8-31-2009

ASA Proposal: Evaluation of the Feasibility of Erecting Regional Wind Energy System within the East Bay of RI, for East Bay Energy Consortium, Bristol, Rhode Island

Applied Science Associates, Inc

asa PROPOSAL

science. services. solutions.

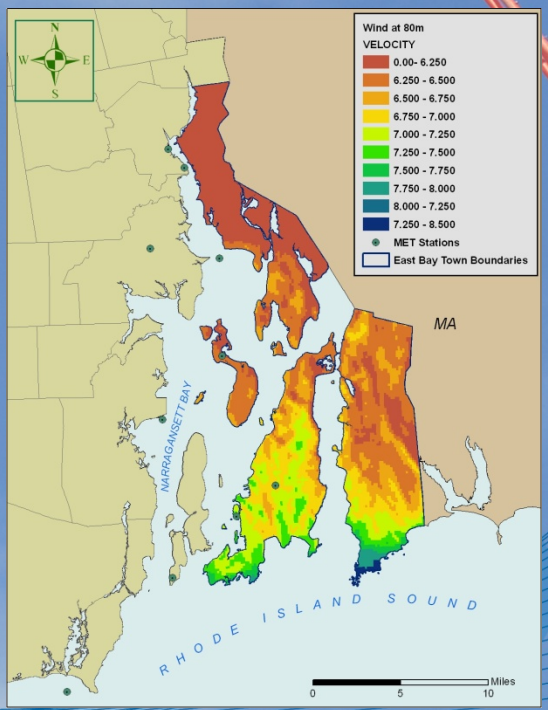
Evaluation of the Feasibility of Erecting a Regional Wind Energy System within the East Bay of RI

for

East Bay Energy Consortium

Bristol, Rhode Island

August 31, 2009



asa
Applied Science Associates, Inc.

55 Village Square Drive
South Kingstown, RI 02879 USA
+1 401 789-6224
asa@asascience.com

Proposal for Evaluation of the Feasibility of Erecting a Regional Wind Energy System within the East Bay of RI

Proposal prepared for

East Bay Energy Consortium

TABLE OF CONTENTS

GENERAL CONTACT INFORMATION

ASA | Applied Science Associates, Inc.
55 Village Square Drive
South Kingstown, RI 02879 USA
phone: +1 401 789-6224
fax: +1 401 789-1932
asa@asascience.com
www.asascience.com

Contracting Point of Contact:
Linda Nolan-Gagne
+1 401 792-4709
lnolan@asascience.com

Technical Point of Contact:
Daniel Mendelsohn
+1 401 792-4706
dmendelsohn@asascience.com

General Office Point of Contact:
Jacqueline Daly
+1 401 789-6224
jdaly@asascience.com

Marketing & Communications:
Lee Dooley
+1 401 789-6224
ldooley@asascience.com

EXECUTIVE SUMMARY

In response to the East Bay Energy Consortium's (EBEC) request for an Evaluation of the Feasibility of Erecting a Regional Wind Energy System within the East Bay of RI, Applied Science Associates, Inc. (ASA, the Consultant, or the Team) has assembled an exceptional team who are experts in each of the technical areas required for this project.

ASA | Applied Science Associates, Inc. is a global science and technology solutions company. Through consulting, environmental modeling, and application development, ASA helps a diverse range of clients in government, industry, and academia investigate their issues of concern and obtain functional answers. Based in Rhode Island (South County) since 1979, ASA has become one of the leading specialized environmental consulting firms in the world. Wind resource analysis, spatial planning and environmental engineering specialties are areas that ASA brings to the table for the EBEC's wind power siting and feasibility study. We are currently involved in the development of a number of wind projects globally and several currently in Rhode Island, Massachusetts, Connecticut and other northeastern states.

To accomplish the objectives of the proposed project, ASA sought out and teamed with the most qualified firms and individuals in the country as described below. ASA has also selected Mr. Daniel Mendelsohn to manage this project. Daniel has been involved in the development of renewable and conventional power projects for over 25 years and is actively involved in the development of wind projects in several New England states. In addition to leading the RIWINDS project for the Governor's Office of Energy Resources, he has successfully led multi-organizational teams such as this for other strategically important projects and has worked with all of the organizations and individuals on our Project Team. This is the project team that performed the RIWINDS study for the state.

- Loria Emerging Energy Consulting, LLC of Framingham, MA specializes in developing renewable energy and distributed generation projects. With over 25 years of power plant development experience, Mr. Loria has been involved in the assessment and development of many wind projects as well as solar and ocean energy projects. In addition, Mr. Loria is a principle in Minuteman Wind which is developing a 12 MW wind project in Western, MA.

- Richard C. Gross P.E., Inc. of Framingham, MA, an expert in electrical power system planning and design will join the ASA Team for all electrical work required of the project. Mr. Gross has 25 years of experience and specializes in conceptual design, interconnection and analysis of distributed energy projects and electrical power systems, including wind turbine systems. Mr. Gross's electrical expertise is essential for the site physical evaluations and technical feasibility analysis of this project.

- Sustainable Energy Advantage, LLC of Framingham, MA has helped private, public and non-profit organizations develop opportunities for clean, renewable sources of energy, including wind, solar, hydroelectric, biomass and geothermal power since 1998. SEA has direct and detailed experience developing and analyzing pro forma economic models of community-scale wind power projects.

- GZA GeoEnvironmental, Inc. Founded as Goldberg-Zoino & Associates, Inc., GZA GeoEnvironmental, Inc. (GZA) been providing its clients with a wide range of geotechnical engineering, environmental consulting, and remediation services since 1964. GZA employs over 550 engineers, scientists, and technical support staff in 24 offices in the U.S. GZA is consistently ranked in the top 100 for *Engineering News Record's* (*ENR's*) annual list of the top 200 environmental firms. GZA maintains a strong service base and expertise in our original specialty of geotechnical engineering.

- Maguire Group, Inc. is the largest engineering firm in Rhode Island. They are uniquely qualified to address the structural engineering issues required for this study. Maguire staff understands the myriad of technical issues in developing power projects. Maguire is one of two firms in the nation to have won the Presidential Award for Design Excellence twice.

- RI WindTech offers a deep understanding of the East Bay Energy Consortium and its constituent municipalities. Mr. Meyer has spent many years involved in various East Bay area planning projects and understands the needs of the various communities and what they have to offer.

- Pandion Systems, Inc. offers specialized services of bird and bat risk assessment to the wind energy sector that address ecological and environmental needs of society and industry. Pandion staff has prepared ecological risk

assessments for a wide range of environmental problems, including the effects of wind turbines on migrating raptors, songbirds and bats.

A summary of the qualifications for each organization is provided in Section 1 and a summary of relevant experience in Section 2 of this Qualification Statement. Resumes for Key Personnel are also contained in Section 1.

The proposed Project Approach was prepared by this experienced Project Team and is provided in Section 3. The scope of services is broken down into specific tasks which focus on the various aspects needed to fully evaluate the siting and feasibility of the potential wind turbine projects. The proposed study will follow the provided scope of work as presented in the request for proposals.

In order to fully address the viability of developing wind power projects in Washington County this study will evaluate the siting potential and feasibility of wind power generation from a multidisciplinary view point. The study will be performed in two basic parts, the site prospecting, screening and ranking evaluation and the follow on, detailed feasibility studies of selected potential sites. The detailed site evaluations are basically divided into three feasibility categories, including Technical; Environmental and Regulatory and Economic Feasibility. Additional categories will address existing data review, (meteorological and site) and development of wind power generation scenarios. The proposed evaluations will be performed following the structure of the EBEC Task list and are described in detail in the Project Approach.

In summary, the benefits of the proposed ASA Project Team (the Team) to the EBEC are clear.

1. *Rhode Island is home to ASA and many of our team members, some from the East Bay area - Our Team is motivated to make this project a success for Rhode island*

   Wind energy will be an important part of Rhode Island's energy future, but based on the experience of some other New England projects, may be a challenge to develop. The ASA team is comprised of well-established Rhode Island firms. ASA team members and staff, including LEEC, Maguire, GZA, Richard Gross, Inc., SEA, Pandion and RIWindTech are all currently involved in a number of wind and electrical distribution projects in Rhode Island. These firms are keenly aware of the issues in developing projects in Rhode Island and the East Bay area and have a vested interest in the future of Rhode Island.

2. Strong Qualifications in All Relevant Areas – ***the EBEC can be confident that all relevant issues will be properly and creatively addressed.*** ASA has put together a team of experts in each area with no "weak links:" Wind Turbine Siting, Environmental Permitting, Structural Engineering, Electrical Interconnections and Knowledge of Rhode Island T&D System, new Legislation and Financial Analysis of Wind Projects, direct knowledge of the East Bay communities involved in the Consortium and the East Bay landscape which has developed a creative and thorough Project Approach to achieve the EBEC's goals.

3. Experienced Team – ***the EBEC gets the efficiency of an experienced team. Our team has successfully worked together on numerous previous projects***. The ASA Team has worked very closely together on many wind energy projects:

   - The RIWINDS project, to assess the technical and economic feasibility of generating 15% of the state's aggregate electric demand from wind power,
   - The Portsmouth, RI Wind Feasibility Study and Development Project Clerk of the Works - now producing energy for the Town of Portsmouth.
   - The Town of Jamestown, RI Wind Feasibility Study
   - The Plymouth County Correctional Facility Wind Feasibility Study,
   - The Cape & Vineyard Electric Cooperative for a Wind Power Feasibility Study
   - The Renewable Energy Feasibility Study for Salt Cay in the Turks and Caicos Islands.
   - Peddocks Island, Boston Harbor Wind Feasibility Study
   - Spectacle Island, Boston Harbor Renewable Energy Feasibility Study
   - The ASA team has been selected by the North Kingstown School Department for a Wind Power Feasibility Study

   In addition, ASA has worked with both Maguire and GZA on many projects for over the past 25 years. Our Project Manager, Mr. Mendelsohn, in addition to Maguire and GZA, has worked with Mr. Loria, SEA, Richard Gross and Pandion Systems on numerous wind and energy related projects.

Portsmouth turned to Daniel Mendelsohn, ASA's energy resources group lead and wind energy development project manager, to lead the Town of Portsmouth wind feasibility study, siting analysis, and project support. The selected site at Portsmouth High School is close to the highest point on Aquidneck Island and the turbine has begun producing electricity for the high school, municipality, and excess power will be sold back to the grid.

1. Firm Description and Key Personnel

ASA is a global science and technology solutions company. Through consulting, environmental modeling, and application development, ASA helps a diverse range of clients in government, industry, and academia investigate their issues of concern and obtain functional answers.

ASA's solutions are based on applied science and advanced research. Our services and products, along with our staff's diverse technical backgrounds, are specialized in the analysis of marine, freshwater, air, and land resources; computer modeling of physical, chemical, and biological processes; geographic information systems (GIS); operational research; and data display.

Since 1979 and in over 100 countries, ASA has been providing services and custom solutions to sectors including energy, environment, construction, defense, security, emergency management, transportation, and shipping. Our clients include government agencies, major corporations, environmental and regulatory consulting firms, legal firms, and research and academic institutions.

ASA's technical staff members hold advanced degrees in ocean engineering, biological oceanography, physical oceanography, biology, chemistry, chemical engineering, mechanical engineering, environmental engineering, water resources engineering, hydraulic engineering, civil engineering, geology, geomorphology, computer science, mathematics, and business administration. This diverse combination of backgrounds offers a thorough range of capabilities for solutions to a wide variety of problems.

Headquartered in South Kingstown, Rhode Island, ASA also has offices in Seattle, Brazil, and Australia. ASA's website, www.asascience.com contains numerous scientific reports written by its staff and extensive information about its products and services.

Science. Our Expertise:	*Services. Our Consulting:*	*Solutions. Applied Science & Services:*
• Engineering • Fluid Dynamics • Oceanography • Meteorology • Water Quality • Sediment Transport • Chemistry • Biology • Computational Methods • Data Management • Computer Visualization • Operational Research • Distributed Systems	• Marine Response & Crisis Management • Coastal Hazards • Coastal Environmental Analysis • Ecological Impact Assessment • Defense & Security • GIS & Data Integration • Litigation Support & Expert Testimony • Renewable Energy, Climate & Sustainability • Offshore Energy	ASA Software, Systems & Utilities: OILMAP™ SARMAP™ CHEMMAP™ AIRMAP™ WQMAP™ HYDROMAP™ SIMAP™ MUDMAP™ ArcGIS® Tools In-House Tools: SSFATE™, SSDOSE™, Inundation Toolbox℠, BathyFusion Toolbox™, Renewable Energy Siting Toolbox℠ Custom GIS & Data Technology Solutions

Renewable Energy, Climate, & Sustainability Services

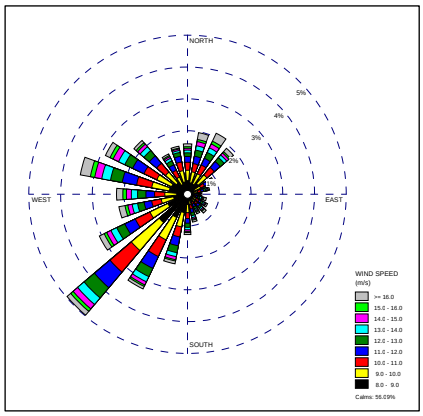
ASA provides scientific and engineering analyses for all aspects of renewable energy projects and climate change challenges both onshore and offshore around the world. At ASA we believe that the promise and potential of diverse and efficient energy systems coupled with advanced, intelligent technologies and alternative energy sources will provide our modern world with secure, optimized, and reliable power systems--while improving the environmental impact of energy production and consumption.

Areas of expertise include conceptual design, prospecting and siting studies, resource assessment, technical and economic feasibility evaluations, power production estimates, environmental impact assessments, and permitting assistance.

ASA's Renewable Energy, Climate & Sustainability services include:

- Energy Resource Assessment
- Renewable Energy Feasibility
- Siting analysis using ASA's Renewable Energy Siting Toolbox℠
- Spatial Planning/Marine Spatial Planning
- Economic Analysis
- Planning, Permitting, & Design
- Ecological Impact Assessment
- Wind Energy Analysis
- Solar PV & Thermal Analyses
- Wave & Tidal Energy Analyses
- Waste to Energy Analysis
- Geothermal Analysis
- Ocean Energy Analysis
- Meteorological Modeling & Data Assessment
- Visualizations
- Met Data Acquisition
- Meteorolgical Modeling
- Inundation and Flooding Analysis
- Due Diligence
- Owner's Engineer

Wind Energy Analysis



ASA has project experience working on wind energy feasibility and development projects and is currently working on a number of projects in the US, Bahamas, and Caribbean. ASA assesses wind resources and site feasibility using the following utilities and tools:

Wind Resource Assessment:

- *ArcView GIS Software*
  Manages wind data and organizes geographically

- *MESMOD Wind Model*
  A two dimensional diagnostic surface wind model predicts wind speeds and direction utilizing topographical data and various data inputs

- *WRF 3D Wind Model*
  A three dimensional wind model predicts wind speeds and direction utilizing topographical data and various data inputs

- *MATLAB Advanced Statistical Analysis*
  Provides computational and analytical power for the determination of wind resource statistics

Site Feasibility and Capacity:

- *Renewable Energy Siting Toolbox™*
  ASA's technology-based in-house assessment tool that employs a set of screening methods for siting of renewable energy facilities. Siting of both onshore (wind) and offshore renewable energy facilities (wind, wave, and current) is performed using two methods: 1) a spatial geographic information system (GIS) analysis approach since the underlying data, including the power potentially recoverable is spatially distributed; and 2) a new approach, based on indices of Technical Challenge and Ecological Service Value. This is a more sophisticated approach based on quantitative rankings of development sites which include project technical complexity and quantitative ecological value.

