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Boreal Renewable Energy Development

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Recommended Citation
Boreal Renewable Energy Development, "Response to Request for Evaluation of the Feasibility of Erecting a Regional Wind Energy System within the East Bay of R.I., Non-Price Proposal" (2009). *East Bay Energy Consortium Documents.* Paper 21.
http://docs.rwu.edu/ebec/21

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Non-Price Proposal

East Bay Energy Consortium

Response to request for:

Evaluation of the Feasibility of Erecting a Regional Wind Energy System Within the East Bay of R.I.

Boreal Renewable Energy Development

with

Power Engineers, LLC
Symmes Maini & McKee Associates
Saratoga Associates

August 31, 2009

Executive Summary

This proposal is organized to best convey how the Boreal Renewable Energy Development (Boreal) team will provide the qualifications for a successful wind power project for the East Bay Community Consortium of Rhode Island. We are committed to the facts that communication is key, analytic depth is assured, professional presentation of results is emphasized, and project implementation and success are paramount.

The Boreal team is well qualified and experienced in the legal issues surrounding renewables and State laws and local zoning issues and, in fact, led a project for the Cape Cod Commission and Cape Light Compact reviewing barriers to wind energy and assisted in the drafting a model wind energy bylaw. In addition, we are an active participant in the Massachusetts Green Communities Act regulatory process and provide guidance on complex rate and tariff issues by advocating for the ease of implementation of renewable generation sources within a complicated regulatory landscape.

Boreal has an excellent working relationship with National Grid on net metering issues having worked with them on coming to consensus on the Massachusetts net metering and distributed generation regulations. Boreal can provide a non-adversarial conduit to engage National Grid in discussions of their understanding and goals of net metering implementation in Rhode Island.

Information is provided in a way so the goal of the Pre-Feasibility Study (FS), to be able to determine whether further study, and costs, will produce the desired results given the available information and resources, are paramount. In addition we understand that:

- The Pre-Feasibility Study ends with the presentation of results regarding the overall viability of the project, complete with a recommendation for future activities.
- Project development of construction bidding documents is not part of this stage of the study, but will be pursued if projects are found to be acceptable after Task 2 completion.
- Rhode Island net metering rules implemented in January 2009 provide the East Bay Energy Consortium (EBEC) the flexibility to site a refurbished wind turbine capable of meeting the electricity needs of various public electrical loads at a site isolated from those particular loads.
- The goal for the two stages of the Feasibility Analysis are as follows:
    - Task 1 is to identify potential sites, compile available project data (wind, consumption, etc.), assess environmental impact, and forecast project economics

for multiple sites in order to enable the Consortium to advance specific sites to Task 2 level analysis.

- Task 2 is to perform detailed feasibility study analysis of selected site(s). The analysis and accompanying reports, will provide a detailed technical and economic assessment. In close consultation with the EBEC and its technical subcommittee, it will provide specific recommendations on what (if any) projects to pursue, including turbine models, interconnection strategy, and ownership structure. . Further, the deliverables will be used for internal and community decision-making, and should facilitate the decision-making processes.

We will work closely with the designated EBEC project manager and other EBEC members.

Role and Function

As this project is being proposed to be sited on public land and to create benefits for the Towns, we understand that it will be closely scrutinized so our approach will involve strong engagement of EDEC at all phases of our project. This includes inspection by parties that will be both strongly in support of and strongly opposed to the project regardless of the results of the feasibility analysis. Thus, beyond the technical, regulatory and industry expertise that must be implicit in the deliverables, the following will be very important:

- Clear roles and communication of project progress and response to inquiries by the designated project manager from EBEC with Boreal.
- Speed and flexibility of response to requests from EBEC brought about by having multiple Boreal staff members very well-acquainted with the project and present at bi-weekly meetings.
- Professional presentation of results with ease of understanding to the average interested lay-person.
- Making raw data, assumptions, and report easily understandable to the EBEC and other stakeholders.
- Understanding the need to address and incorporate comments, edits, critiques from draft to final versions of reports and presentations.

We know we can successfully work with the East Bay Energy Consortium as Boreal has successfully performed or is performing more than twenty feasibility studies for onsite wind generation many for public entities. We have worked on feasibility studies in Rhode Island for

Raytheon of Portsmouth and are currently working with the Rhode Island Dept. of Env. Management.

We have assembled a top-notch project team to address the issues that will confront the feasibility study process. Our project team consists of the following organizations (and the lead team member from the firm).

- Project Management, Wind Resources Analysis, Permitting Assessment, Financial Model, Geographic Issues, FAA Requirements, Zoning Community Issues – Boreal Renewable Energy Development – Tom Michelman, Bob Shatten, Alex Weck
- Electrical Engineering – Power Engineers LLC – Dave Colombo
- Visibility and Shadow/Flicker Analysis – Saratoga Associates – John Guariglia
- Civil Engineering, Access to Site, Transport to Site, Site Technical Assessment, – SMMA - Peter Glick

Each team member's qualifications and responsibilities will be discussed more fully below.

1 Firm Description and Key Personnel

Below, team member qualifications are listed

1.1 Boreal Renewable Energy Development

43 Margaret St.
Arlington, MA 02474
978.580.6190
tmichelman@boreal-renewable.com

In 2003 Boreal Renewable Energy Development (Boreal) was co-founded by Principals Robert A. Shatten and Thomas S. Michelman to cost effectively implement distributed generation renewable energy projects.

Boreal is a local New England-based firm with a history of successfully managing all aspects of the site assessments and feasibility studies relating to wind energy as is envisioned by the EBEC. Our company was created to provide full service in the study and implementation of wind turbines for

private and public clients. Our strategy is to aid in the growth of wind turbine technology wherever it is economically and environmentally feasible. Below, as requested, is a list of client references as well as a table of all the similar projects (with contact information) undertaken over the last three years.

Please note that Boreal principals and co-founders Tom Michelman or Bob Shatten have managed each of the projects below and will be fully engaged in the EBEC feasibility study.

Boreal is based in Arlington, Massachusetts and has two full-time employees and a set of part time contributors that include a field crew and legal counsel. Full resumes for Boreal employees and project subcontractors are available in Appendix A.

Tom Michelman

Tom Michelman will manage the EBEC project, his Boreal staff, and the team of subcontractors.

Mr. Michelman's areas of expertise include: retail and wholesale electric markets, financial pro forma scenario analysis, processing of historical energy consumption, and analysis of current and future utility tariffs, and wholesale and REC prices. Mr. Michelman was a key participant working on consensus language for net metering that was included in the Massachusetts 2008 Green Communities Act.

Mr. Michelman has over five years of experience and participated or led over two dozen wind projects most of over 100 kW in capacity through either feasibility or design and construction stages. He is leading the Notus Clean Energy wind energy project from inception through feasibility study, design, bidding, construction and commissioning. The Notus project has over a $4,000,000 construction budget for which he acted in capacity of owner's engineer, managing contract specification and design documentation preparation, for the competitive bid solicitation. Among other activities he is currently managing design and permitting efforts for the Eagle Hill School 600 kW wind turbine in Hardwick, MA and Nauset Regional High School the 900 kW wind turbine project.

