the information contained in Section I. 6 of the Application, as well as the information set forth in my testimony above, I believe that the Project will not have an unreasonable impact upon public health and safety.

Q. Does this conclude your testimony?

A. Yes.