- *WindFarm*
  A powerful and flexible system for wind turbine project development for single and multiple turbine systems. Drawing on many years of expertise gained in aerodynamics and wind turbine system development, the program enables analysis, design, and optimization of proposed wind turbine systems.

- *WindCad Model*
  Analyzes wind inputs, tower heights, and turbine specifications to determine predicted energy outputs on an annual, monthly, and daily scale. WindCad also predicts average output power.

- *Cash Flow Model*
  Incorporates capital cost of wind turbine along with energy outputs from the turbine. The model factors in tax credits, state funding, loan specifics, interest rates, operation and maintenance, and other financial factors to determine the payback period, average monthly savings up to and past payback period, as well as the internal rate of return.

Ecological Impact Assessment:

- *Marine Impacts Assessment*
  - Marine biology/fisheries
  - Benthic characterization
  - Bird and mammal habitat & migration
  - Threatened & endangered species
  - Oil & chemical transport, fates, and effects
  - Effects of noise
  - Suspended sediment
  - Recovery time

- *Terrestrial Impacts Assessment*
  - Wetlands assessment

- Wildlife impacts (e.g., avian, bats)
- Threatened & endangered species
- Effects of noise
- Contaminated sediment

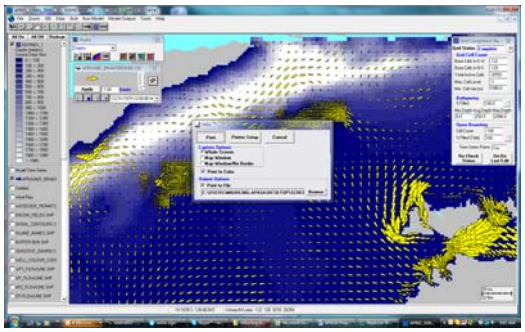
- *Regulatory Compliance*
  - EIS/EIA
  - NEPA
  - Magnuson-Stevens Fishery Conservation and Management Act (Sustainable Fisheries Act) – Essential Fish Habitat (EFH)
  - Marine Mammal Protection Act (MMPA)
  - Endangered Species Act
  - Clean Water Act (CWA)

- *Ecological Service Value Index (ESVI)℠*
  ESVI measures the relative value of a location to biological resources and human uses of natural resources. The ESVI is a composite measure based on ecological service values for individual natural resources, including:
  - Habitat type, quality and productivity
  - Presence and degree of usage by biological resources, such as listed (i.e., threatened and endangered) species of concern, birds, marine and terrestrial mammals, sea turtles, other reptiles, fish and shellfish, bats, butterflies, and other species of interest
  - Harvest value, such as to commercial and recreational fisheries
  - Usage for aquaculture
  - Recreational usage related to natural resources (e.g., wildlife viewing)

- *WILDMAP™*
  To quantify distributions and relative densities of specific species of concern, ASA applies its wildlife movement (migration and behavior) model (WILDMAP™) based on life history information, nesting/breeding and foraging locations, and available observational data for the species evaluated. The model is supported and ground-truthed by presence/absence, abundance, frequency and spatial observational data.

Offshore Site Feasibility and Capacity:

- *HYDROMAP™*
  Generates current and water level predictions for any coastal waters around the world. ASA's hydrodynamic model is used to calculate currents in the area of a proposed development site to provide hydrodynamic information for subsequent analyses. Hindcast/forecast current simulations are used to estimate potential impacts from pile installation and electrical cable or pipeline burial.

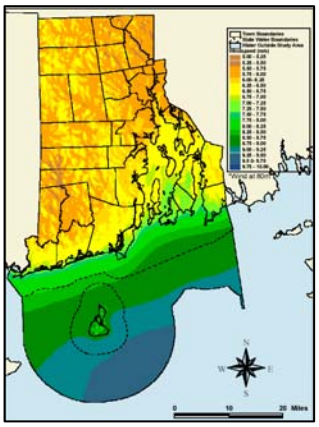


- *SSFATE™*
  is an integrated system combining a Geographic Information System (GIS) with a computational model that predicts the transport, dispersion, and settling of suspended sediments released to the water column as a result of dredging or cable / pipeline burial operations.

- *SSDOSE™*
  calculates exposures of various aquatic organisms to sediment plumes resulting from dredging or burial operations. SSDOSE uses the output from SSFATE that includes concentration of suspended

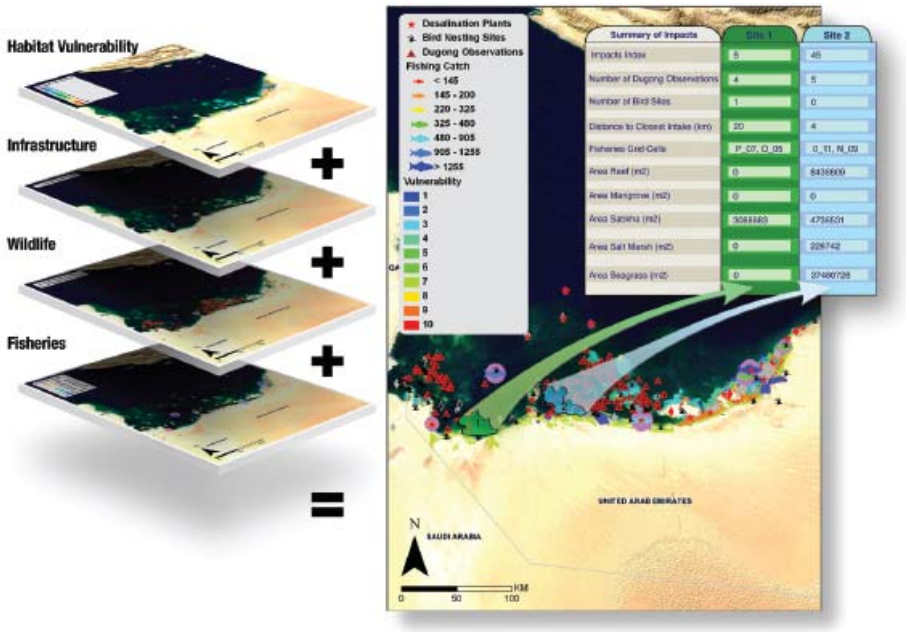
sediments and bottom deposition as a function of space and time to estimate the duration and concentration that affect various types of aquatice organisms.

ASA also provides other analysis services to both the offshore and onshore wind energy industry including:



- Environmental Assessments
- Coastal Engineering
- Field Monitoring
- Phases I & II Site Assessments
- Natural Resource Impact Modeling
- Wetland Services
- Ecological Modeling and Evaluation
- Permitting and Regulatory Compliance
- Market Analysis
- Financial Analysis and Pro Formas
- Spatial Planning/Marine Spatial Planning

ASA has comprehensive *GIS* and remote sensing (RS) capabilities and uses a variety of GIS/RS software that can produce data in any required format. We routinely use aerial orthophotography and satellite imagery to derive geographic databases. GIS/RS projects are augmented with full Global Positioning System (GPS) capabilities. The ESRI geodatabase model is used to archive data for subsequent project use. Final products have included detailed vegetation and land-cover maps, stormwater-structure inventories, and basemaps for use in wind resource, water quality, hydrodynamic, or ecological modeling.



GIS layers are characterized and processed through a rules-based model to allow planners to evaluate relative impacts from renewable energy development activities. This specific spatial planning example from ASA's Abu Dhabi Coastal Atlas project compares coastal resources impacts of two potential energy infrastructure sites.

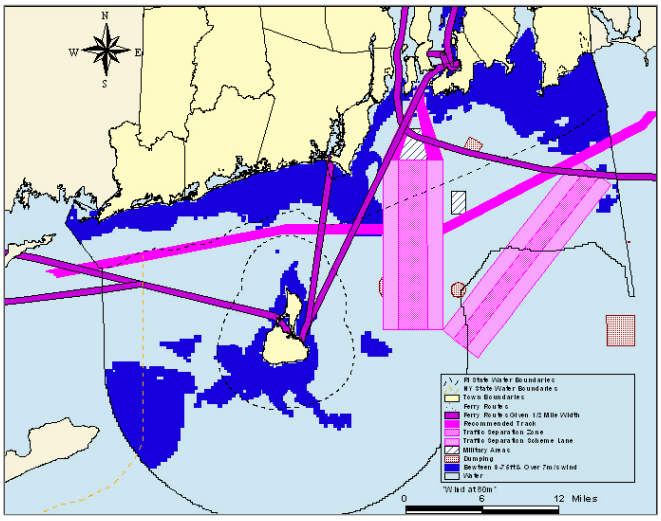
ASA is dedicated to providing innovative engineering and management services to create successful, environmentally sensitive, sustainable projects and cost effective regulatory compliance solutions for public and private clients throughout the world.

Renewable Energy Siting Toolbox℠

Renewable Energy Siting Toolbox℠ is ASA's technology-based assessment service and in-house toolset that employs a set of screening methods for siting of renewable energy facilities. Siting of both onshore (wind) and offshore renewable energy facilities (wind, wave, and current) is performed using a spatial planning, geographic information system (GIS) approach. ASA's toolbox includes two new indices: Technical Challenge (TCI) and Ecological Service Value (ESVI). The TCI assesses the technical difficulty in siting the facility compared to the power production potential while the ESVI assesses the ecology service values that might be impacted by various siting locations and patterns. In addition tools are available to perform the same assessments based on Principal Component Analysis and Cluster Analysis methods. ASA's toolbox represents a significant advance on existing screening methods as it allows quantitative rankings of development sites which include project technical complexity and quantitative ecological valuation.

Renewable Energy Siting Toolbox Highlights:

- Evaluates the tradeoff between power production potential and the technical challenge to extract the power and the ecological value of the biological resources
- Applies to any spatially variable renewable energy source (wind, waves, in-stream tidal currents and ocean currents)
- Applies at a wide variety of spatial scales (large scale screening, site specific evaluation)
- Provides quantitative analysis approach that allows numerical ranking of potential sites
- Incorporates uncertainties in input data and TCI/ESVI formulation via Monte Carlo simulation strategy and allows for in depth sensitivity studies
- Provides objective methodology for alternatives analysis
- Enables input of geospatial data readily available (bathymetry, NOAA ENC Maps, wind, wave, in-stream tidal current power distribution maps, seabed sub-bottom geology, extreme wind and wave conditions, etc.)
- Enables evaluation of use conflicts with existing fisheries (fixed and mobile gear and recreational), aquaculture operations, leases, mineral and aggregate extraction, conservation, and marine transportation)
- Allows evaluation of hard and soft constraints on siting
- Enables assessment of environmental impacts using ASA's well developed bird, fish, and marine mammal population and migration model systems



Example offshore wind energy development project siting study Level 1 Screening Analysis. Map includes implementation of minimum wind speed criteria, bathymetry, and transportation and shipping route exclusions.

The Renewable Energy Siting Toolbox Process is Different

The first step in the Renewable Energy Siting Toolbox process creates a map that describes the energy resources that are to be exploited. In step two areas that would prohibit any renewable energy developments are determined. These typically include regulated marine transport areas, preferred marine transport corridors, disposal sites, estuarine and marine protected areas, ferry routes, airport buffers, coastal buffers, etc.

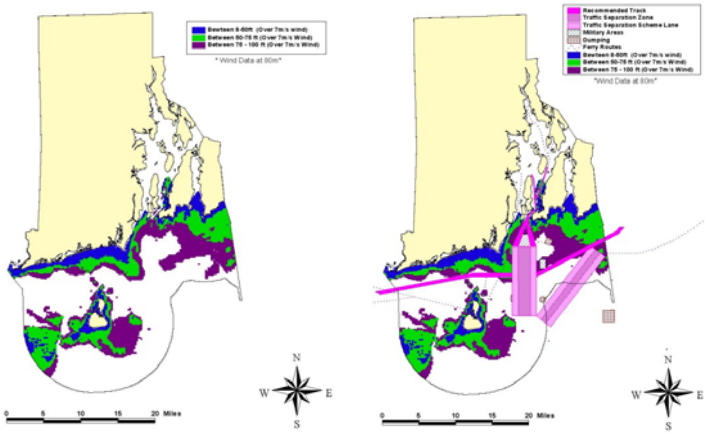
Step three incorporates technology constraints on the remaining potentially developable areas that further restrict the area under consideration. For instance, the technology chosen to support offshore wind turbines is based on water depth (i.e., monopiles in 5 to 25m water depth, lattice jacket structures in 25 to 50m, and floating moored structures in deeper water) becomes increasingly complex and costly the deeper the water.

The fourth step of the screening analysis is to incorporate use conflicts and collaborations such as visual impact, recreational and commercial fishing areas, marine mammal feeding and breeding grounds and transit paths, bird migratory paths and feeding and nesting areas, etc. The results of the analysis provide ranked sites that balance the benefits from the renewable energy facility against the economic, ecological and sociological impacts.

One key component of the Renewable Energy Siting Toolbox screening analysis is the Technology Development Index (TDI). The TDI is the ratio of the Technical Challenge Index (TCI) to the Power Production Potential (PPP) of the energy extraction facility. TCI is a measure of how difficult it is to site the device at a given location (e.g. water depth, mooring configuration, foundation, or support structure) plus the distance from the device location to the closest electrical grid connection point. The PPP is the potentially recoverable power from a facility that can be delivered for consumption.

Another key component of the Toolbox is the Ecological Service Value Index (ESVI). The ESVI is a relative measure of natural resource values, based on combinations of individual indices of usage by and of natural resources of concern. The under-lying ecological analysis includes mapping of habitat values, as well as usage by birds, bats, marine mammals, sea turtles, and fisheries resources. To quantify distributions and relative densities of specific species groups of concern, ASA applies its wildlife movement (migration and behavior) model (WILDMAP™) based on life history information and available observational data. The WILDMAP model is supported and ground-truthed by presence/absence, abundance, frequency and spatial observational data. For human usage of natural resources (fisheries utilization, aquaculture and wildlife viewing), spatial and statistical data are incorporated into the overall ESVI.

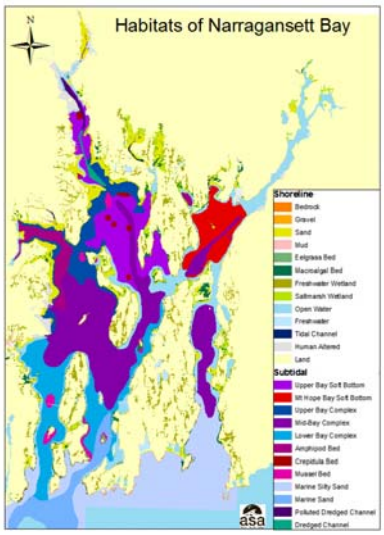
Renewable Energy Siting Toolbox assigns TDI and ESVI values and identifies areas with the highest potential and lowest impact for development — areas with low values of the two indices are the best locations for siting a renewable energy facility. Uncertainty in the underlying data and formulations of the indices is evaluated by performing a Monte Carlo simulation to estimate TDI and ESVI. These results are typically presented in the form of contours of these indices in the area of interest with the upper and lower 95% confidence intervals.