Robert A. Shatten

Mr. Michelman will provide extensive support to the project and will lead the economic assessment portion of the scope.

Mr. Shatten's area of expertise include: environmental permitting, energy facility siting and environmental and power plant due diligence assessment, (he has performed third party due

diligence assessments of wind energy facilities in the U.S., Canada, and Germany) community relations, emissions calculations and sustainability and recycling expertise.

Mr. Shatten has over five years of experience and participated or led over two dozen wind projects most of over 100 kW in capacity through either feasibility or design and construction stages. He led the Forbes Lofts 600 kW wind energy project from inception through feasibility study, design, bidding, construction and commissioning. The Forbes project's capital costs were over $1,500,000. He currently leads for example, large wind energy design and construction projects at for Varian Semiconductor Equipment Associates Inc. (VSEA) (fully permitted and bid process completed for construction of 5.0 MW) and the Woods Hole Oceanographic Institution (funded for design and construction of 4.0 MW). As part of the VSEA project, Mr. Shatten acted as owner's engineer for the advertisement and pending award of a $7,800,000 million construction contract.

Mr. Shatten has a M.S., Civil Engineering, Stanford University, 1988 and a B.S., Environmental Engineering, Northwestern University, 1983.

Alex Weck

Mr. Weck will provide analytical support to the project throughout its duration. With experience in wind resource assessment and modeling, financial assessment, geographic information systems, report writing, construction management, and other aspects of wind energy development he will handle a large portion of the Boreal workload.

1.2 Power Engineers

Dave Colombo, PE
Principal
415 Boston Turnpike
Shrewsbury, MA 01545-3446
508.792.2920
dave@powerengineersllc.com

Dave Colombo is the owner and sole employee of Power Engineers LLC, an electrical engineering, design and consulting firm. As a principal engineer, Mr. Colombo provides power system design, lighting design, technical studies and consulting to clients such as utilities, municipalities, colleges, industrial / commercial facilities, other consultants and the insurance industry. Mr. Colombo has

experience in forensic assessment of electrical equipment at both low and high voltages and safety training in the proper use of personal protective equipment to avoid electrical injuries. Several of Mr. Colombo's recent projects have involved cogeneration, renewable energy and wind power feasibility.

Mr. Colombo has been part of several project teams associated with the design, installation, and interconnection of new generation and co-generation projects. These projects have included emergency generator installations as small as 5kW up to combined cycle plant and transmission line interconnection projects as large as 250MW. He has also prepared feasibility studies and conceptual designs for numerous wind power projects. He has worked on seven currently-installed wind projects in New England.

Dave will be in charge of all analysis concerning electrical interconnection of turbines for the project. More detail is given to this in Section 3 of this proposal.

1.3 Saratoga Associates

John Guariglia
Alliance Principal
109 South Warren Street
Suite 400
Syracuse, NY 13202
315.288.4286 x3302
JGuariglia@saratogaassociates.com

Saratoga Associates have the primary disciplines of Planning, Landscape Architecture, Civil Engineering and Architecture are employed in every aspect of planning and design to ensure high-quality innovative solutions that reflect the spirit of their place, needs of the shareholders and realities of construction. John Guariglia, RLA, will be leading all of Saratoga's efforts. He brings over ten years experience in the field of Landscape Architecture to Saratoga Associates. During his career he has worked on a variety of site development, planning and aesthetic projects throughout the Northeast.

Specifically, over the past seven years, John has become a recognized expert in conducting visual impact assessments utilizing standard methodologies including the New York State Department of Environmental Conservation's Program Policy "Assessing and Mitigating Visual Impacts." In

addition to his many years of project management, John is skilled in a variety of software programs and has served as an expert witness.

John will produce photo simulations based upon base photographs, GPS coordinates and other information provided by Boreal.

1.4 Symmes Maini & McKee Associates

Peter Glick, PE
Civil Engineer
400 Westminster Street
Providence, RI 02903
401.421.0447
pglick@smma.com

Peter Glick will be providing civil engineering support for the project from SMMA's Providence office. Mr. Glick is well-versed in a wide array of engineering principles that will be useful for studying the feasibility of wind turbines and will assist with the development of any necessary CAD or GIS documents for the project. The preparation of large scale maps based on the information provided during Task 1 will be a helpful analytical tool for selecting appropriate sites for wind development.

1.5 Availability

All project team members are available to perform the Scope of Work within the scheduled time period.

2 Relevant Experience

Boreal has performed more feasibility studies for onsite wind energy projects in New England than any other firm. Boreal Principals Bob Shatten and Tom Michelman provide significant contributions to every project listed below. Alex Weck has contributed on every project dated 2007 or later.

Subcontractors have contributed significantly to Boreal-managed projects. Boreal has established a working relationship with our listed subcontractors through multiple projects worth of collaboration – SMMA (6 projects), Power Engineers (8 projects), Saratoga Associates (15+

projects). In all cases, subcontractor personnel listed in the previous section were the active representatives of their respective companies when contributing to the Boreal project.

2.1 Boreal Wind Projects:

The following is a list of related wind energy projects worked on by Boreal:

- *Aquacultural Research Corporation* - Dennis, MA - FS completed in 2008. Design ongoing
- *Aquinnah Wampanoag Nation* – Aquinnah, MA – FS on tribal lands.
- *Barnstable Water Pollution Control Facility* – Barnstable MA – FS completed 2005. Design ongoing.
- *City of Fall River, MA* - FS completed at the city's wastewater treatment facility in 2008.
- *Costco Warehouse* - Everett, MA - Fatal Flaw Analysis completed in 2007.
- *Dominion Energy New England, Inc.* - FS at two electrical generation facilities completed in 2007.
- *Eagle Hill School* - Hardwick, MA - FS completed in 2008. Design ongoing.
- *Falmouth Hospital* - Falmouth, MA - FS completed in 2005.
- *Forbes Park Development* - Chelsea, MA - FS completed in 2007. Installation of a 600 kW turbine in 2008.
- *Green Island Power LLC* - British West Indies - Meteorology and design support for Anguilla Wind farm in 2008-09.
- *Gordon Conwell Theological Seminary* - Hamilton, MA - FS completed in 2009.
- *High Point Treatment Center* - Plymouth, MA - FS completed in 2009.
- *Highland Center, Cape Cod National Seashore*– Truro, MA - FS for development within the NPS ongoing.
- *City of Jaffrey* - Jaffrey, NH - A financial review was completed for a wastewater plant in 2007.
- *Jiminy Peak Ski Resort* - Hancock, MA - Permitting support of one 1.5 MW turbine constructed in 2007.
- *Lightolier* - Fall River, MA - FS completed in 2007. Design ongoing.
- *MWRA* – Boston, MA – FS and Design and numerous sites.
- *Museum of Science* - Boston, MA - Roof-mounted wind turbines FS completed in 2006. Phase 1 construction complete.
- *Nauset Regional High School* - Eastham, MA - FS completed in 2008. Design ongoing.
- *NBC-10 Transmitter* - Rehoboth, MA - FS completed in 2006.

- *Notus Clean Energy* - Falmouth, MA - FS completed in 2005. Permitted 1.65 MW wind turbine. Construction in 2009.
- *Private Residence* - Peterborough, NH - Wind resource and regulatory analysis ongoing.
- *Raytheon Naval Integration Center* - Portsmouth, RI - FS completed in 2006.
- *Raytheon Integrated Defense Systems* – Tewksbury, MA – Pre-FS completed in 2008.
- *Town of Rutland, MA* - FS for a redevelopment of a former state hospital site completed in 2008.
- *Tufts University* – Grafton, MA – FS for veterinary school ongoing.
- *Twin Rivers Technologies* - Quincy, MA - FS completed in 2007.
- *Varian Semiconductor Equipment Corp* - Gloucester, MA - FS completed in 2005. Permitted 2 - 2.5 MW wind turbines.
- *Up-Island Regional School District* – W. Tisbury, MA – FS ongoing.
- *White Cliffs Country Club* - Plymouth, MA - FS completed in 2008.
- *Woods Hole Oceanographic Institution* - Woods Hole, MA - FS completed in 2007. Design -1.5 MW wind turbines.

2.2 Project References

2.2.1 Boreal Renewable Energy Development

Mr. Robert (Bob) Wedekind
V.P. Downlighting and Engineering Services
Lightolier
631 Airport Road
Fall River, MA 02720
(508) 646-3140
BWedekind@lightolier.com

Completed MTC LORI wind turbine funded feasibility study in June 2007, performed follow-on assessment and submitted a MTC LORI Design and Construction grant for $500,000 in August 2007. Currently assisting with permitting and design tasks, while awaiting decision on grant application. Tom Michelman is managing this project, Bob Shatten and Alex Weck provide extensive assistance. Saratoga Associates worked on this project.

Mr. Rick Johnson
Director of Facilities
Varian Semiconductor Equipment Associates, Inc.
35 Dory Road
Gloucester, MA 01930-2297
(978) 282-2794
Rick.johnson@vsea.com

Completed MTC funded wind turbine feasibility study and submitted and won MTC design and construction grant for $575,000. Boreal has supported all aspects of design and permitting. Wind turbine purchase order and construction are pending after final City Council approval. Bob Shatten is managing this project. Tom Michelman and Alex Weck provide extensive assistance. Saratoga and SMMA worked on this project.

David Chamberlain
Principal Energy Engineer
235 Presidential Way, Mail Stop 26/21A
Woburn, MA 01801-1060
Phone: (978) 436-8128
David_R_Chamberlain@raytheon.com

Completed full wind turbine feasibility study at Raytheon Naval Integration Center - Portsmouth, RI. Installed meteorological tower, after ghost-writing and winning RI Renewable Energy Fund grant. Raytheon is pursuing construction of turbines on site. Bob Shatten managed the project. Tom Michelman provided extensive assistance.

2.2.2 Power Engineers

Holy Name High School
Mary Riordan
President
Holy Name High School
144 Granite St.
Worcester, MA 01604
(508) 753-6371

Power Engineers provided design of interconnection for one 600kW turbine. Work included interconnection design, protective relaying design, ground grid design, electrical site plans, and technical specifications. Turbine was put on-line October 2008.

Ms. Diana Duffy
Owner
Hyannis Country Garden
380 West Main Street
Hyannis MA 02601
508-775-8703
Power Engineers prepared preliminary utility interconnection diagrams and utility interconnection application, along with functional description, to begin the process prior to final design and construction. Preparation of final design plans and specifications for construction of all electrical equipment. Assisted in testing and utility approval of protective systems. Turbine was put on-line in December of 2008.

Rose Forbes PE
HQ AFCEE/MMR
322 East Inner Road
Air Station Cape Cod MA 02542,
(508) 968-4670 x 5613
Power Engineers completed design of interconnection of one 1500kW turbine. Work includes interconnection design, protective relaying design, ground grid design, electrical site plans, and technical specifications. Turbine expected to be constructed in 2009.

3 Proposed Scope of Work and Schedule

3.1 Overview

This section outlines Boreal's approach to managing the study tasks outlined in the Scope of Work as detailed in the request for proposals. We have successfully completed very similar wok scopes for over a dozen New England companies, school, governmental and non-profit organizations. We will work closely with the EBEC to address these and other concerns and goals. The two stages of the feasibility study are:

- Task 1: Identify feasibility of project at various locations within the East Bay
- Task 2: Provide detailed analysis of selected sites.

Some tasks (e.g., the financial will be conducted for Task 1 and repeated with more defined inputs in Task 2), some tasks will be given a cursory review in Task 1 (electrical interconnection), but will be analyzed in detail in Task 2, and some tasks will conducted in full in Task 1 and likely need no update for Task 2, and some will be deferred to Task 2. As there is so much overlap between the two tasks, we use the Task 2 outline. We explicitly differentiate between Task 1 and Task 2 scope items.

Regardless, Task 1 will largely be a step of coordination and compilation of existing information off which to come up with a concrete direction to take a project in. The Task 1 written report will be a valuable summary for the future of wind projects in the East Bay.

Separately, we have added an additional project management task as prerequisite of implementing a successful project.

3.2 Project Management

Project Management tasks primarily focus on communication and coordination and adding value to our subcontractor's efforts through our experience. Tom Michelman will be the project manager for the Boreal team and the gateway for communication between the Boreal team and the EBEC assigned liaisons. Mr. Michelman, in concert with the EBEC, will coordinate and schedule all meetings for the Boreal team. He also will be the main contact for invoicing.

While not explicitly requested, we consider an on-site kick-off meeting a high value task for project management. Besides the value of a face-to-face meeting, walking the sites, noting and asking about site features, observing the infrastructure, abutting properties, topography, flora, and fauna will all help guide the study. A kick-off meeting and subsequent site visits will help facilitate future communication and project expectations.

Once the kickoff and site visits have been completed, Mr. Michelman will lead the project by setting agendas for each biweekly meeting. Each agenda will include a list of goals for the following fortnight, as well as a number of items to follow up on from previous meetings. Decision making in Task 1 will be performed quickly and the scope of the project will change markedly from the screening of a large number of sites to the selection of finalists to be fully analyzed in Task 2.

We expect to involve EBEC members will be heavily involved in the early stages of Task 1. As a major project management task, gathering all existing information will require significant

coordination between Boreal and the EBEC and its local contacts. A wealth of information is held within the experiences and understandings of the EBEC membership. The transfer of that information will be actively elicited by Boreal and will require noteworthy assistance from the EBEC.

In Task 2, the role of the project manager remains largely the same, but will be performed on a broader and more in-depth scale. Again, a project kickoff meeting will provide an opportunity for project contributors, now to include representatives of the chosen site(s), to establish a framework. With an in-depth feasibility study, longer lead times are inherent (awaiting completion of other sections of the study – potential met tower installation, sound study, etc.) so it is the job of the project manager to structure the sequencing of the project tasks so that as much concurrent work as possible can be completed.

3.3 Kick-Off Meeting

As the first step in preparing the analyses, Boreal will compile all the available information known to be available. This will be initiated at a project kickoff meeting and will include, but not be limited to:

- List of sites already in consideration
    - Site plans, geotechnical / boring reports, environmental studies, etc for those sites under consideration
- Available wind data files and/or summaries
- Facility electric bills, and contracts if any with competitive generation suppliers
- Permitting progress underway (FAA filings, etc.)