Ecological Service Value Index (ESVI)SM

ASA's Ecological Service Value Index (ESVI)SM measures the relative value of a location to biological resources and human uses of natural resources. The ESVI is a composite measure based on ecological service values for individual natural resources, including:

- Habitat type, quality and productivity
- Presence and degree of usage by biological resources, such as listed (i.e., threatened and endangered) species of concern, birds, marine and terrestrial mammals, sea turtles, other reptiles, fish and shellfish, bats, butterflies, and other species of interest
- Harvest value, such as to commercial and recreational fisheries
- Usage for aquaculture
- Recreational usage related to natural resources (e.g., wildlife viewing)



ASA has developed and applied its ecological service valuation model over the past two decades while performing environmental impact evaluations for proposed developments, pollutant discharges, and oil and chemical spill assessments. The under-lying ecological analysis for producing the ESVI includes mapping of habitat values, as well as usage by birds, bats, mammals, other wildlife, and fisheries resources. For human usage of natural resources (fisheries utilization, aquaculture and wildlife viewing), spatial and statistical data are incorporated into the overall ESVI.

ASA applies its ESVI model to aquatic and terrestrial areas potentially affected by development, such as for renewable energy facilities (onshore and offshore wind, wave, and current), infrastructure, and shipping and port facilities. The ESVI model is ideally suited to siting evaluations, as it allows quantitative rankings of potential development sites to be developed and mapped based on ecological valuation. The layout of the development's infrastructure and use patterns can also be designed in consideration of the spatial distribution and usage of natural resources.

WILDMAP™

To quantify distributions and relative densities of specific species of concern, ASA applies its wildlife movement (migration and behavior) model (WILDMAP™) based on life history information, nesting/breeding and foraging locations, and available observational data for the species evaluated. The model is supported and ground-truthed by presence/absence, abundance, frequency and spatial observational data. Considerable information is available on general migratory pathways, the timing of migrations, temporal distributions of sightings, behavior of animals while migrating and foraging, habitats utilized, and reproductive behavior. The relative distribution of animals in space and time is quantified by modeling movements of representative individuals. Behavioral and sightings frequency distributions are used to determine behavioral choices at any given instant and location. The model tracks movements within the boundaries of the study area (a geographical map of habitat characteristics over a large enough domain to include normal movement patterns for the species), as well as migrations in and out of the modeled area. By modeling movements of a local population, relative densities of the species (in space and time) can be calculated from model results and compared to observational data for calibration and verification. ASA has combined its WILDMAP migration and behavior model with population modeling to evaluate the magnitudes of potential impacts to species of concern, as well as recovery time. Example applications are listed below.

Example publications:

French, D.P., M. Reed, J. Calambokidis and J. Cubbage, 1989. A simulation model of seasonal migration and daily movements of the northern fur seal, Callorhinus ursinus. Ecological Modelling 48:193 219.

Jayko, K., M. Reed and A. Bowles, 1990. Simulation of interactions between migrating whales and potential oil spills. Environmental Pollution 63:97 127.

Renewable Energy Services

ASA provides scientific and engineering analyses for all aspects of renewable energy projects both onshore and offshore around the world. At ASA we believe that the promise and potential of diverse and efficient energy systems coupled with advanced, intelligent technologies and alternative energy sources will provide our modern world with secure, optimized, and reliable power systems--while improving the environmental impact of energy production and consumption.

Areas of expertise include conceptual design, prospecting and siting studies, resource assessment, technical and economic feasibility evaluations, power production estimates, environmental impact assessments, and permitting assistance.

ASA's Renewable Energy Services include:

- Energy Resource Assessment
- Renewable Energy Feasibility
- Siting analysis using ASA's Renewable Energy Siting Toolbox℠
- Spatial Planning/Marine Spatial Planning
- Economic Analysis
- Planning, Permitting, & Design
- Ecological Impact Assessment
- Wind Energy Analysis
- Solar PV & Thermal Analyses
- Wave & Tidal Energy Analyses
- Waste to Energy Analysis
- Geothermal Analysis
- Ocean Energy Analysis
- Meteorological Modeling & Data Assessment
- Visualizations
- Met Data Acquisition
- Meteorolgical Modeling
- Due Diligence
- Owner's Engineer

Renewable Energy Development

ASA provides expert environmental data collection and analysis of wind, solar, geothermal, and water information for the renewable energy sector. Our services offer clients a thorough understanding of the resources and opportunities available for renewable energy and sustainable development while maximizing the use and minimizing the negative impact to natural environments. ASA applies a suite of custom-built GIS technology and data aggregation techniques as well as other core proprietary computer tools that enable successful and cost effective energy and environmental resource assessments in support of development projects.

Energy Services

ASA provides quantitative estimates of the environmental effects of siting energy facilities, energy extraction, energy transmission, resource transportation, and energy infrastructure projects using sophisticated analyses and modeling capabilities—simulating relevant physical, chemical, and biological processes. These energy activities include offshore and coastal oil and LNG terminals, onshore and offshore pipelines and cables, fossil and nuclear-based power plants, land-based utility-scale and offshore renewable energy development, and oil and chemical spills and releases.

ASA's Energy Services include:

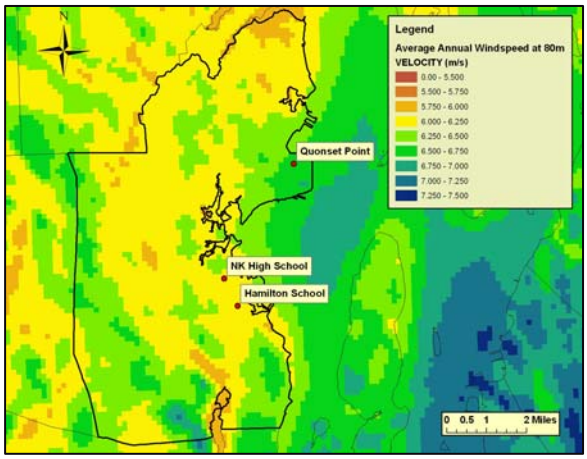
- Energy Resource Assessment
- Energy Siting & Feasibility Analysis
- Thermal & Chemical Discharges
- Entrainment & Impingement
- Sub-sea Pipeline & Cable Burial
- Ecological Impact Assessment Services and Mitigation
- Channel & Berth Dredging
- Wave, Current, and Wind Resources
- Inundation & Flooding Analysis
- Oil & Chemical Spill Modeling and Response Systems
- Spatial Planning/Marine Spatial Planning

ASA Energy Services Clients

Acres International
Arthur D. Little Limited (ADL)
ADL UK
Atlantic Sea Island Group
Bluewater Group
British Gas E&P, Inc.
Calais LNG
Camp, Dresser & McKee
Cape Wind
CH2MHILL Madrid
Colorado Oil & Gas Association (COGA)
Coler & Colantonio
Continental Shelf Associates
Crescent Technology
CSA International, Inc.
DNV
Dominion
Duke Energy
Earth Tech
ECB
Ecology & Environment, Inc.
EDSA Cloward
Elmosa
Entergy
Environmental Resources Managers Limited (ERML)
Environmental Strategic Systems, Inc. (ESS)
Epsilon Associates, Inc.
Engineer Research and Development Center
ESS Group
EULA
Exponent
ExxonMobil
ExxonMobil Biomedical Sciences
ExxonMobil Pipeline
Florida Power & Light
General Electric (GE)
GE Oil & Gas
Goodwin & Procter
GTE Telecom International
Haliburton KBR
ICF International
Islander East
Industrial Economics, Inc. (IEC)
IRC
KeySpan Corporation
Louis Berger
Maguire Group
MJ Harden
Natural Resource Group, Inc. (NRG)
Normandeau Associates, Inc.
PBR Consortium
PG&E National Energy Group
Project Consulting Services (PCS)
RMA
RPS Plc.
Rsd Laffan LNG Co. Ltd.
Shannon LNG
Stone & Webster
Tec Icon
Technip-Coflexip
TechnoConsult
TRC Environmental Corporation
U.S. Army Corps of Engineers
URS Corporation, Ltd.

Representative Project Experience & References

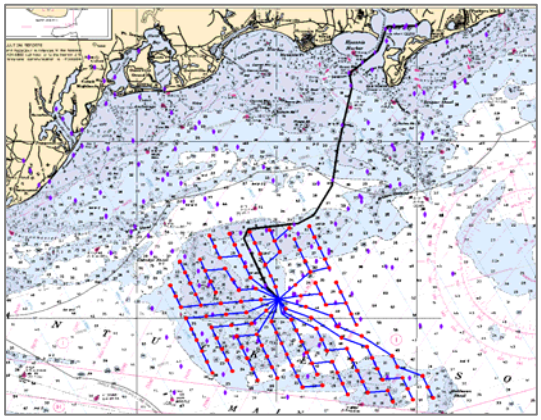
North Kingstown Wind Power Feasibility, North Kingstown School Department, North Kingstown, RI



Reference Contact:
Ned Draper
Director, Administrative Services Department
North Kingstown Public Schools
100 Fairway Drive
North Kingstown RI 02852
401-268-6410
Ned_Draper@NKSD.NET

ASA is currently leading a team in a technical and economic feasibility assessment for placement of behind-the-meter wind turbines at two proposed school sites. The project includes detailed wind resource, electrical interconnect, energy use, environmental resource assessment, financial analyses for different turbine sizes at the two potential locations, stakeholder meeting participation and public awareness planning.

Analysis of Potential Impacts from a Proposed Nantucket Sound Wind Farm, Nantucket Sound, MA



Reference Contact:
Len Fagan
Cape Wind Energy, LLC
Vice President, Engineering
75 Arlington St., Suite 704
Boston, MA 02116
(617) 904-3100 X 122
lenfagan@msn.com

ASA Staff Involvement:
Craig Swanson

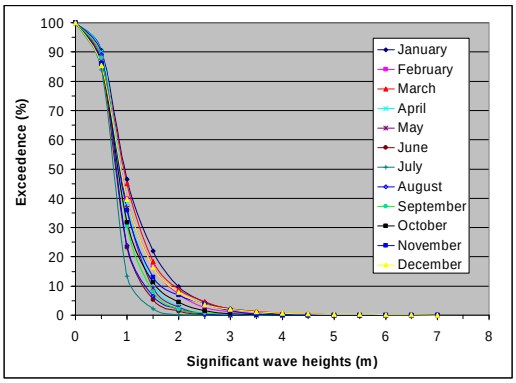
Cape Wind Energy, LLC has proposed to build a wind turbine farm on Horseshoe Shoal in Nantucket Sound off the coast of Massachusetts. The project would consist of 130 wind turbine generators, an electric service platform, a series of cables connecting the generators to the service platform and a pair of cables from the platform to the mainland shore.

ASA performed a modeling analysis to estimate potential impacts from electrical cable burial using the HYDROMAP model to calculate currents, and the SSFATE model to calculate suspended sediments in the water column and bottom deposition resulting from burial operations. ASA also performed an engineering analysis to estimate the expected changes in waves and currents from the placement of the generator pile foundation array on the Shoal. The study used both a hydrodynamic model, HYDROMAP to calculate currents in the area and wave data collected from the Scientific Measurement Devices Station (SMDS) to provide input information for the analytic approaches used to estimate the zone of influence of the generator piles.

During the hydraulic jetting process used to embed the cables some sediment is injected into the water column and a portion is transported by currents away from the trench, resulting in a depression or scar on the seabed. Sediment flux at discrete locations along the proposed cable routes was calculated. These flux rates represent the range of sediment flux throughout Nantucket Sound, and based on these transport rates, recovery rates for jetting scars along the cable route were estimated.

Results from application of the models and analysis of the sediment flux rates were used to support permit applications for the project.

Wave Analysis for Long Island Offshore Wind Park, Long Island Sound, NY



Reference Contact:
Louis Coakley
Florida Power & Light (FPL)
P. O. Box 14000
700 Universe Blvd.
Juno Beach, FL 33408
ASA Staff Involvement:
Craig Swanson

Florida Power and Light (FPL) have proposed to build an electrical generation wind turbine park for the Long Island Power Authority to be located south of Fire Island, Long Island, New York. ASA was retained by FPL to evaluate the wave climate at the proposed wind park that the turbine piles would be subject to. Analysis of potential wind energy and context over long time periods to the information predicted for the site was also required.

Massachusetts Department of Capital and Asset Management, Boston, MA

Reference Contact:
John Rizzo, P.E., Director
American Development Institute
36 Spring Water Way
Woonsocket, RI 02895
(401) 524-5334
ASA Staff Involvement:
Daniel Mendelsohn

Daniel, teaming with Applied Technology & Management and American Development Institute, is providing services for a continuing services contract with the State of Massachusetts, Department of Capital and Asset Management (DCAM) to perform renewable energy feasibility and design studies for selected state facilities. Recent project examples include:

- wind power feasibility study for the Plymouth County Correctional Institute
- wind and geothermal energy assessments for Spectacle Island, in Boston Harbor
- wind power feasibility for Peddock's Island, in Boston Harbor

Massachusetts Ocean Partnership: Integrated Multi-Use Ocean Management, MA

Reference Contact:
Nicholas Napoli
Science Program Manager
Massachusetts Ocean Partnership
UMass Boston - Healey 10th Floor
100 Morrissey Blvd
Boston, MA 02125
nnapoli@massoceanpartnership.org
(617) 287-3926
ASA Staff Involvement:
Daniel Mendelsohn
Christin Reynolds

The Massachusetts Executive Office of Energy and Environmental Affairs (EEA) is developing a comprehensive ocean-use management plan that represents all interests, is based on the best available

science and that may serve as a model for other coastal states. To support these efforts the Mass Ocean Partnership (MOP) has been providing technical and policy to support the efforts of the EEA. The MOP describes itself as an independent public-private partnership created specifically to advance ecosystem-based integrated multi-use management of the Commonwealth's coastal ocean waters. To achieve this purpose the MOP has contracted with ASA to provide technical support services related to data needs and uses.

MOP first tasked ASA to provide consultation in support of an ocean data network. An ocean data network is an infrastructure of data, systems, services, and tools that allow a variety of users including the public, coastal managers, and research scientists to access "live" and archived data related to coastal and ocean management. This may include maps, observations, and model data. Meeting user needs is a main driving force for the development of the data network. User needs identified were based on reports from the ocean management plan working groups. The working groups include: Fisheries, Habitat, Ocean Recreation, Cultural Services, Transportation, Navigation, and Infrastructure, Sediment, Renewable Energy. ASA's focus in the initiative is on the data integration and interoperability of the ocean data network.