Project logistics including communications protocol and meeting scheduling will be addressed at the kick-off meeting.

3.4 Technical Assessment

3.4.1 <u>Wind Resource and Production Estimates</u>

For the Task 1 analysis we will use publicly available wind data to estimate the wind resources and ultimately the production of various wind turbine configurations. We will use estimates of shear

(i.e., wind speed change with height above ground level) and distribution of wind resources to make calculate expected production.

3.4.1.1 Computer generated wind resource modeling

For the Task 2 analysis, we will analyze the suitability of the of chosen site wind resources using WindFarm software to incorporate the interaction of measured wind resources, topography, buildings / structures, and shadowing and turbulence that will occur from other wind turbines in a small wind farm configuration. Taking into account wind turbine availability, wake, electrical line, and other losses we will estimate the annual production for different turbine configurations, including various tower heights. Once wind resources are projected, estimating production for multiple turbine configurations is a turn-the-crank process.

3.4.1.2 Install Meteorological Tower and Analyze Data (if and when needed)

Optionally for Task 2, we will install one or more meteorological towers to collect onsite wind data to confirm modeled wind resources. Data will be gathered for at least three months before initial estimates are performed. We will use industry standard measure, correlate and predict methodology to estimate the local wind resources. Results will be incorporated into the WindFarm modeling described just above to provide more certain estimates of wind resources and turbine production.

The cost of such an installation will be dependent upon the availability of loaner wind towers from the Rhode Island Renewable Energy Fund / Roger Williams and /or the availability to co-locate anemometry equipment on communication or other towers.

3.4.2 Foundation Requirements & Access and Constructability Assessment

For Task 1 local geologic maps and any site specific geological studies or knowledge of site use history will be incorporated into feasibility of foundation construction. For example, fill or peat are media not conducive to wind turbine foundation moment and load requirements.

If necessary, a physical geotechnical engineering study (e.g., with drilling) will be deferred to Task 2 analysis, and it can be established whether or not a specialized wind turbine foundation will be required during the design and construction phases of the project, and what the additional costs would be.

The feasibility study will fully assess turbine transportation issues. Involvement of an expert civil engineer Peter Glick from SMMA in the project will provide an additional level of security from which to base design and construction efforts.

We will be assessing the transport issues in regards to turbine, tower, and crane size and weight. This will include loading, offloading, and transport to site by road.

For Task 1 Analysis, transport costs will be evaluated on a conceptual level only for the basis of comparison between alternative routes.

Task 2 Analysis will include preliminary site design in AutoCAD. Items of importance include dock accessibility, crane availability, truck turning radii, road slope, road width, road height clearance (e.g., overhead utility lines). It would not be surprising if infrastructure constraints resulted in the transport of a larger turbine as either technically impractical or too costly to be worthwhile. These issues will be assessed through review of road maps, inquires to local riggers, and a visual reconnaissance of the most likely routes. Site turning radii and access road characteristics also will be considered in the analysis. There should be no significant staging and erection issues beyond transport constraints since there is considerable open space for construction on either site.

3.4.3 Electrical Connection and Integration Assessment

The electrical portion of the Task 1, Pre-Feasibility Study will focus on analyzing the interconnection requirements of the chosen sites. For each site a site visit will be used to identify the available interconnection points on the utility system or existing municipal facilities at each site. These available interconnection points will be identified and ranked based on their ability to satisfy local utility requirements in the most cost effective manner, with a minimal construction impact to the surroundings if a wind turbine is to be erected on that site.

The electrical issues at each site will be discussed in Task 1 related to interconnection, relative cost impacts, ease of construction, utility requirements, additional upgrades required, metering, and protection along with other relevant factors. All of these factors are dependent on the size of a proposed wind turbine, as a smaller turbine may easily be able to be connected into the existing electrical equipment at a building, facility, etc. A larger wind turbine most times requires its own independent connection to the utility system as to not overload existing equipment and to satisfy the local utility requirements for protection of the adjacent utility grid from the wind turbine during contingencies.

For Task 2 analysis Power Engineers will:

- Develop conceptual electrical schematics showing the electrical interconnection alternatives of the wind turbine generators at the sites for two options: (i) to meet the electrical needs of the sites; and, (ii) to obtain the maximum generation output from wind turbine generators installed at the sites.
- Prepare planning accuracy cost estimates for the electrical interconnection facilities associated with the project options that are identified.
- Prepare a letter report to summarize the findings.

3.4.4 Turbine Siting Considerations

Beyond factors considered above, for Task 1 we will consider rules of thumb for distance of turbines from buildings, residential properties, schools, airports, etc on what turbines would be appropriate for a particular site. For Task 2 we will firmly establish a specific location for each site still in consideration.

3.4.5 Turbine Screening

For Tasks 1 & 2, the turbine screening is an assessment of Technical, Environmental, Permitting, turbine availability, and economic factors. For each Task we will screen turbines for individual sites, providing rationale on screening criteria. EBEC will provide preference weights to these criteria.

For Task 1 we expect to perform preliminary screening of many sites (e.g., more than a dozen). We will perform preliminary screening and conduct the full Task 1 analysis described herein on up to six sites for the proposed budget.

3.5 Permitting and FAA Requirements

Boreal has performed regulatory analysis and permitting of multiple utility-scale wind turbine projects. The bulk of the regulatory constraints reside at the local level however, some State and Federal environmental regulations are applicable and additional permits are required. Boreal has successfully permitted three utility scale turbine projects Other Boreal projects are at various stages in permitting processes. Boreal will oversee all the permitting and regulatory requirements associated with the proposed project including the following specific areas:

Local

- Zoning by-laws
- Special permitting authority

State

- Rhode Island DEM and U.S. EPA Stormwater Control program
- Rhode Island DEM Wetlands
- Rhode Island DOT
- Rhode Island Historical Society
- Rhode Island Coastal Resources Management Council
- Integrate utility interconnection requirements

Federal

- Federal Aviation Administration – FAA lighting is required if a project is above 200 ft height limit. A Determination of No Hazard to Air Navigation must be obtained from the FAA in these instances.
- Federal Energy Regulatory Commission
- U.S. Department of the Interior (Endangered Species Act)
- ISO – New England

FAA requirements will be described in the Task 1 analysis. Submission of a FAA 7460-1 form(s) will be deferred until Task 2.

Requesting federal and Rhode Island DEM review of potential impacts of a project on critical habitat and species of special concern will be deferred to Task 2. For Task 1 EBEC in-kind volunteers can review and provide knowledge of habitat and species concerns for all sites under consideration.