In addition ASA was tasked by MOP to develop GIS data layers from map data obtained from stakeholder meeting as well as other data sources. These layers included:

- Whale data
- Commercial fisheries
- Recreational fisheries
- Marine mammal data
- Vessel traffic data
- Tidal currents

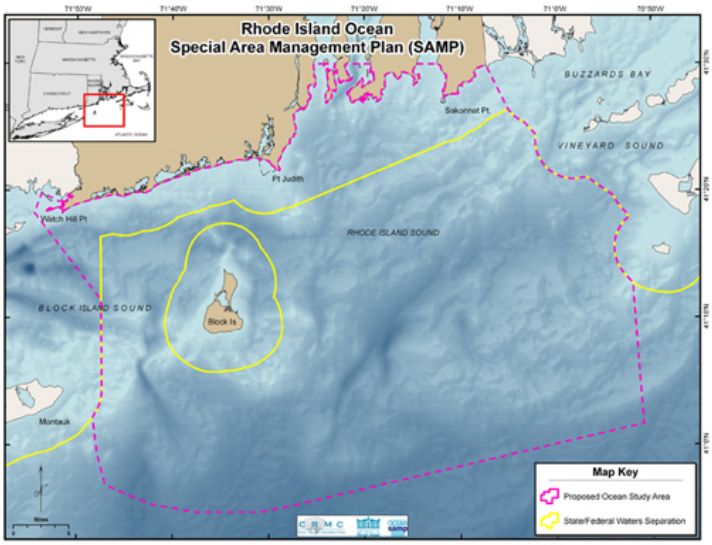
Technical Support for Rhode Island Ocean Special Area Management Plan (SAMP)

Reference Contact:

Grover Fugate
Executive Director, Coastal Resources Management Council
Stedman Government Center - Suite 3
4808Tower Hill Road
Wakefield, RI 02879-1900
gfugate@crmc.ri.gov
(401) 783-3370

ASA Staff Involvement:

Malcolm Spaulding (Founder of ASA and Chairman of the ASA Board of Directors. Dr. Spaulding is working on this project as a faculty member in the Ocean Engineering Department, University of Rhode Island (URI)



The Rhode Island Coastal Resources Management Council (CRMC) is developing the Ocean / Offshore Renewable Energy Special Area Management Plan (Ocean SAMP) with technical support from the University of Rhode Island. The objectives of the Ocean SAMP are to streamline federal and state permitting processes, promote a balance between economic development and natural resource protection, build a knowledge base of ocean-related scientific data and technologies to support the permitting process and foster a well informed and committed public constituency. The SAMP will, in essence, zone Rhode Island's offshore waters for renewable energy development while protecting current uses and natural habitats.

As part of its involvement in the development of the Ocean SAMP, URI is conducting a series of technical studies. Dr. Malcolm Spaulding is one of two Senior Advisors from URI for the project. He is also a Principal Investigator of three technical support studies: (1) wave and storm surge characterization for RI coastal waters; (2) marine transportation

paths based on Automated Identification System (AIS) reported data; and (3) refinement of wind farm site screening analysis.

The wave and storm surge characterization consisted of performing detailed comparisons of wind data available for RI coastal waters to determine the most accurate estimate of wind resources. Using the statistical definition of winds, computer models were used to simulate wave conditions with various return periods. A companion study using US Army Corps of Engineers estimates of flood profiles was used to estimate return periods for surge height.

The analysis of marine transportation paths was based on collection of AIS data from ships traveling through RI waters. The AIS data consists of continually transmitted ship location information so that individual ship tracks can be determined. When all the data is processed the transportation corridors actually used can be displayed visually and compared to established shipping lanes, fairways and precautionary areas.

The refinement of the wind farm site screening analysis expands on the earlier RIWINDS study conducted by Mr. Daniel Mendelsohn, now on the ASA staff, for the RI Office of Energy Resources. The site screening protocol developed by Dr. Spaulding uses a multi-level geographic information system (GIS) approach. The first level (Tier 1) screening identifies the potential energy resource (wind, wave, in-stream tidal and ocean current) to be exploited and then overlays areas that are prohibited as potential site locations such as regulated marine transport areas, disposal sites, estuarine reserves, ferry routes and preferred marine transport corridors, airport offsets, etc.). The areas remaining are potential sites for energy facilities and are ranked according to technical attributes of the proposed energy development that may restrict potential areas. The second level (Tier 2) screening evaluates the use conflicts / collaborations with energy development such as recreational and commercial fishing areas, marine mammal activity areas, avian activities, etc. The analysis produces a ranked list of sites that balances the benefits of renewable energy development against the economic, ecological, and sociological impacts. This protocol has been incorporated into the ASA Renewable Energy Siting Toolkit™. Further information is provided elsewhere in this document.

Ocean Energy Renewable Resources Management on the Outer Continental Shelf (OCS), Atlantic & Pacific OCS, Mineral Management Service

Reference Contact:
Bruce Kaplan
Mangi Environmental Group
1896 Leimert Blvd.
Oakland, CA 94602
BKaplan@mangi.com
(510) 333-8540

ASA Staff Involvement:
Craig Swanson
Deborah French McCay
Rich Sweetman

Offshore wind, wave and tidal energy generation technologies continue to develop rapidly and an increasing number of commercial companies are applying to State and Federal government agencies for approval to utilize alternative energy resources in U.S. coastal waters. The Minerals Management Service (MMS), a bureau in the U.S. Department of the Interior, is the Federal agency that manages the nation's natural gas, oil and other resources including renewable energy potential on the outer continental shelf (OCS).

ASA was retained by the Mangi Environmental Group along with several other firms and academic and research institutions on two separate projects for the MMS Office of Alternative Energy Programs. These projects are building reference databases and syntheses of oceanographic resources for each of the east and west coasts of the continental United States. The databases being assembled for the U.S. Atlantic and Pacific OCS contain contemporary information on the natural and human environments of these valuable and energy-rich regions. The databases update and expand upon information collected more than a decade ago and will be used by MMS to evaluate the impact of renewable energy technology infrastructure on the environment of the continental shelf. The finished products of databases and synthesis reports will describe the biological, chemical, geological and physical oceanography of the U.S. OCS regions, as well as the socio-economic effects of ocean development.

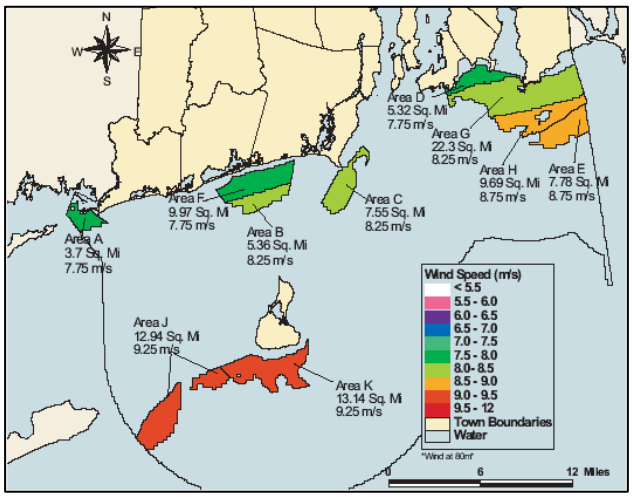
The final project deliverables for three offshore areas: North Pacific OCS, South Pacific OCS, and Atlantic OCS, will supply MMS with the necessary information to evaluate the environmental impacts of alternative energy development (as well as oil and gas) on the outer continental shelves. Examples of potential alternative energy projects include wind energy, wave energy, ocean current energy, solar energy, thermal energy, and hydrogen production.

Daniel Mendelsohn, ASA's Energy Resources Group Lead has been involved in the development of a number of wind and other renewable energy projects. Example specific project experience with reference information includes:

RIWINDS Wind Feasibility Assessment: Phase I Siting Study, RI

Reference Contact:
Mr. Andrew Dzykewicz,
Commissioner, Rhode Island Office of Energy Resources
1 Capitol Hill
Providence, RI 02908
adzykewicz@energy.ri.gov
(401) 574-9119

ASA Staff Involvement:
Daniel Mendelsohn
Deborah Crowley
Christin Reynolds
(Daniel Mendelsohn, Deborah Crowley and Christin Reynolds led and staffed this project while at a previous employer, Applied Technology and Management.)



In 2006, the State of Rhode Island established the RIWINDS Program to promote the development of wind energy in the State. The goal of the Program was aggressive: to meet 15 percent of the State's 1000 MW peak electric demand (1.3x106 MWh per year), requiring approximately 450 MW of wind energy capacity, by 2012. The Phase I Feasibility Study scope was to evaluate the entire State of Rhode Island to identify the most viable areas for wind energy development and assess the potential energy generation associated with these areas. The process used a unique set of GIS and analytical tools to screen and prioritize potential areas, both on land and offshore, taking into consideration technical, environmental, financial and public acceptance issues. The study evaluated projects using utility scale wind turbines (1.5 MW and larger) for small customer connected and community installations as well as for large, wholesale installations where all of the power is fed into the New England electric transmission system.

The key results of the Study indicated that:
1. The RIWINDS goal is achievable.
2. The cost of wind energy to meet this goal appears to be competitive with the projected cost of electricity in Rhode Island.
3. Over 95 percent of economic wind opportunity is offshore

The study concluded that 10 offshore sites and one onshore site, where producing wind energy would be economically feasible, were potentially feasible and could generate electricity at competitive market rates. Not all the sites would need to be developed to reach the governor's 15-percent goal and the 11 areas could produce five times the amount of energy needed to meet that goal.

Portsmouth Wind Resource and Economic Feasibility, Portsmouth, RI

Reference Contact:
Gary Gump
Portsmouth Economic Development Committee
Chairman PEDC Sustainable Energy Subcommittee
37 Aquidneck Avenue
Portsmouth, RI 02871

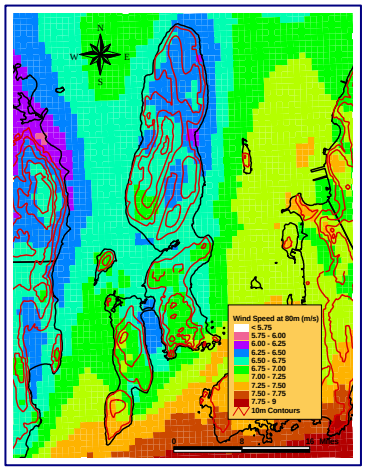
(401) 741-1011
ggump1@verizon.net

Daniel led the team in a technical and economic feasibility assessment for placement of behind-the-meter wind turbines at two proposed school sites. The project included detailed wind resource, electrical interconnect, energy use, and financial analyses for different turbine sizes at the two potential locations. Daniel is continuing on as the Town's representative, reviewing plans and activities during the construction process of the final turbine project at the High School.

Narragansett Bay Commission Met Tower, Providence, RI

Reference Contact:
Barry Wenskowicz
One Service Road
Providence RI, 02905
(401) 461-8848 x329

Daniel and Lorax Energy Systems provided wind turbine feasibility consulting services and planning, layout and installation of an NRG 50m Tall Tower met station with a 9200-Plus data logger for the Narragansett Bay Commission (Providence Municipal Sewer Authority). The Authority plans to install a behind-the-meter system to offset operational electric costs for the wastewater treatment facility.



Jamestown Wind Power Feasibility Study Project Jamestown, RI

Reference Contact:
Donald Weinberg
36 Narragansett Ave.
Jamestown, RI

Daniel is providing project management and senior scientific support to ATM for the Town of Jamestown project to evaluate the potential for wind power generation on Conanicut Island, where the Town is located. Daniel's team is providing a technical and economic feasibility assessment for potential projects, including single, behind-the-meter, and multiple, grid-connected wind turbine systems. The project includes a fatal flaw analysis, reducing the number of candidate sites from 10 to three, detailed wind-resource assessment, electrical interconnect, energy use, and financial analyses for various turbine capacities.

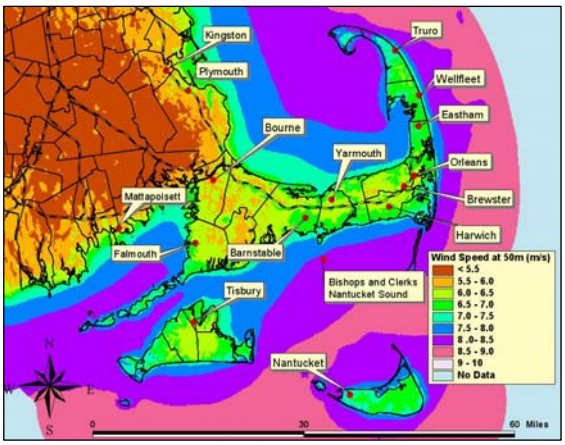
Wind Turbine Development Project Development Oversight, Portsmouth, RI

Reference Contact:
Gary Gump
Portsmouth Economic Development Committee
Chairman PEDC Sustainable Energy Subcommittee
37 Aquidneck Avenue
Portsmouth, RI 02871
(401) 741-1011
ggump1@verizon.net

Daniel is providing ongoing engineering support for the construction portion of a behind-the-meter wind turbine development project at the Town of Portsmouth High School. Dan is acting as the Town's representative and working with the developer to review plans and activities during the construction process of the final turbine project at the High School.

Cape and Vineyard Electric Cooperative Wind Feasibility Study, Barnstable, MA

Margaret T. Downey, Clerk
Cape and Vineyard Electric Cooperative, Inc.
3195 Main Street, Superior Courthouse
Barnstable, MA 02630
mdowney@barnstablecounty.org



Daniel Mendelsohn is providing a technical and economic feasibility assessment for placement of multiple wind turbines at proposed production sites on Cape Cod, Massachusetts. The project includes detailed site assessment, wind data review, potential environmental impacts assessment and a permitting review including FAA issues, visualization and public perception in a preliminary study. Pending the outcome of the preliminary evaluation for the selected site this is followed by a detailed avian impacts assessment, wind resource analysis, engineering and financial analyses for different turbine sizes and combinations at the site.

ASA (Wind Energy) In the News

The state of wind energy projects in Rhode Island
ASA's Daniel Mendelsohn was interviewed by Providence Business News' Kevin Shalvey to shed light on the state of wind energy projects in Rhode Island and ASA's new contract for a wind feasibility study for North Kingstown. "In places like Rhode Island, it's not like Oklahoma or Iowa, where there are wide open spaces. There are a lot of people, a lot of development everywhere, so you have to be really careful about how you place these things so they don't unduly impact any residents," said ASA Senior Principal Daniel Mendelsohn.
Providence Business News - August 7, 2009
http://www.asascience.com/news/inthenews/2009/inthenews_Mendelsohn-PBN-5Q.shtml
http://www.pbn.com/detail/44026.html

Wind Farm Projects Could Spur National Job Boom
ASA's Daniel Mendelsohn's discussion was highlighted during the Northeast Sustainable Energy Association's recent Boston conference and trade show.
Providence Business News - March 28, 2009
http://www.asascience.com/news/inthenews/2009/inthenews_Mendelsohn-Renewables.shtml
http://www.pbn.com/detail/41254.html

Small Town's Megawatt-Sized Wind Turbine Success
The Town of Portsmouth, Rhode Island erected and commissioned the state's second utility-scale, megawatt-sized wind turbine. The small town is recognized as a successful model in municipal sustainable energy projects that can offset rising town budgets and provide clean energy at the same time. Many people in the state, including ASA's wind energy expert, Daniel Mendelsohn, who worked on the project, applaud Portsmouth's leadership and commitment in perusing alternative energy solutions at the municipal level.
http://www.asascience.com/news/releases/2009/pr09-TownWindTurbine.shtml
Featured on CNN - http://asascience.typepad.com/asas_applied_science_blog/2009/03/local-wind-turbine-powers-towns-alternative-energy-leadership.html

ASA Welcomes Daniel Mendelsohn to Lead Renewable Energy Resources Group
To address the growing need and importance of renewable energy, climate change and sustainability services, ASA has brought back Daniel Mendelsohn, as Principal and Energy Resources Group Lead to their growing team of consultants. Widely considered one of the top experts in renewable energy development and project management, Daniel brings 25 years experience in the implementation and management of engineering analyses, modeling studies, environmental impact assessments, site assessment/feasibility studies, field monitoring programs, and data analysis.
http://www.asascience.com/news/releases/2009/pr09-mendelsohn.shtml
http://www.projo.com/business/content/bz_findig31_01-31-09_V7D53M9_v12.3414fa6.html

Subcontractor Team Members

ASA's team has had many years of experience working together on a number of successful wind energy and other engineering projects, including the RIWINDS project for Governor Donald Carcieri that assessed the technical and economic feasibility of generating 15% of Rhode Island's aggregate electric demand from wind power. In addition, the Team recently completed a project working together for the School District of Portsmouth, RI to perform a Wind Energy Resource and Economic Assessment for the Town's Middle School and High School properties, and is currently involved in several other wind feasibility studies similar to this East Bay wind power feasibility study.