3.5.1 Environmental Impacts

Permitting requirements and likely impacts of a wind turbine will be addressed in detail in the Task 1 analysis. Other requested items (below) will be touched upon in Task 1, but in-depth analysis will be provided as part of Task 2. This includes

- Avian Risk

- Noise Modeling
- View Shed Impact (Photo Simulations)
- Strobing & Shadowing

3.5.1.1 Avian Risk

For Task 2, to address impact and risk to avian resources, the feasibility study will include surveys conducted to determine which avifauna species are resident at the site and which species pass through the site as migrants. These efforts will entail a literature search and on-site surveys. The literature search will focus on a review of studies conducted to date by federal, state, and academic bodies. The goal of the literature search is to obtain existing information on regional bird distribution in East Bay communities and the greater Narragansett Bay region inclusive of the site. A literature search also will be conducted to identify success stories that have avoided, minimized, or otherwise mitigated potential impacts to avifauna. This would include, for instance, an identification of desirable rotor speeds, lighting arrays (e.g., positions, light intensity, patterns, and color), etc.

Optionally for Task 2 on site surveys will be conducted in order to close data gaps and provide site-specific information. Surveys would be conducted during one or both breeding seasons and during northbound (spring) and southbound (autumn) migratory movements. Breeding season surveys will determine which species are resident at the site. This information will be used to ascertain which breeding resident species could potentially be disturbed via site construction and subsequent operation of the wind turbine. It will address impacts associated with habitat loss and the imposition of a structure within the flight zones of supra-canopy and open space foragers and those species which perform aerial courtship displays.

Studies conducted during the migration season will provide site-specific data on which species likely pass through the site during migration and therefore have potential to come into contact with the structure and its appurtenances. A combination of transect surveys and point counts are typically used to generate this data. Surveys are typically conducted during the daytime (morning) and during night (a few hours after dusk and a few hours before daylight) under appropriate weather conditions (no to low wind velocity and clear skies). To address the further potential of impact to migrants, an evaluation of the site will be conducted to identify the location of the site in relation to landscape level physiographic features typically followed by birds during migration.

3.5.1.2 Shadowing / Strobe Assessment

For Task 2, Boreal will conduct a shadowing/strobe assessment calculate the shadow distance on the ground from a wind turbine at the turbine's certain coordinates for every hour of three days of the year – winter solstice, summer solstice, and equinox. Using proposed turbine coordinates and dimensions, sunrise, sunset, and hourly solar azimuth and altitude, animations are composed in Google SketchUp. Results are provided in the form of radial graphs and 3-dimensional models of the site with turbine and shadow – from which 2-D snapshots can be derived.

Optionally for the Task 2 analysis Saratoga will use the WindPro Shadow Module. Saratoga will map the geographic area falling within the shadow zone of the proposed wind turbine rotor. This will exhibit the maximum hours per year of potential flicker based on existing topography (to be obtained through USGS) and the precise solar conditions of the project area (publicly assessable information will be obtained from the nearest major airport). The proposed work product will include an isoline map will be prepared illustrating the maximum cumulative shadow area of the proposed wind turbine. This map could be used to identify the geographic area where additional investigation may be required (additional investigation is not part of this proposal).

This analysis will be conducted using sunshine "probabilities" from meteorological data compiled at the nearest major airport, and operational time/rotor orientation from data supplied by Boreal.

Note; 1) this analysis will not include potential screening caused by vegetation or structures; 2) individual locations (or receptors) will not be analyzed; and 3) unless discussed in advance of developing the isoline map, the area within 10 times the diameter of the rotor will be analyzed.

3.5.1.3 Preliminary Noise Study

World class wind energy planning software WindFarm incorporates topographic, building, and surface roughness data along with turbine noise and dimension data to produce sound impact images and tables in the immediate vicinity of a turbine installation. Locations for sound impact measurements can be selected at any location within the turbine vicinity to produce highly accurate estimates of sound impact to nearby residences, businesses, and public spaces. Using these measurements and other sound dynamics laws, the overall audible impact of a turbine installation can be effectively estimated.

Optionally for Task 2, a noise analysis will be conducted to determine the potential impact of the proposed wind turbine to be located at selected locations. The noise analysis will consist of a noise monitoring program and a noise site assessment. The noise monitoring program will be conducted to determine existing ambient background noise levels in the vicinity of the proposed

wind turbine site. Monitoring locations will be selected to represent sensitive receptors in close proximity to the project site. Ambient background noise levels will be collected for different times of the day as well as at varying wind speeds. Monitoring results will be correlated with wind speed to ensure the most appropriate ambient background level is selected for any given wind turbine operating condition.

The noise site assessment will consist of evaluating future noise generated by the proposed wind turbine. A sophisticated computer model will be used to calculate wind turbine noise based on manufacturer's specifications data at various wind speeds. The computer model will also utilize sound propagation factors in accordance with ISO standard guidelines for the calculation of the absorption of sound by the atmosphere. Calculations will be completed for wind turbine cut-in speed conditions as well as full operation wind speed conditions. Cut-in wind speed conditions will most likely correspond to potentially lower ambient background levels while full operation wind speed conditions correspond to the maximum noise levels generated by the wind turbine. The computer model will generate noise contours which will represent the predicted wind turbine noise levels in the area surrounding the site. Predicted noise levels will also be estimated at select discrete sensitive receptor locations. The modeled results will be compared to ambient background levels to determine the onset of any potential human annoyance conditions. In addition, modeled noise levels will also be compared to local, state and international guidelines developed to limit property line noise generated by the operation of a wind turbine.

3.5.1.4 Photo Simulations

Custom photosimulations will be deferred to the Task 2 analysis.

For the Task 2 analysis, Saratoga Associates in conjunction with Boreal will conduct the visualization study. Four photosimulations of the wind turbine from agreed upon locations. The best locations are ones that the general public is very familiar with. The base field photos will consist of digital photographs from the four viewpoints looking towards the project site, GPS coordinates (viewpoint and turbine locations), viewing angle to the project site (using a digital compass), elevation data, and general site notes will be taken. All of the photographs will be taken with \ camera using a 50mm lens setting to replicate the human field of vision. The 3D model used to create the renderings generally are developed using AutoCAD and AutoCAD Viz. All GPS coordinates relating to the turbine and viewpoint locations will be first located in MapSource software. The coordinates will then be exported as a DXF file and overlaid on the USGS map in AutoCAD. Select roadways, buildings and contours, as well as the turbine location, existing towers, and all viewpoint locations will be traced, thus creating a base map.

3.5.2 Economic Assessment

We will address every item in detail, as all need to be incorporated to estimate financial pay-back. The primary difference between the Task 1 and the Task 2 analysis is there will be more certainty on the model inputs for the Task 2 modeling (e.g., more certain wind resources, cost estimates).

3.5.2.1 Project Cost Estimates

For Task 1 we will use cost estimates we have accumulated from public projects, responses to request from proposals we have managed, and research and analysis. We currently have cost estimates for typical New England sites for turbine ranges of 50 kW to 2500 kW, including equipment, construction, O&M, insurance, and financing costs. We will make adjustments for costs for sites where we find are particularly difficult (e.g., site access, lack of sufficient electrical distribution) to build on. Financing costs and terms will be estimated upon consultation with EBEC technical subcommittee.

For Task 2 we will sharpen cost estimate by including specific costs for specific wind turbines at a specific site, including interconnection costs, civil construction costs, additional transportation other costs, etc. as applicable. We will update other costs as applicable (e.g., acquire latest indicative pricing from manufacturers).