- Loria Emerging Energy Consulting | Dennis Loria, P.E.
  Mr. Loria has been involved in the development of emerging and conventional power projects for over 25 years and is actively involved in the development of wind projects in several New England states. He has successfully led multi-organizational teams and has successfully delivered projects working with the staff proposed herein. Mr. Loria has been retained as a project manager on a variety of projects under Daniel Mendelsohn over the past several years.

- Richard C. Gross, P.E., Inc.
  Rich Gross is an electrical power systems engineer specializing in technical analyses and feasibility studies related to the integration of generation projects to electric utility distribution and transmission systems. Comprehensive background in the electric utility industry gained through more than 25 years of power system planning, design, and construction of electrical substations, transmission interconnections, and distribution systems. Mr. Gross is a Licensed Professional Engineer in the states of Massachusetts and New York.

- Sustainable Energy Advantage, LLC (SEA)
  SEA has helped private, public and non-profit organizations develop opportunities for clean, renewable sources of energy, including wind, solar, hydroelectric, biomass and geothermal power since 1998. SEA has extensive experience developing and analyzing pro forma economic models of community-scale wind power projects.

- GZA GeoEnvironmental, Inc.
  Founded as Goldberg-Zoino & Associates, Inc., GZA GeoEnvironmental, Inc. (GZA) been providing its clients with a wide range of geotechnical engineering, environmental consulting, and remediation services since 1964. GZA employs over 550 engineers, scientists, and technical support staff in 24 offices in the U.S. GZA is consistently ranked in the top 100 for *Engineering News Record's* (*ENR's*) annual list of the top 200 environmental firms. GZA maintains a strong service base and expertise in our original specialty of geotechnical engineering. Over the years our engineering capacity has broadened to general civil engineering services with an emphasis in geo-structural engineering and site civil applications, such as solid waste engineering, stormwater management, site design, and dam engineering.

- Maguire Group
  Maguire is the largest engineering firm in Rhode Island. They are uniquely qualified to address the structural engineering issues required of this study; their staff understands the myriad of technical issues in developing power projects. Maguire is one of two firms in the nation to have twice won the *Presidential Award for Design Excellence*.

- Pandion Systems, Inc.
  Pandion offers specialized services to the wind energy sector that address ecological issues associated with the construction and operation of wind turbines. In particular Pandion specializes in avian and bat risks and agency coordination dealing with wind/wildlife interactions. Pandion staff has prepared more than 10 ecological risk assessments for wind projects in the US including the Northeast, Southeast, Southwest and Midwest. Pandion is active in the wind industry being a member of American Wind Energy Association (AWEA) and its staff are active participants in the National Wind Coordinating Collaborative (NWCC). To better serve the wind industry Pandion has offices in Vermont, Florida and Texas.

- RI WindTech - Merritt Meyer
  Mr. Merritt Meyer, an architect and planner is also a founder/director/officer of the Rhode Island Wind Alliance, a not-for-profit organization that advocates the use of renewable sources to generate electricity and an integral part of the Bristol, RI planning community.

A list of similar wind power projects that team members have participated in, or are currently working on, includes, but is not limited to:

RIWINDS Statewide Siting and Feasibility Study, RI

FM Global Wind Energy Feasibility Study, West Glocester, RI

North Kingstown School Department Wind Feasibility Study, North Kingstown, RI

Town of Portsmouth Wind Feasibility Study, Portsmouth, RI

Town of Jamestown Wind Feasibility Study, Jamestown, RI

Ninigret Hamlet Wind Feasibility Study, Charlestown, RI

Raytheon Naval Integration Center, Portsmouth, RI

Cape Winds Offshore Wind Farm Impacts Assessment, Cape Cod, MA

Cape and Vineyard Electric Cooperative Wind Feasibility, Cape Cod, MA

Town of Falmouth Wind Feasibility, Falmouth, MA

Plymouth County Correctional Wind Feasibility Study, Plymouth, MA

Spectacle Island Renewable Energy Feasibility Study, Boston, MA

Peddocks Island Renewable Energy Feasibility Study, Boston, MA

Varian Semiconductor Equipment Corporation, Gloucester, MA

Savoy Wind Generation Project, Savoy, MA

Jiminy Peak, Hancock, MA

Salt Cay Renewable Energy Feasibility Study, Turks & Caicos

Holbox Island Renewable Energy Feasibility Study, Yucatan, Mexico

SUBCONTRACTOR ADDRESSES

Dennis Loria, P.E.
10 Speen Street
Framingham, MA 01701

GZA GeoEnvironmental, Inc.
One Edgewater Drive
Norwood, MA, 02062

Maguire Group
33 Commercial St # 1
Foxboro, MA 02035

RIWindTech
328 High Street
Bristol, RI 02809

Sustainable Energy Advantage, LLC (SEA)
10 Speen Street
Framingham, MA 01701

Rich Gross, P.E.
10 Speen Street
Framingham, MA 01701

Pandion Systems, Inc.
257 Stimpson Hill Rd
Whitingham, VT 05362

Sustainable Energy Advantage, LLC

Qualifications

Since 1998[1], ***Sustainable Energy Advantage, LLC*** has helped private, public and non-profit organizations develop opportunities for clean, renewable sources of energy, including wind, solar, hydroelectric, biomass and geothermal power, in competitive wholesale and retail electricity markets. By providing analysis and support on multiple fronts - strategy, policy, finance, planning, marketing, negotiation, product development, and pricing - Sustainable Energy Advantage helps its clients develop the building blocks of a sustainable energy future: wholesale and retail renewable electricity businesses; public policies such as Renewable Portfolio Standards and incentive programs; and rules of the road for electricity markets. SEA focuses exclusively on surmounting the barriers to and tapping the potential of clean, renewable energy sources. As a result, we can bring an unparalleled level of focus, knowledge, experience, expertise, insight and credibility to the challenges faced by our clientele.

Our unique approach to problem solving provides our clients with a sustainable advantage.

- ***Analytical Foundation***. You cannot see an attainable future through rose-colored glasses. We are first and foremost analysts, and support our efforts - strategic initiatives, business ventures, or effective public policy - with a strong analytical foundation. We combine assessments of best practices to a client's particular circumstances to understand what may work, what may not, and why.
- ***Interdisciplinary Approach***. The most challenging issues and problems facing society cross the boundaries of discipline. Our training is interdisciplinary, based in science and engineering, economics, and public policy. SEA prides itself in its broad range of functional experience: research, power supply planning, analysis and modeling, rate design, regulatory economics, finance, engineering, business, and negotiation. We regularly work with business decision-makers, lawyers, engineers, accountants, and policymakers. For buyers and sellers in wholesale and retail markets. For developers, generators, utilities, marketers, retailers, aggregators, regulators, advocates, tracking and verification systems, certifiers, and renewable energy trust funds. Building businesses, policies and market infrastructure. From small startups, to some of the largest energy companies in the world.
- ***Insight***. This unique blend of training and experience allows SEA to quickly assess and surround a problem, see it from all relevant perspectives, anticipate and take into account the positions of the full range of stakeholders in policy arena, and both buyers or sellers in transaction negotiations.
- ***Credibility***. SEA is particularly adept at providing expert input in multi-stakeholder situations, while being seen as credible by wide range of stakeholders with competing/conflicting interests.
- ***Cutting Edge***. We pride ourselves with staying in touch with cutting edge developments, looking beyond the mainstream to understand and establish the next frontier. We don't shy away from something just because it's never been done before.
- ***Action Orientation***. We relish the opportunity to follow up development of strategy and tactics to supporting successful implementation of ideas and approaches we help develop. And because the world doesn't afford us the luxury of complacency, we help generate the feedback and self-assessment necessary to foster continuous improvement.

Sustainable Energy Advantage, LLC
10 Speen Street, 3rd Floor
Framingham, MA 01701
bgrace@seadvantage.com
www.seadvantage.com

[1] Prior to July of 1999, operating as Sustainable Energy Solutions

Robert C. Grace, president of Sustainable Energy Advantage, is a leader and innovator in technical and policy analysis of renewable energy markets and developing markets, opportunities and infrastructure for bulk renewable electricity supply. Trained as an interdisciplinary analyst in energy and environment, he has accumulated a diverse experience base over 20 years in the electricity industry, including working with a broad range of stakeholders and a diverse array of functions. He specializes in multi-stakeholder activities addressing complex and cutting edge challenges, and is known for doing so in a comprehensive, credible, creative and balanced manner. He is a frequent public speaker, author of several business plans, market assessments, RFPs, and policy white papers, and a regular participant in committees/workshops probing issues shaping the renewable power landscape in a competitive market environment.

Mr. Grace previously headed up green power activities at AllEnergy Marketing Company, and was a Principal Analyst specializing in wholesale power marketing and industry restructuring for New England Power Company. Earlier, Mr. Grace served as a Senior Analyst for LaCapra Associates, supporting over 20 clients in the electric and gas utility sector. Mr. Grace holds a M.S. in Energy & Resources (U.C. Berkeley), and an Energy Studies B.S. (Brown University).

Jason S. Gifford, consultant at Sustainable Energy Advantage, has over ten years of experience in the development of renewable energy policy in restructured electricity markets, market and financial analysis, REC market policy and development, and the development of community-scale renewable energy projects. Prior to joining Sustainable Energy Advantage, Mr. Gifford served as Industry Investment and Development Manager at the Massachusetts Technology Collaborative's Renewable Energy Trust. At MTC, Mr. Gifford focused on project finance, community-scale renewable energy development, and investment-related financial analysis and due diligence for the Renewable Energy Trust. From 1998 to 2002, Mr. Gifford was Manager of Regulatory Affairs and Business Development at Green Mountain Energy Company, where he led the Company's public policy efforts to establish competitive markets for renewable energy in PJM, Ohio and New England. While at Green Mountain, Mr. Gifford co-negotiated a contract to serve the nation's largest residential electric consumer aggregation. Jason Gifford holds a B.A. in Political Science from Bates College and an M.B.A. in Finance and Entrepreneurship from Babson College.

Sue J. Kim, analyst at Sustainable Energy Advantage, has over two years of professional experience in the public finance sector. Prior to joining Sustainable Energy Advantage, Ms. Kim served as a financial analyst at Red Oak Consulting, a division of Malcolm Pirnie Inc. At Red Oak, Ms. Kim focused primarily on project finance for water and wastewater utility clients. Ms. Kim began her career at the New York City Mayor's Office of Management and Budget where she modeled revenue projections for various City agencies. From 2005 to 2006 Ms. Kim worked on two consulting teams for The Clean Energy Group in Vermont and the New York City Economic Development Corporation. Her work for The Clean Energy Group involved a community wind regulatory and best practices analysis within the Clean Energy States Alliance. Her work with the Economic Development Corporation focused on the feasibility of deployment and financing of wind turbines in the NYC landscape. Sue Kim holds a B.A. in Environmental Studies and Government and Legal Studies from Bowdoin College and an M.P.A. in Environmental Science and Policy from Columbia University.

New Energy Group

Sustainable Energy Advantage, LLC is part of the New Energy Group of consulting firms, which collaborate in delivering a wide range of advisory services to clean energy sector clients. New Energy Group also consists of:

- **Loria Emerging Energy Consulting, LLC**
- **McCauley Lyman LLC**
- **New Energy Opportunities, Inc.**
- **Richard C. Gross, P.E., Inc.**

Team Approach: In addition, Sustainable Energy Advantage frequently collaborates on project teams with other leading organizations and individuals including LaCapra Associates, KEMA, AWS Truewind, Exeter Associates, GDS Associates, Antares Group, Navigant Consulting, Ed Holt & Associates, Ryan Wiser, Mark Bolinger, Tom Rawls, Center for Resource Solutions, Applied Technology & Management, Inc., and Raab Associates.

Services

SEA's services and experience include the following practice areas:

- ***Public Policy Analysis, Development and Implementation.*** SEA has provided policy and technical analysis and strategic support for public sector renewable energy policy mechanisms. We have authored a variety of policy white papers on RPS design options, as well as assessing the market impacts, costs and environmental impacts of several RPS mandates. We have evaluated opportunities, developed strategies, and designed programs for several state renewable energy funds, including Rhode Island, Massachusetts, Connecticut, New York and California.

- ***Strategy Development and Market Analysis.*** SEA specializes in renewable energy market analysis, with particular emphasis on the New England market through our New England Renewable Energy Market Outlook subscription briefings. Whether for public- or private-sector clients, SEA specializes in the development of renewable energy and green power market strategy to achieve the organization's objectives. Efforts have included analysis of market opportunities and barriers for renewable power projects, developers and technologies. SEA or its principals have either developed or implemented all or part of business plans and market analyses for wholesale generation companies; retail marketers; aggregators; wind and solar developers and renewable energy funds.

- ***Financial Analysis and Advisory Services.*** SEA provides detailed project and portfolio financial modeling and analysis services in support of wind, solar, biomass and other renewable energy developments. Through comprehensive, MS Excel-based modeling, SEA creates a framework for its clients to assess the economic viability and structural feasibility of a wide range of project ownership and financing options. By maintaining an up-to-date understanding of renewable energy finance trends and all available government incentive programs, SEA provides advisory services which help its clients make informed decisions that best fit their interests and risk profiles.

- ***Quantitative Analysis and Modeling***. We have performed and managed analyses of cost, market and environmental impacts of public policies such as RPS and electricity market rules. We perform detailed project financial modeling of installations such as community-scale wind projects, including the evaluation of multiple financing and project ownership options. Using our proprietary supply database of over 370 operating and proposed renewable energy projects throughout New England, we perform detailed REC supply-demand forecasts and REC price projections. SEA has also developed spreadsheet-based decision models for electricity portfolio management and product pricing.

- ***Green Power Product Development and Pricing***. SEA has analyzed, created and developed pricing for green power product offerings for wholesale generation companies, retail energy service providers and aggregators. Efforts have supported groundbreaking exploration of tapping the hedge value of renewable energy sources.

- ***Renewable Energy Supply***. SEA has assessed market potential and provides strategic and competitive analysis of renewable energy supply. We develop competitive procurement programs and solicitations, and evaluate responses, for several wholesale and retail buyers and sellers of renewable power. We lead or support contract negotiations between and among developers,

generators, wholesalers, retailers, aggregators, involving renewable generation technologies such as wind, landfill gas, solar, and hydroelectric.