For Task 2, Boreal will research a handful of financing options, as we have done for numerous clients. For example, we track long-term REC prices, have been on teams submitting Clean Renewable Energy Bond (CREB) applications, researched the possibility of additional revenue by co-locating communication equipment on wind turbine towers. Very importantly, there are many barriers and opportunities for Town / regional ownership in Rhode Island. We plan to build on the work already completed by RIWinds study, NREL, and others to assess the many ownership issues and financing options. We also will interview and discuss with local industry contacts their views on the potential of third-party ownership models in general, and for the Task 2 sites specifically. We will provide an assessment of the most promising financing scenarios as part of the Task 2, and incorporate into scenario of project financial payback.

3.5.2.2 Project Revenue Estimates

For Task 1 we will make explicit assumptions of the value of kWhs used onsite, exported to the grid and reimbursed according to net metering, and exported to the grid and reimbursed according to wholesale rates based on historical averages. State and federal grants and incentive programs will be considered.

For Task 2, we will update research from Task 1.

3.5.2.3 Project Ownership

For Task 1 we will consider a simple municipal ownership model and a single third-party ownership with a fixed cost power purchase agreement with a single municipal or collaborative entity.

For Task 2, we will work with the EBEC to provide more detailed scenarios based on the constraints and desires of the EBEC communities.

3.5.2.4 Project Ownership / Estimated Project Revenue & Cash Flows / Calculations of Key Figures of Merit

We will run the pro-forma analyses integrating project costs (installation and ongoing), financing costs, wind production, onsite electrical consumption, avoided costs and revenue to provide paybacks in terms of internal rate of return, net present value, simple payback (e.g., years to cash-flow positive) benefit to cost ratio. Annual and Cumulative cash flow will be presented in both a graphical and tabular format.

Boreal has built a sophisticated pro forma tool that uses, as inputs, hourly electricity consumption, hourly renewable energy project production based on long-term and historic weather conditions, applicable retail and wholesale electricity rates, project costs, tax and interest rates. These inputs are arranged on an hourly basis (8760 hours in a year) and modeled over the course of a prototypical year. This provides a very accurate estimate of the proportion of generation that typically will be used on-site versus exported to the distribution grid (and the relatively high value associated with on-site usage versus the relatively low value exported on an hourly basis). The tool provides financial returns in terms simple payback, net present value, internal rate of return, and years to breakeven, on both a pre and post tax basis. Results are presented in terms of host ownership, and third party ownership. The model is constructed to easily provide sensitivity analysis for any variable of interest.

After providing base case analyses for various turbine configurations and ownership options, we will run sensitivity analyses on a variety of factors including wind resources, cost of avoided generation, renewable energy certificate and locational marginal price revenue, construction costs, ongoing costs, interest and inflation rates. We will incorporate these findings, including detailed cash flow analysis, charts, tables and all assumption into a comprehensive into the Task 1 and Task 2 findings.

3.6 Deliverables

We will deliver the following items for both tasks:

- Biweekly Progress Reports
- Draft Report – Presented for stakeholder review and comment
- Final Report including an electronic copy

3.7 Schedule

As requested we will start the project in September 2009. We envision no barriers to providing a draft report for the Task 1 analysis in a six weeks time (see below), submittal of final report will be dependent on reaction and input from the EBEC and other stakeholders. The Task 2 analysis and draft report, building on the Task 1 efforts again can be accomplished relatively quickly, but will be dependent final scope chosen.

Task 1 Schedule

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Kickoff Meeting						
Gather Information						
Site Visits						
Research and Analysis						
Draft Report						
Presentation of Findings						
Final Report						

4 Cost Proposal & Additional Items

As requested in the RFP, a cost proposal for Task 1 Pre-Feasibility Study is provided in a separate sealed envelope.

We currently have $1,000,000 professional liability insurance coverage, and if awarded job would bind coverage to the EBEC providing listing of limits and notable policy exclusions.

We will produce the proposed scope in the proposed time frame.

Appendix A– Resumes of Key Personnel

Tom Michelman - Boreal Renewable Energy Development

Expertise

- Over 15 years energy industry experience
- In-depth knowledge of retail and wholesale electric, and renewable energy certificate markets
- Exceptional analytic, spreadsheet modeling and quantitative skills
- Winning track record of proposal and grant writing
- Manager of dozens of energy industry consulting projects

On-Site Renewable Generation:

Managed dozens of wind turbine projects as Principal and co-founder of Boreal Renewable Energy Development: From fatal flaw analysis through design and construction for commercial, industrial, municipal and institutional clients.

Analysis includes: economic payback, wind resource modeling, project costs estimates, revenue generation, retail, wholesale, and REC market structure.

Created cutting edge pro-forma financial analysis spreadsheet that simultaneously takes into account, hourly electricity consumption, production based, applicable retail and wholesale electricity rates, project costs, tax and interest rates to provide a realistic and defensible return on investment. The model is constructed to easily provide sensitivity analysis for any variable of interest.

As part of team for Department of Energy, characterized current status and quantified market potential of market potential, availability and economics of mid-sized wind turbines.

As part of team, researched, assessed, and provided new community-based renewable energy business models for We Energies. .

As part of team, analyzed, and crafted alternatives for long-term procurement of renewable energy for State of Maryland accounts.

Renewable energy project sales lead generator, proposal writer, contract negotiator and deal closer.

Regulatory:

Lead participant in crafting a consensus for Massachusetts' avant-garde virtual "net metering" legislation which was incorporated into the Green Communities Act signed into law July 2008.

Provided expert testimony on proposed NSTAR distributed generation (DG) standby rates (Massachusetts DTE Docket 03-121) and their effect on the economics of DG wind turbine installations for Conservation Law Foundation and Solar Energy Business Association of New England. DTE accepted a settlement to which NSTAR as a signatory exempts wind turbine and other renewable installations from the standby rates.

Retail Energy:

Senior consultant specializing in retail energy, price responsive load, demand side management, and renewable energy. Responsibilities included managing millions of dollars of consulting projects and key developer of retail energy consulting practice. Leveraged multi-client subscription studies as springboard to over $3 million of new consulting work. Considered industry expert in retail energy field, presenting at dozens of conferences and meetings, and authoring dozens of articles and reports. Originator, managing editor, and contributor of KEMA-XENERGY's Retail Energy Foresight. Bimonthly periodical publishes the only comprehensive updates on U.S. retail energy switching.

Education:

M.S., Resource Economics, University of Rhode Island, 1992 (Thesis, *Contingent Valuation and the Bounded Rationality Perspective* winner of award of merit at AAAE and NAREA conferences.)

B.A., Mathematical Methods in the Social Sciences/Political Science, Northwestern University, 1983. Additionally, master's level continuing education classes in wind power, finance, statistics, and management.

Other:

Board Member of the Northeast Energy Commerce Association. 2005-2009 (www.necanews.org), leader in fashioning very successful annual renewable energy conferences.

President – Friends of the Bruce Freeman Rail Trail 2006-2009, Secretary 2004-2006 (www.brucefreemanrailtrail.org). Instrumental in growing the organization into one of the, if not the largest and most potent rail trail advocacy group in Massachusetts.