- ***Business Infrastructure Development***. SEA develops spreadsheet-based tools for managing wholesale and retail green power businesses. We assist clients with setup of competitive market retail delivery infrastructure and design of tradable renewable energy credit systems.
- ***Transaction Facilitation, Contract Development and Negotiation Support***. SEA has represented clients, as well as provided support to clients, in negotiating contracts to buy or sell renewable energy or renewable energy credits. We have also facilitated negotiations between renewable energy buyers and sellers.

Products

New England Renewable Energy Market Outlook[sm] (REMO)

Our subscription-based, detailed analysis of renewable energy market supply and demand is based on SEA's proprietary database of 300 operational or development renewable energy projects influencing the New England market. Update three times per year, REMO helps subscribers develop a sophisticated market outlook necessary to support good decision-making. Subscribers include:

- Project Developers (wind and biomass)
- Renewable Energy Asset Owners & Managers
- Financiers (equity and debt)
- Renewable Energy Credits Brokers, Buyers and Marketers
- Renewable Portfolio Standard Administrators
- Renewable Energy Fund Administrators
- Policy Advocates

New England Eyes & Ears[sm] Service

We track it... now you can, too. Our "Eyes & Ears" Service helps you keep track of renewable energy-related legislative, policy and regulatory activity which could affect your interests in each of the six New England states. Gain greater confidence that you won't miss opportunities to act or react… extending the reach of your eyes & your ears.

The service includes:

- Monthly indexed e-mail updates with issue summary, identification of opportunities for action or input, and links to more information.
- Supplemental briefings or e-mail alerts.
- Links to on-line, subscribers-only document reference library.

Sustainable Energy Advantage, LLC

Client List

Current and past clients or research sponsors of Sustainable Energy Advantage include:

Business:

Abt Associates Inc.

Allco Renewable Energy

AllEnergy Marketing Company

Atlantic Renewable Energy Corporation

Backyard Farms, LLC

CH Energy Group

Connecticut Energy Cooperative, Inc.

Consumer Power Line

Cooperative Pioneers, Inc.

Edison Mission Energy

Edison Mission Marketing & Trading

Essential.com

Fox Islands Electric Cooperative

GenPower

Green Mountain Power Company

Horizon Wind Energy

HSH Nordbank

Iberdrola Renewable Energies USA

Independent Energy Producers of Maine

Massachusetts Energy Consumers Alliance

NEO Corporation (an NRG company)

New Jersey Utilities Working Group *

Noble Environmental Power

Ontario Power Generation Corporation

PowerLight Corporation

Russell Biomass LLC

Tioga Energy

UPC Wind Management

Vermont Energy Research Associates

Washington Electric Cooperative*

Wind Power New York (American Wind Energy Association)*

Wind Works LLC

Xenergy, Inc. – Retail Electricity Multi-Client Study*

Your Energy, LTD

Ze-Gen

Government:

California Energy Commission*

Connecticut Clean Energy Fund

Energy Trust of Oregon

Illinois Attorney General

Lawrence Berkeley National Laboratory

Maine State Energy Program

Massachusetts Division of Energy Resources

Massachusetts Renewable Energy Trust/Massachusetts Technology Collaborative

National Geothermal Collaborative

National Renewable Energy Laboratory

Nevada Renewable Energy Task Force

New York State Attorney General's Office

New York State Energy Research & Development Authority

North Carolina Utilities Commission*

Rhode Island Department of Environmental Management*

Rhode Island Economic Development Corporation*

Rhode Island Public Utilities Commission*

Rhode Island Renewable Energy Fund/State Energy Office

Rutgers Center for Energy, Economic & Environmental Policy

Wisconsin Division of Energy and University of Wisconsin*

Non-Profit, Community & Consumer:

Brown University

Cape Light Compact

Clean Energy Group

Energy Foundation

Heinrich Böll Foundation

Mt. Wachusett Community College (MA DCAM)*

Natural Resources Council of Maine

Pace Energy Project

PowerOptions (Massachusetts Health & Education Facilities Authority)

SmartPower, Inc.

Town of Portsmouth, RI*

Union of Concerned Scientists

Yale University*

* = subcontractor

GZA Service Areas

FIRM PROFILE

Geo-Civil Engineering Services
Soil & Rock Engineering
Foundation Design
Tunnels & Trenchless Construction
Dams & Hydraulic Structures
Marine/Coastal Facilities
Deep Excavation Design
Geotechnical & Civil Engineering Construction Inspection & Monitoring
Contractor Support Services
Geotechnical Instrumentation

Environmental Consulting
Phase I II, and III Site Investigations
Hydrogeologic & Remedial Investigations
RCRA & CERCLA Studies
Human Health & Risk Assessments
Ecological Risk Assessments
Feasibility Studies
Environmental Modeling
Water Supply Development
Stormwater Management
Wetland Consulting Services

Solid Waste Management
Permitting
Facility Design/Build
Facility Operations Engineering
Facility Closure
Post-Closure Monitoring

Regulatory Compliance & Environmental Management Services
Environmental Management Systems
Compliance Auditing
Regulatory Training
Feasibility/Siting Studies
Environmental Impact Studies
ISO 14000 Services
Permitting Assistance
Air Quality Services
Occupational Health & Safety

Support Services
Environmental Laboratory
Geotechnical Laboratory Testing
Aquatic Toxicity Laboratory
Soil & Rock Instrumentation

Environmental Remediation
Remedial System Design
Treatability & Pilot Studies
Remedial System Construction
Mobile Environmental Systems
Transport & Disposal Services
Facility and Site Closure
UST/AST Services
Asbestos & Lead Abatement
O & M Services

Founded in 1964 as Goldberg-Zoino & Associates, Inc., a soils and foundations specialty consultant, GZA GeoEnvironmental, Inc. (GZA) has grown into a full-service company providing its clients with a wide range of geotechnical engineering, environmental consulting, and remediation services. GZA employs over 550 engineers, scientists, and technical support staff in 24 offices in the U.S. GZA is consistently ranked in the top 100 for *Engineering News Record's* (*ENR's*) annual list of the top 200 environmental firms.

Building from our geotechnical engineering and geology experience, GZA became a pioneer in geohydrological studies for contaminated sites in the 1970's. GZA provided assessment and remedial design services for some of the earliest U.S. EPA enforcement actions and Superfund sites. Present environmental services range from initial assessment and evaluation of contaminated sites to design, construction and operation of remediation systems that treat, control, or remove contamination. Other in-house capabilities include environmental permitting, public health and environmental risk assessment, environmental compliance auditing, industrial hygiene, pollution prevention, and air quality services.

GZA maintains a strong service base and expertise in our original specialty of geotechnical engineering. Over the years our engineering capacity has broadened to general civil engineering services with an emphasis in geo-structural engineering and site civil applications, such as solid waste engineering, stormwater management, site design, and dam engineering.

Through integration of its geotechnical, environmental, and civil engineering expertise, GZA has historically been able to offer both a broad range of technical expertise and cost-effective and technically appropriate solutions to problems. We have taken the additional step to tailor our integrated services around the client-specific needs of various client groups such as retailers, site developers, the power industry, government agencies, industrial and commercial land owners, contractors, etc. This approach allows us to provide the technical expertise, innovation, sensitivity to client needs, and responsiveness to the unique permitting, structural, or construction issues associated with each group.

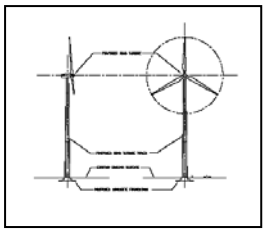
As this philosophy applies to environmental site assessment and remediation, we understand the special hurdles faced by owners and operators in moving through the permitting process, assessment and remedial design phases, and construction and operation of remedial systems and programs. Using a broad-based technical approach, we anticipate potential barriers to regulatory closure and aggressively work with the client and project team to move the project forward. We take an active role in identifying solutions, and look to create an open, two-way channel of communication with our clients and project team members to effectively advance the project. In addition to this role as consultant, we also provide a complete set of services related to site preparation, facility closure, foundation construction to promote site redevelopment.

Our in-house services and support facilities include full *AutoCAD/Softdesk*-based computer-aided design and drafting capabilities; a complete soil and rock testing laboratory with specially designed as well as standard equipment for physical and engineering properties testing (soil, rock, geosynthetics, and concrete); a complete instrumentation laboratory and machine shop and a full-service environmental chemistry laboratory.

Wind energy is one of the world's fastest growing renewable energy source in the deregulated energy marketplace. GZA's technical experience covers initial site permitting support; wind resource assessments to facility construction and regulatory compliance of operating units. Multi-disciplinary environmental practice areas, teamwork, land development and energy industry experience qualifies GZA to manage fast-tracked and complex engineering projects. GZA is committed to communicate design alternatives and their associated risks with "no surprises". This approach creates value for owners, energy source developers, wind turbine manufacturers and the balance of plant contractors. Our ability to provide comprehensive services enables us to move your project from conception to start-up. Services provided for wind projects include:

Regulatory Siting Applications & Environmental Permitting

- Regulatory Compliance
- Federal, State and Local Permitting
- Avian Studies
- Wildlife Impacts
- Wetlands Considerations
- Visual Assessments
- Noise Surveys
- Impact Assessments
- Carbon Offset Evaluations
- Meteorology



Geotechnical/Foundation Design

- Site Investigation
- Lateral and Dynamic Load Analysis
- Patrick & Henderson Foundation Design Analysis
- Offshore and Inland Wind Farms
- Geotechnical and Seismic Testing Laboratory
- Construction Bid Package Administration
- Construction Monitoring and Compliance
- Third Party Geotechnical Engineering Review
- Specialty Structural Instrumentation
- Forensic Analysis

Site/Civil Plans & Specifications

- Site Layout
- Erosion & Sediment Control Measures
- Stormwater Management Plans and BMPs

Project Highlights

- **Geotechnical Engineering, Foundation Design Recommendations, and QA/QC during foundation excavation and anchor installation.**
- **Foundation consists of an anchored mat on shale bedrock.**
- **Provided Site/Civil Engineering for the Project**
- **Designed an access Roadway for Delivery of the Turbine and Blades as well as for Permanent Operation and Maintenance.**

Portsmouth High School Wind Turbine
Geotechnical Engineering
Site/Civil Engineering

PORTSMOUTH, RHODE ISLAND

GZA provided a geotechnical investigation and foundation design recommendations for a new 262-foot high, 1.5 MW wind turbine on Fort Butts Hill at the Portsmouth High School in Portsmouth, RI.

The foundation consists of an anchored, 20-foot diameter mat founded on shallow weathered shale bedrock that became more competent with depth. Approximately fourteen, 2-1/2-inch diameter, high strength steel rock anchors were installed around the perimeter of the mat to depths of approximately 50 feet. A performance test was completed on one of the anchors and a proof test was completed on each anchor. The tower was erected and turbine installed in February and March of 2009, and the turbine is now in operation.

In addition to the geotechnical engineering GZA provided site/civil engineering services for the project. This included an FAA location survey, a topographic survey of the wind turbine site, the proposed utility corridor, and a construction access road. The survey data was compiled to form an existing conditions base plan for the project.

A stormwater evaluation was prepared for the site to include development of the pre-construction and post-construction stormwater flow comparison. Site drainage was evaluated and stormwater control measures designed to accommodate any changes in site conditions

A final grading plan was developed showing site features, drainage, the wind turbine base, transformer pads, and access roads. A utility plan was also be prepared showing the location of the grid connection and detailing the location of electrical conduits and electrical man-holes. The design package also included a construction Soil Erosion and Sediment Control Plan for the project.

View of the Access Roadway from the Wind Turbine Site on the top of Fort Butts Hill in Portsmouth.

Alexander Pichs
Regional Sales Manager, Northeast USA
AAER USA, Inc.
400 Westminster St., Suite 202
Providence, RI 02903
T. : +1.401-228-7810
F. : +1.401-228-7812
E-mail : a.pichs@aaer.ca

March 31, 2009

Mr. Tom Billups
GZA GeoEnvironmental, Inc.
530 Broadway
Providence, RI 02909
USA

Dear Sir or Madam:

AAER is a wind turbine manufacturer located east of Montreal that is supplying utility scale wind turbines for the North American market. A project that we recently completed in the Northeast region of the US was for the Town of Portsmouth, Rhode Island. In the RFP, the Town of Portsmouth requested a turnkey proposal for a 1.5 MW wind turbine installation. Since our core business is manufacturing, we needed to subcontract various aspects of the balance of plant, such as the geotechnical and site engineering work.

GZA GeoEnvironmental was able to provide the geotechnical and site engineering services that were needed for this project in a timely and professional manner. After doing the borings needed for the soil analysis, they provided a thorough report that was furnished to the foundation engineer who was able to use it in order to produce the final design of the foundation. They were also proactive in communicating directly with the foundation engineer, so he knew exactly what was needed at the site.

Furthermore, GZA provided the engineering and site plans that depicted all the features needed to implement the wind turbine installation. Our specifications require certain grade elevations in order to successfully deliver the large wind turbine components to the site. These were incorporated in the plans, which allowed the project to proceed without interruption at a crucial stage when all the components were being delivered to the site.

Lastly, because the project took place at a high school, some of the construction had to be done during the summer months when the school was on break. As stated, GZA was able to provide the services needed in a timely and efficient manner so we were able to construct the foundation during this time period. This project, which was recently completed, is estimated to save the Town of Portsmouth approximately $4,000,000 over the life of the wind turbine. Thanks to the services of GZA the project was successful. I would highly recommend GZA GeoEnvironmental for future wind turbine projects.

Sincerely,

AAER USA, Inc.

Alexander Pichs
Regional Sales Manager, Northeast USA

Enclosure

Project Highlights

- Completed wetland delineation services for a 2.5 mile access roadway system. The roadway crossed over several streams and was located near sensitive wetland resources.
- Completed and presented Notice of Intent permit applications for the construction of the access roadway that crossed through two Towns.
- Completed and presented an Environmental Notification Form and two Notice of Project Change applications pertaining to the Massachusetts Environmental Policy Act. These applications were needed to present several development options for the proposed wind power facility.
- Performed construction monitoring services during the construction of the access roadway and the two replacement wetlands in support of environmental compliance requirements.
- Completed wildlife habitat assessments in wetland resources pertaining to performance standards of the Massachusetts Wetlands Protection Act.

Environmental Permitting Services, Berkshire Wind Power

HANCOCK, MASSACHUSETTS

GZA completed environmental permitting related services for Distributed Generation Corporation in support of a 15 Megawatt Wind Power Facility in Hancock, Massachusetts. GZA completed numerous wetland delineations over a 400 acre area, which included wildlife habitat evaluations. Additional permitting requirements included the filing of an Environmental Notification Form and two Notice of Project Change applications to demonstrate the potential development options for constructing the wind power facility. GZA was also responsible for providing supporting documentation demonstrating environmental compliance and presenting development options in two permit appeals, which resulted in permits being issued by the Massachusetts Department of Environmental Protection allowing the wind power facility to commence.

GZA was instrumental in providing compliance monitoring services during the construction of the access roadway including stormwater management implementation and monitoring. GZA conducted several site inspections for the Massachusetts Department of Environmental Protection Staff to ensure the projects compliance with applicable permits. Weekly reporting was provided during the active work period. GZA also designed and monitored the construction of two replacement wetlands that were required to mitigation for impacts to wetland resources.