Selected Energy Related Papers / Publications / Presentations:

Local Rules Rule The Economics Of Community-Scale Wind Projects . Presented at American Wind Energy Association Annual Conference. June 2006, Pittsburgh, PA.

As Important as Wind: The Structure of Utility Tariffs on Behind-the-Meter Community Scale Wind Projects. Presented at American Wind Energy Association Annual Conference. May 2005, Denver, CO.

The Wild, Wild East: REC Price and Supply / Demand Dynamics in ISO-NE, NYISO, and PJM. Presented at American Wind Energy Association Annual Conference. May 2005, Denver, CO.

Switching Trends column in Retail Energy Foresight, and author / contributor to numerous additional articles and analyses. 2000 to 2004.

Robert A. Shatten - Boreal Renewable Energy Development

Expertise

- Over 20 years of professional environmental experience
- Expertise in all aspects of renewable energy and power plant development including project management, Clean Air Act, Water/Wetland regulations, RCRA, and CERCLA
- Multidisciplinary experience in power plant siting, feasibility, environmental assessments/impact studies and permitting
- Ongoing multiple renewable energy developments throughout the U.S.

On-site Renewable Generation:

Partner in Boreal Renewable Energy Development – Please refer to the firm's qualifications

Power Plant Development:

Responsible for all aspects of the planning and siting of a state-of-the-art, $300 million natural gas combined cycle power plant in Londonderry, New Hampshire. Specifically managed Federal, State and local regulatory permitting process for the siting, design and operation of the facility. Achieved unanimous regulatory approval from the New Hampshire Site Evaluation Committee. Led facility design team to implement the requirements of the Londonderry Eco-Industrial park including land use considerations, conservation, recycling, energy efficiency and "green" architecture. Effort led to $3.5 million in cost savings.

Led environmental due diligence for power plant acquisitions in New England, New Jersey and Pennsylvania. Prepared environmental permitting plan for the development of a combined cycle power plant in Cartagena, Spain. Led brownfield power plant siting development.

Other Siting/Development Experience:

Directed Federal, State and local regulatory permitting and compliance for an innovative environmental recycling technology from a patented concept through project siting, research and development to full-scale operation of multiple commercial facilities.

Obtained Federal and/or State authorizations for four separate facilities. Approvals obtained under the following regulations: Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act (RCRA), Toxic Substances Control Act (TSCA), and the Atomic Energy Act.

Remedial Investigation/Feasibility Study:

While Project Manager at US EPA, managed the investigation and cleanup activities at three toxic waste sites in Massachusetts. Responsibilities: directed remedial investigation and feasibility study efforts, including: supervision of financial expenditures for government contractors; construction oversight; technical assistance to attorneys; intergovernmental coordination; participation in and organized public meetings; and, interaction with print and TV media. Developed conceptual cleanup plans and remedial cost estimates for waste sites.

Environmental Due Diligence:

Managed and performed environmental due diligence assessments and audits throughout Europe, Canada and the U.S. for multiple clients. Assessments included facility inspections, review of environmental compliance history and management systems, operations, waste disposal practices, liability identification and remedial cost estimation.

Performed environmental audits at U.S. Department of Energy facilities. Examined inactive waste sites for regulatory compliance and best management practices.

Performed environmental audits/assessments of lighting manufacturing facilities in Hungary. Functional area experience included solid and hazardous waste management, soil and groundwater contamination, underground storage tanks and water pollution control.

Education:

M.S., Civil Engineering, Stanford University, 1988

B.S., Environmental Engineering, Northwestern University, 1983

Selected energy related papers / Publications / Presentations:

1995-2006 Guest Lecturer – Northwestern University Kellogg School of Business; Boston University School of Business; University of Michigan Business School – Molten Metal Technology Case Study

U.S. Patent 6,668,562 – Issued December 30, 2003; Inventors: Shatten, Carrier, Jackson – "A System and Method for Cryogenic Cooling Using Liquefied Natural Gas";

Fall 2004 – Teaching Assistant, Mechanical Engineering Processes; Massachusetts Institute of Technology

H. Alex Weck

Analyst / Boreal Renewable Energy Development

Expertise:

Background in Applied Mathematics, Mathematical Modeling, and Environmental Studies

Renewable Generation:

Employee of Boreal Renewable Energy Development – January 2007 to present.

2+ years experience with all aspects of wind energy industry. Specific experience with economic pro forma design and analysis; regulatory analysis; project management; wind data collection, analysis, and modeling; grant writing; editing; meteorological tower, boom tower, and datalogger assembly and installation; rate analysis; cost work; photosimulation management; and public relations.

Collects and maintains extensive database of turbine and electrical interconnection capital costs for a broad range of turbine sizes.

GIS software trained and operator.

OSHA construction certified.

Education:

B.A., Mathematics/Environmental Studies, Lawrence University, 2006

Selected Papers / Presentations:

Modeling the Transition from Conventional to Organic Agriculture – Thesis for Senior Seminar in Environmental Modeling

Public Policy of Process Surrounding Light Rail Projects in Three American Cities – Recipient of the Harrison Memorial Grant for Independent Research in the Humanities and Social Sciences

DAVID J. COLOMBO, P.E.

Rensselaer Polytechnic Institute:	M.Eng. in Electric Power Engineering
Worcester Polytechnic Institute:	B.S. in Electrical Engineering
Licensed Professional Engineer:	Massachusetts, Vermont, Maine, Maryland, Rhode Island, Connecticut, New Hampshire NCEES (National PE Registration)
Professional Affiliations:	IEEE, Power Engineering Society Eta Kappa Nu Engineering Honor Society Northeast Public Power Association (NEPPA)

Mr. Colombo is a principal engineer specializing in the design and operation of high and low voltage electrical distribution systems. He has extensive experience is utility and industrial/commercial distribution planning, design, and operations, including substation, underground circuits, overhead circuits, URD, and network systems.

Mr. Colombo has been heavily involved with the planning of power systems projects through the use of computer modeling. These projects have ranged from low voltage industrial applications, through distribution lines and large-scale transmission systems up to and including 345 kV. Mr. Colombo has been responsible for analytical and computerized load flow, short circuit, power factor correction, line loss, voltage drop, and protective relaying studies for a number of large and small facilities and utilities.

His engineering projects have included distribution substation modifications, circuit extensions, circuit replacements, recloser and switch installations, transformer replacements, relay work, and contingency planning. Mr. Colombo has prepared equipment and installation specifications for new and replacement high and low voltage distribution equipment and supervisory control (SCADA) systems.

Mr. Colombo has been involved with, and supervised the engineering, cost estimating, specifications, purchasing, budgets, and coordination for large facilities projects, including the operating procedures, switching schemes, and live line working guideline for low voltage commercial and high voltage distribution applications.

Mr. Colombo has been part of several project teams associated with the design, installation, and interconnection of new generation and co-generation projects. These projects have included emergency generator installations as small as 250 kW up to combined cycle plant and transmission line interconnection projects as large as 250 MW.