Project Highlights

- Met Client Schedule and Budget Requirements
- Presented Constructible Solutions for Wind Turbine Foundations

Locust Ridge II Wind Farm
Geotechnical Assessment
SHENANDOAH, PENNSYLVANIA

GZA was retained by Iberdrola to complete a subsurface exploration program and provide geotechnical engineering recommendations for design and construction of foundations for a proposed 50+ wind turbine project.

The subsurface exploration consisted of 50+ test borings, each made near the approximate location of a proposed wind turbine, and over 20 test pit excavations. The topography across the area varied widely and access to the boring/test pit locations was difficult. The area can generally be described as mountainous with access through mining or lumber field paths. Our preliminary data research noted that overburden thickness would also vary across the proposed area, from near surface to about 20-feet thick. GZA:

- Coordinated the subsurface exploration program;
- Retained a test boring subcontractor to complete the subsurface exploration and coordinated and oversaw this work;
- Performed soil electrical resistivity testing at each boring locations;
- Completed 20+ test pit explorations and CBR field tests;
- Reviewed and assessed the test boring and test pit exploration logs;
- Submitted selected soil samples to our soils laboratory for index testing and tested rock core samples for compressive strength;
- Submitted numerous samples for thermal resistivity testing;
- Made geotechnical evaluations based on the subsurface conditions encountered and our understanding of the proposed project; and
- Prepared a geotechnical assessment report summarizing the findings of the subsurface explorations and laboratory testing program and presenting geotechnical design and construction recommendations for the wind turbine foundations.

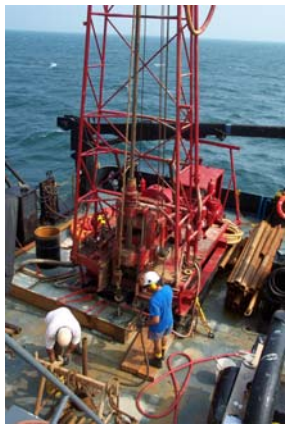
Project Highlights

- Cape Wind Energy Project will be the first offshore wind farm in the United States.
- On average the wind farm will produce enough electricity to power three-quarters of Cape Cod and the Islands.
- Successful project with difficult combined geotechnical and marine issues
- All Health and Safety Objectives were successfully met on a logistically complicated project.

Cape Wind Energy Project

NANTUCKET SOUND & CAPE COD, MASSACHUSETTS

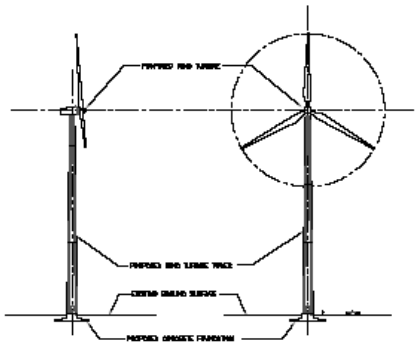
Waterside Facilities. Upon completion, the Cape Wind Energy Project will be the first offshore wind farm in the United States. The proposed site covers approximately 22 square miles and is located on Horseshoe Shoal in the Nantucket Sound, approximately 9 miles east of Martha's Vineyard, 6 miles south of Cape Cod and 14 miles north of Nantucket. The wind farm will consist of 130 wind turbines spaced approximately half a mile apart, supported on 16 foot diameter monopile foundations embedded approximately 75 feet below the sea floor. During average wind conditions, the wind farm will produce enough electricity to power three-quarters of Cape Cod and the Islands with clean, renewable energy.



To prepare for the proposed 2005 wind farm construction start date, Cape Wind Associates LLC asked GZA to perform two preliminary geotechnical investigations at the site to evaluate the subsurface conditions across Horseshoe Shoal. The first investigation, completed by GZA in May 2002, consisted of three borings, and included one boring at the Meterological Tower location. The 196-foot MET tower has now been constructed and is powered by both solar and wind energy and measures wind conditions at three different elevations in order to predict performance of the proposed wind farm. The second investigation, completed by GZA in October 2003, included thirteen 100- to 150-foot borings across the site to be used for preliminary design of the wind turbine foundations. Pressuremeter tests were completed in order to predict displacement and lateral loading within the different soil strata. Due to the massive lateral loads and constant dynamic interaction, the geotechnical investigations will play a critical role in design and construction of the foundations.

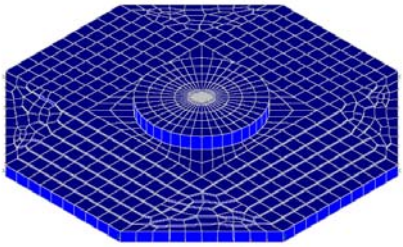
Landside Facilities. The project also included an overland cable route from Lewis Bay to a substation in Barnstable. The approximately 6-mile transmission line alignment required four significant cable crossing locations. Cape Wind Associates engaged GZA to perform geotechnical studies at each crossing location and provide engineering consultation regarding appropriate trenchless technologies.

GZA completed the first phase of work in 2004. This phase included preliminary borings, evaluation of applicable construction technologies to install cable crossings, and development of the geotechnical report. A second Phase of work consisted of additional subsurface investigations, discussions with permitting agencies and contractors, and development of trenchless technology approaches to be utilized. The subsurface conditions and configuration at each crossing is significantly different. Soil conditions range from uniform outwash sands to Glacial Moraine containing varying amounts of silt to boulder size material. The length of crossings ranges from 150 feet to hundreds of feet with horizontal curves.



Project Highlights

- Complete subsurface investigation, analysis and foundation design services
- Test borings revealed very dense glacial till over bedrock.
- Engineering evaluations showed feasibility of mat foundations bearing on till or rock.
- Evaluated foundation for structural stability and fatigue
- Designed reinforced concrete mat foundations in accordance with Turbine supplier requirements



RISA 3-D Foundation Model

Confidential Client
Beaver Ridge Wind Turbine Foundation Investigation and Design
FREEDOM, MAINE

GZA provided complete geotechnical investigation and foundation design services for three new 262-foot high, 1.5 MW wind turbines on Beaver Ridge in Freedom, Maine.

A program of test borings was used to investigate subsurface soil, bedrock and groundwater conditions at the three proposed foundations. The borings revealed up to 30 feet of dense glacial till overlying hard, slightly weathered metasiltstone. Subsurface investigation data were used to develop soil and rock properties for use in foundation design. Evaluations of the data resulted in a recommendation of mat foundations to support the structures.

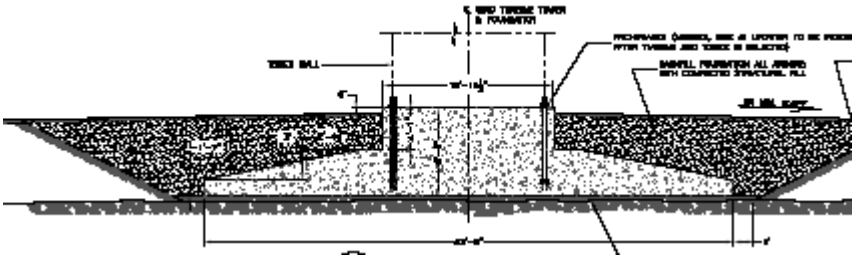
Foundation design evaluations were required to address codes and standards of the United States and Europe where those codes more appropriately address the unique vibration and fatigue issues associated with wind turbine foundation design. The general methodology included evaluation of limit states using partial safety factors.

It is estimated that about 10^8 fatigue cycles will occur over the 20-year design life. GZA fatigue analyses included a check of all foundation components, including concrete, rebar, and anchor bolts in accordance with the resistance factors specific to each component.

Structure stability evaluations were made of the mat foundations under both normal operating and extreme loading cases. Appropriate factors of safety were confirmed for overturning, base sliding, base rotation and allowable subgrade contact pressure. Settlement analyses evaluated total settlement, differential settlement, inclination, and foundation system stiffness.

Design of the reinforced concrete mat and was completed with the help of GZAs in-house structural engineering staff and analysis tools including RISA 3D and MathCAD. The final design deliverable including sealed plans and supporting calculations.

GZA anticipates providing construction phase services for the project including observation of subgrade preparation, reinforcing steel and concrete, and consultation regarding construction dewatering and earthwork.



Typical Foundation Section

Project Highlights

- Met Client Schedule and Budget Requirements
- Presented Constructible Solutions for Wind Turbine Foundations that Involved Soil Improvement with Deep Dynamic Compaction

Highland Wind Farm – Geotechnical Assessment

DUNLO, PENNSYLVANIA

GZA was retained by EverPower Renewables, Inc to complete a subsurface exploration program and provide geotechnical engineering recommendations for design and construction of foundations for a proposed 30 +/- wind turbine project.

The subsurface exploration consisted of test borings and electrical resistivity testing at each of the proposed wind turbine locations, plus we completed multichannel analysis of surface wave (MASW) profile along three sections. The topography across the area varied widely and access to the boring/test pit locations was easy to difficult. Ten (10) turbine locations were along a mountain ridge with access through a cleared path. Fifteen (15) turbine locations were in mine spoil areas (the result of strip mining for coal). Our preliminary data research noted that overburden thickness would vary across the proposed area, from near surface to about 100-feet thick. GZA:

- Coordinated the subsurface exploration program;
- Retained a test boring subcontractor to complete the subsurface exploration and coordinated and oversaw this work;
- Performed soil electrical resistivity testing at each boring locations;
- Reviewed and assessed the test boring logs;
- Submitted selected soil samples to our soils laboratory for index testing and tested rock core samples for compressive strength;
- Submitted numerous samples for thermal resistivity testing;
- Made geotechnical evaluations based on the subsurface conditions encountered and our understanding of the proposed project; and
- Prepared a geotechnical assessment report summarizing the findings of the subsurface explorations and laboratory testing program and presenting geotechnical design and construction recommendations for the wind turbine foundations.

Turbine foundations were recommended to be a shallow mat foundation (generally about 10-feet thick) constructed on either natural medium dense to very dense overburden soils, bedrock or mine spoil that had been improved via deep dynamic compaction.

RIWINDS Study

Client: Rhode Island Economic Development Corporation

Project Features

- Wind turbine foundation design
- Cost Estimating
- Feasibility Study

Reference

Rhode Island Economic Development Corporation

Cost: $25,000

Year of Completion: On-going

The State of Rhode Island established the RIWINDS Program to promote the development of wind energy in the State. The goal of the RIWINDS Program is to produce 15 percent of the States overall electrical demand by wind turbines. The Rhode Island Economic Development Corporation (RIEDC) commissioned the RIWINDS Wind Energy Siting Study to study the feasibility of meeting the States wind energy generation goal. The scope of the study was to evaluate the entire State of Rhode Island including upland and offshore areas, to identify the most viable areas for wind energy development and assess the potential energy generation associated with these areas.

Maguire Groups role in the RIWINDS Study included preliminary design and cost estimating for the civil and structural components of the onshore and offshore turbines. Preliminary design of the offshore foundations for the 3.6 MW wind turbines included establishing wave design criteria and analyzing various foundation types. A large diameter mono-tube pile foundation was selected due to proven constructability at European wind farms and relative ease of installation in the extreme offshore sea conditions. The preliminary foundation design established the screening criteria for a maximum water depth of 75 feet. Construction cost estimates were prepared by Maguire for use in the financial analysis of the various sites.

In April 2007 the Phase I: Wind Energy Siting Study was presented to the State. The Study identified one onshore and ten offshore areas with the potential to be viable sites for wholesale wind energy production. The cost to generate electricity from wind turbines at these areas appears to be competitive with the projected cost of electricity in Rhode Island. The potential sites identified in the study could meet and exceed the States 15 percent wind turbine generation goal.

Lumus Construction
Wind Turbine Projects

Client: Lumus Construction

Project Features

- Electrical design
- Civil design
- Environmental management

Reference

Sumul Shah
Lumus Construction Inc.
56 Cummings Park
Woburn, MA 01801
781-935-5600

Year of Completion: On-going

Maguire Group is providing design services to Lumus Construction to support their Design-Build Wind Turbine Projects. Maguire is providing civil, environmental and electrical engineering services to support the construction of up to 1.5 Mw wind turbines with towers up to 75 meters. Civil and environmental design services including preparation of layout plans and writing soil management and Health and Safety plans for sites that may impact contaminated soil. Electrical engineering services include preparation of electrical drawings and obtaining interconnection approval from the electrical utility companies.

Maguire provided electrical engineering services for the recently completed 600 Kw wind turbine that was recently completed at the Mark Richey Woodworking Company in Newburyport Massachusetts. Maguire is working with Lumus on the following on-going projects:

- Massachusetts Water Resources Authority (MWRA): Installing two 600 kW wind turbines at the Deer Island Treatment Facility.
- Cohasset Heights: Installing two 1.5mW wind turbines.
- Raytheon Company; Installing two 600kW wind turbines at Raytheon's Portsmouth, RI facility.

Wind Energy Environmental Services

Qualifications and Experience

Prepared by

Pandion Systems, Inc.
4603 NW 6th Street
Gainesville, FL 32609
(352) 372-4747
www.pandionsystems.com

April 1, 2008

Introduction

Pandion Systems, Inc. is pleased to present its wind energy qualifications and experience. Pandion team members have been at the forefront of environmental issues related to power generation since 1970. With experience related to more than 40 protected species, we are unique in our ability to provide ecological and wildlife services to the utility and wind industry. We are actively involved in AWEA and the NWCC Wildlife Working Group and Risk Assessment Subgroup, and have provided services to CalWEA and APLIC. Staff members Crissy Sutter and Jim Newman have specific expertise in assessment and mitigation of effects on bats, whooping cranes, raptors, and other wildlife from wind turbines, power lines, and other utility structures. Greg Forcey is an ornithologist with particular expertise in wind monitoring study design and GIS analysis of wind radar data.

Our staff of biologists, ecologists, and communications specialists provide a full range of ecological and communications services to meet your needs for wind energy – from ecological assessments and agency consultation to public participation and education.

Pandion provides high quality reliable wildlife consulting services. We design solutions based on good science and innovative approaches that represent the interests of the client and the natural resources. Pandion Wind Energy Environmental Services carry a project from speculation through to operations:

- Prescreening of potential wind sites for wildlife and natural resource issues
- Custom prescreening tool for bat likelihood
- Interpretation and implementation of wind policy guidelines
- Pre-construction and operations monitoring
- Agency consultation and coordination
- Wildlife and ecological risk assessments
- Mortality reduction strategies
- Regulatory compliance, mitigation, and permitting (ESA, MBTA, BGEPA, NEPA)
- Expert witness testimony and technical support
- Environmental communications and education
- Public participation and meeting facilitation

The following are examples of Pandion's approach to providing these services to the Wind Industry.

Prescreening for Natural Resources

Undetermined ecological conditions at a prospective site can increase development risk. Pandion's suite of GIS-based screening tools reduces your risk by evaluating the likelihood of occurrence of wildlife, natural, cultural, and historic resources. This cost-effective process provides opportunities to avoid impacts to significant resources when site planning is still flexible. It can also provide the foundation for agency consultation and be the basis for a formal risk assessment.

Pre-Construction and Operations Wildlife Monitoring
Pandion biologists are recognized experts in the field of protected species, including passerines, raptor, shorebird, wading birds, and waterfowl. Pandion has specialized bat monitoring expertise includes acoustic, roost, and mist netting surveys for bats, as well as use count, presence/absence, and nesting surveys for birds. We design studies with the end use in mind, ensuring that data is both reliable and relevant in regulatory compliance – saving you time and money.