Mr. Colombo is a Registered Professional Engineer in Massachusetts, Vermont, Maine and Maryland. Mr. Colombo is a member of the Institute of Electrical and Electronics Engineers, and the Boston Chapter of the Power Engineering Society and has served on the PES Education Committee. Mr. Colombo is also a recognized member of the electrical engineering honor society Eta Kappa Nu.

Over the past 15 years, Mr. Colombo has been part and sole owner of two engineering consulting firms and has also been employed as an Engineering & Operations Superintendent for an electric utility in Massachusetts.

DAVID J. COLOMBO, P.E.

Employment History

Power Engineers, LLC
Shrewsbury, MA

Principal / Owner
Owner of small engineering firm providing consulting, planning and design engineering to utilities, municipalities, colleges and large facilities

Primary business focus is on utility consulting and planning for new increments of system capacity, from conceptual design, budgeting, detailed design and construction.

Consulting Engineers Group, Inc.
Hopedale, MA

Principal Engineer / Owner
Part owner of firm specializing in electric engineering and design of utility power systems. Work included design of medium and low voltage electrical facilities for clients including utilities, colleges and industrial/commercial facilities.

Prepared detailed planning studies for utilities, municipalities and colleges, used for long range planning to retire old equipment and make recommendations to add system capacity in anticipation of future load growth.

Primary focus on underground electrical systems, including the preparation of plans, specifications, and cost estimates for new medium voltage power cable extension projects.

Wellesley Municipal Light Plant
Wellesley, MA

Engineering & Operations Superintendent
Responsible for engineering functions for distribution utility serving 30,000 people.

Work included design of new electrical services, low and medium voltage for new residential and commercial customers.

Supervised substation maintenance program for six (6) existing medium voltage (13.8kV) electric distribution and customer substations.

DAVID J. COLOMBO, P.E.

R.W. Beck, Inc.
Framingham, MA

Electrical Engineer
Responsible for electrical engineering design and assigned projects, primarily in the areas of high voltage substation and medium voltage utility distribution systems.

Work included preparing contract plans and specifications for municipal utility clients for substation interconnection projects.

General Dynamics
Groton, CT

Electrical Engineer
Responsible for electrical engineering and design functions associated with development of new shipboard electric power and propulsion systems.

List of Current Wind Turbine Projects

- Town of Princeton, Mount Wachusett Wind Farm – Design of interconnection of two (2) 1.5MW turbines. Work includes interconnection, protective relaying design, electrical site plans, technical specifications, contract preparation, review of bids for owner, and technical assistance during construction.

- Town of Templeton, Narragansett High School Wind Turbine – Engineering project manager for installation of one (1) 1.5MW turbine. Work includes design of all electrical components, interconnection, protection, metering, low & high voltage connections, etc. Project duties include site selection, geotechnical engineering, civil and structural engineering, etc.

- Forbes Park, Chelsea MA - Design of interconnection of one 600kW turbine. Work includes interconnection, protective relaying design, ground grid design, electrical site plans, technical specifications, utility negotiations, switchgear selection, review of bids for owner, and technical assistance during construction.

- Upper Cape Regional Technical School, Bourne MA – Feasibility study for interconnection and electrical conceptual design for one (1) 1.5MW turbine.

- Town of Paxton MA – Proposed installation of three (3) 2.5MW turbine wind farm on non-profit site. Acting as Town's electrical engineer and consultant to design interconnection of project, review electrical permitting, and system upgrades.

- Commonwealth, Division of Conservation & Recreation (DCR) – Feasibility study for renewable project installation on Boston Harbor Island, as part of utility infrastructure upgrade. Reviewed available technologies and recommended cost/benefits to client, prior to developing detailed design for chosen alternative and utility interconnection.

- Town of Chester MA – Assisting Town with conceptual planning and interconnection of one or two 1.5MW wind turbines. Acting as Town's electrical engineering consultant.

- Town of Ashburnham, MA – Review of private development wind farm, to be connected to Town's electrical distribution system. Developed scope and cost estimates for distribution system upgrades necessary to facilitate the project. Acting as Town's electrical engineering consultant.

DAVID J. COLOMBO, P.E.

- Holy Name Catholic High School, Worcester MA - Design of interconnection of one 600kW turbine. Work includes interconnection design, protective relaying design, ground grid design, electrical site plans, and technical specifications.

- Town of Hanover MA, Water Treatment Facility – Propose installation of a single 100kW wind turbine. Prepared preliminary utility interconnection diagrams and utility interconnection application, along with functional description, to begin the process prior to final design and construction.

- St. Mary's Abbey, Wrentham MA – Propose installation of a single 100kW wind turbine. Prepared preliminary utility interconnection diagrams and utility interconnection application, along with functional description, to begin the process prior to final design and construction.

- Country Garden, Hyannis MA –Propose installation of a single 100kW wind turbine. Prepared preliminary utility interconnection diagrams and utility interconnection application, along with functional description, to begin the process prior to final design and construction.

- City of Medford, McGlynn School, Medford MA – Propose installation of a single 100kW wind turbine. Prepared preliminary utility interconnection diagrams and utility interconnection application, along with functional description, to begin the process prior to final design and construction.

John Guariglia, RLA
Alliance Principal

Saratoga Associates

Education
State University of New York, College of Environmental Science & Forestry
Bachelor of Landscape Architecture

Monroe Community College
Associate in Science

Registration
New York

Professional Experience
John brings over ten years experience in the field of Landscape Architecture to Saratoga Associates. During his career he has worked on a variety of site development, planning and aesthetic projects throughout the Northeast.

Specifically, over the past seven years, John has become a recognized expert in conducting visual impact assessments utilizing standard methodologies including the New York State Department of Environmental Conservation's Program Policy "Assessing and Mitigating Visual Impacts." In addition to his many years of project management, John is skilled in a variety of software programs and has served as an expert witness.

Representative Project Experience

- Sodus Central School District, Sodus, NY
- Beech Ridge Wind Farm, Greenbrier, WV
- High Sheldon Wind Farm, Sheldon, NY
- Bliss Wind Farm, Eagle, NY
- Clinton/Ellenburg/Altona Wind Farms, Clinton County, NY
- Plum Island Offshore Wind Farm, Southold, NY
- Varian Semiconductor Wind Power, Gloucester, MA
- Windfarm Prattsburgh, Prattsburgh/Italy, NY
- Falmouth Technology Park Wind Power, Falmouth, MA
- Safe Harbor Offshore LNG Facility, Long Beach, NY
- CapeWind Wind Farm, Cape Cod, MA*
- Flat Rock, Lowville, NY*
- 345kV Electrical Transmission Line (Art VII Application), Rensselaer County, NY*
- Neptune Regional Transmission System (AC/DC Converter Station – Art VII Application), Long Island, NY*
- Trigen Power Plant Expansion, Long Island, NY*
- Empire Newsprint Recycling and Power Plant (Art X Application), Rensselaer, NY*
- Empire Newsprint Recycling and Power Plant, Kingston, NY*
- Conectiv Power Plant, Bordentown, NJ*
- Con-Ed Repowering, Manhattan, NY*
- Syracuse Area Industrial Waste Cell (Landfill), Syracuse, NY*
- Chaffe Landfill, Chaffe, NY*

**Prior to Association with Saratoga Associates.*