Risk Assessment for Birds, Bats, & Wildlife
Risk assessment evaluates the likelihood that adverse effects may occur or are occurring as a result of exposure of wildlife to wind energy structures. Pandion experts understand this specialized field of study and provide clients with the confidence of sound results. For the Chautauqua Wind Project in New York, Pandion biologists developed the first quantitative avian risk assessment model that estimated the birds at risk and/or potentially killed by wind turbines. Pandion serves on the NWCC's Risk Assessment Subgroup

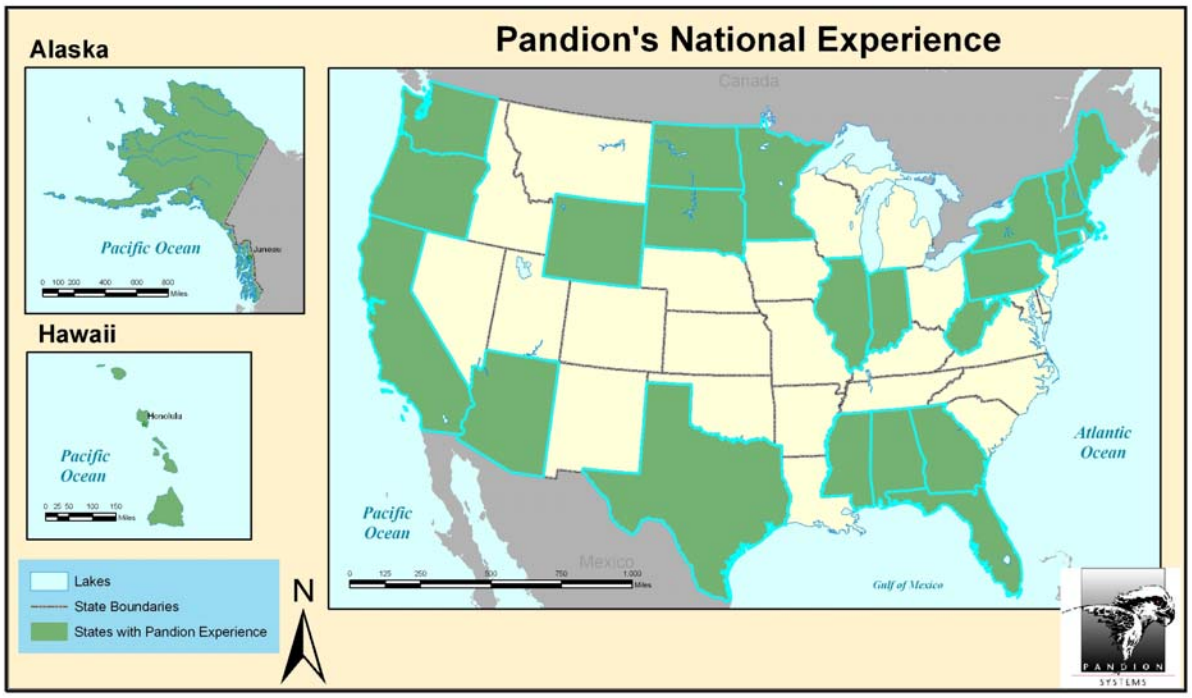
Communications & Education
As wind energy expands to meet renewable energy targets, there is an increasing need to address social issues and communicate key messages about wind energy. Pandion's multi-disciplinary professionals understand both the ecological and social issues of wind energy. We specialize in creating and implementing innovative programs that reach and affect specific target audiences. In addition, our staff are certified in public participation and meeting facilitation, with over 20 years experience.

Profile of Pandion Systems, Inc.

Pandion Systems, Inc. is an environmental science, research, communications, and training company with special expertise in providing ecological services to the utility industry, especially as related to wildlife and protected species. We address environmental challenges with creative, timely, and cost-effective solutions, while recognizing the essential importance of conducting scientifically-based studies. Our professional staff use the latest technology and methods in study design and data analysis to ensure quality results.

Pandion was founded in 1997 with the goal to work on projects that focus on interactions between people and natural systems. We are committed to finding ways to promote the exchange of accurate information and feasible solutions so that individuals and organizations can make the best decisions for the environment and society.

Our presence in New York, Florida and Texas enables Pandion to serve utility and wind energy clients nationally with regional expertise in the northeast, southeast, and southwest. The figure below shows the breadth of Pandion's national experience. Our international experience includes Canada, Mexico, Caribbean, Central Europe, and Southeast Asia.



Pandion Clients' Performance Evaluation

Clients know that Pandion will find answers and innovative solutions that are scientifically based. In a recent survey of all past clients, over two-thirds responded that Pandion's expertise, technical knowledge, and science-based approach make us different from our competitors. The other third of the respondents said that Pandion's personable, accommodating, and adaptable service is the key differentiating factor from competitors.

This survey indicated client loyalty where 100% of our past clients said they would hire Pandion again and recommend Pandion to others. Pandion delivers scientifically based high quality services that meet the needs of our clients.

Pandion Client Testimonials

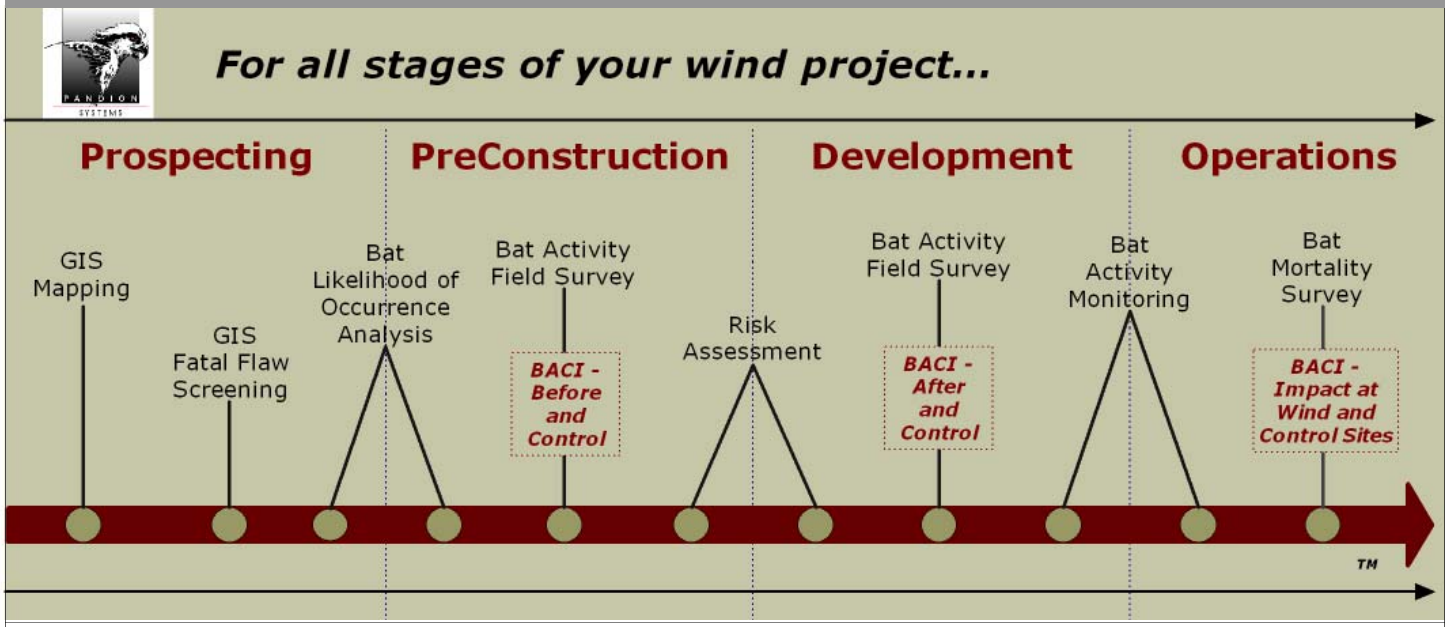
"Competent, adaptable, cooperative"

"The very knowledgeable staff is also very personable. Pandion proposed a very unique project, followed through with their projected methodology, finished in a timely manner, and kept to the budget."

"Excellent technical knowledge and experience in a very specialized area."

Further information about Pandion is available on our web site at www.pandionsystems.com.

Bats and Wind Energy Services



One-Stop Services to Assess Bats at Wind Resource Areas

GIS Mapping

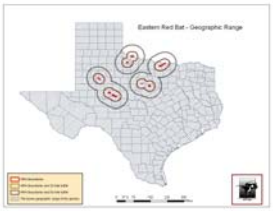
GIS mapping identifies the locations and types of ecological resources on the prospective site. This addresses the potential for fatal flaws and reduces developer risk.

GIS Fatal Flaw Screening

Pandion's expanded GIS screening includes supportive text and guidance from biological experts along with the maps ecological resources.

Bat Likelihood of Occurrence Analysis

This analysis determines the likelihood of bat occurrence at prospective sites and provides a site specific report with detailed species information and relative risk levels. Useful in agency consultation and site planning.



Risk Assessment

Pandion performs a formal risk assessment based on site specific characteristics and field data. Our risk assessment report yields an estimate of the effects that the Wind Resource Area is likely to have on bats and their populations. Useful in agency consultation and permitting.

Bat Activity Field Survey (BACI)

Pandion uses proven techniques for onsite field surveys for bats, including acoustic, roost, and netting surveys. At pre-development this survey provides baseline data, including presence/ absence, activity levels, and patterns. During development this survey provides change detection from pre-development levels. Useful in agency consultation, site planning, permitting, and mitigation.

Bat Activity Monitoring

Onsite monitoring of bat activity within the rotor swept zone of the turbines addresses "biological significance." It provides relative measures of bat activity within and beyond the turbine rotor swept zone. Useful in agency consultation, permitting, and mitigation.

Bat Mortality Survey (BACI)

Pandion conducts field searches for bat carcasses with corrections for scavenger and observer bias. These surveys provide an accurate measure of the number of bats killed, species affected, and distribution across the wind resource area. Useful in agency consultation, permitting, and mitigation.

Pandion Systems, Inc.
Crissy Sutter, MS Senior Ecologist (352) 372-4747 csutter@pandionsystems.com

Specific Project Experience

Avian Risk Assessment, Avian Protection Plan, and Habitat Conservation Plan for the Horse Hollow Wind Farm

FPL Energy

Pandion developed a risk assessment model to evaluate the likelihood of risk of the federally-endangered avian species to exposure to tall structures (wind turbines) based on collisions and habitat loss, habitat fragmentation, and increasing edge effects. Pandion is currently writing an avian protection plan to address potential collision mortality and habitat loss and fragmentation and secondary effects.

Avian Protection Plan

Florida Power and Light

Pandion developed an Avian Protection Plan to provide a single resource containing all company policies, guidance, and procedures; all international, national, and state laws and regulations; and the responsibilities and requirement those regulation place on FPL and its employees. This document addresses all species covered under the MBTA and ESA and Florida Endangered Species Act.

Synthesis of Electricity Generation Impacts to Wildlife

NYSERDA

Pandion Systems and Environmental Bioindicator Foundation (EBI) were recently selected by the New York State Energy Research Foundation (NYSERDA) to conduct a systematic analysis and comparison of wildlife effects from conventional energy and wind energy technologies. The analysis and comparison will include project life cycle analyses of known effects to wildlife. This analysis will be prepared in a format that policy makers, decision makers, environmental organizations, and the general public can understand.

Bat and Wind Turbines White Paper

Florida Power and Light

Pandion Systems wrote a white paper to review the relevant information on 17 eastern species of *vespertilionid* bats and their associated mortality with wind energy facilities. The paper included relevant research on bat natural resource history, bats and wind energy facilities, risk factors for bats and wind turbines, environmental laws and policies associated with bats, recommended research and monitoring needs, and pertinent references. The client will use the paper during consideration of proposals for a new wind turbine facility.

Ecological Risk Assessment: A Framework for Wildlife Assessments at Wind Energy Facilities

National Wind Coordinating Committee

Dr. Newman along with members of the NWCC Wildlife Workgroup Risk Assessment Subgroup developed a "white paper" on the application of ecological risk assessments to wind projects.

Avian Risk Assessment for Wind Demonstration Project

Florida Power and Light

Pandion prepared the wildlife portion of an Environmental Assessment for the first project of its kind in Florida in coordination with the client, Kennedy Space Center, Merritt Island NWR, and the USFWS. This included an avian risk assessment, literature search, and related avian studies to predict bird abundance and mortality for a suite of avian species. The assessment was to be followed by field studies of bats, indigo snakes, and rare plants, as well as assistance with wildlife and endangered species related permits. However, the assessment resulted in a decision to discontinue the project at this site and consider another location.

Assessment of Bat Occurrence at 8 Proposed Wind Resource Areas

FPL Energy

Pandion compiled and analyzed information to rank the likelihood of bat use and bat abundance at each of the proposed WRAs within ten counties of central and north Texas to detect sites with an elevated likelihood of affecting bats. Literature and research included published literature and interviews with Texas Parks and Wildlife Department, Texas Speleological Survey, and the National Speleological Society. Additionally, spatial interpretation and analysis of aerial photography, vegetation classification systems, wetlands, topography, and hydrology was conducted to assess the on-site conditions of each WRA in regards to bat roosting and foraging habitat. Pandion created a map of bat species ranges in Texas for each species, based on review of multiple sources of localities records.

Avian Risk Assessment for Chautauqua Wind Project

Jasper Energy LLC

Pandion developed an ecological risk assessment methodology to predict the impacts of a proposed wind turbine project along Lake Erie on migrating birds, in particular migratory raptors and songbirds. Pandion developed the monitoring protocol for the fall migration period and worked with the field personnel to collect the appropriate data. Pandion has taken the monitoring data and used it with known literature on avian mortality from wind turbines to develop the first wind turbine avian risk model that estimates the number of birds at risk and/or potentially killed by wind turbines. Pandion assessed compliance with state and federal regulations (ESA, NEPA, MBTA, and BGEPA) and prepared an Environmental Assessment. Pandion wrote the scope of work for the project and assisted with writing the risk assessment for presentation to Federal and State agencies reviewing the project.

APLIC Suggested Practices for Protecting Raptors and Other Birds on Power Lines

Pandion was contracted by APLIC to conduct a literature review, synthesis, and revisions to a 1996 report on the risk to birds from power lines. Specifically, Pandion was asked to review the literature and expand the information on the risk of electrocution to non-raptors such as wading birds. The review and synthesis focused on the behavior of the birds and nesting characteristics that increase the risk for electrocutions. The document's target audience was for the utility industry.

Avian Protection Plan for Stormwater Treatment Areas

South Florida Water Management District

Pandion is preparing an Avian Protection Plan (APP) for Black-necked Stilts and Burrowing Owls in the Everglades Construction Project Stormwater Treatment Areas. Met with District staff for initial meetings and an APP workshop that included USFWS representatives. Performing a literature search and review of existing data and resources. Writing and preparing the APP as well as providing guidance to the District. The APP includes a risk assessment methodology, and addresses construction design standards, operation and maintenance design standards, mortality reduction measures and avian enhancement, training and public awareness, and an avian reporting system, permit compliance, and quality control.

Wood Stork Colony Protection Plan

Sea Island Company

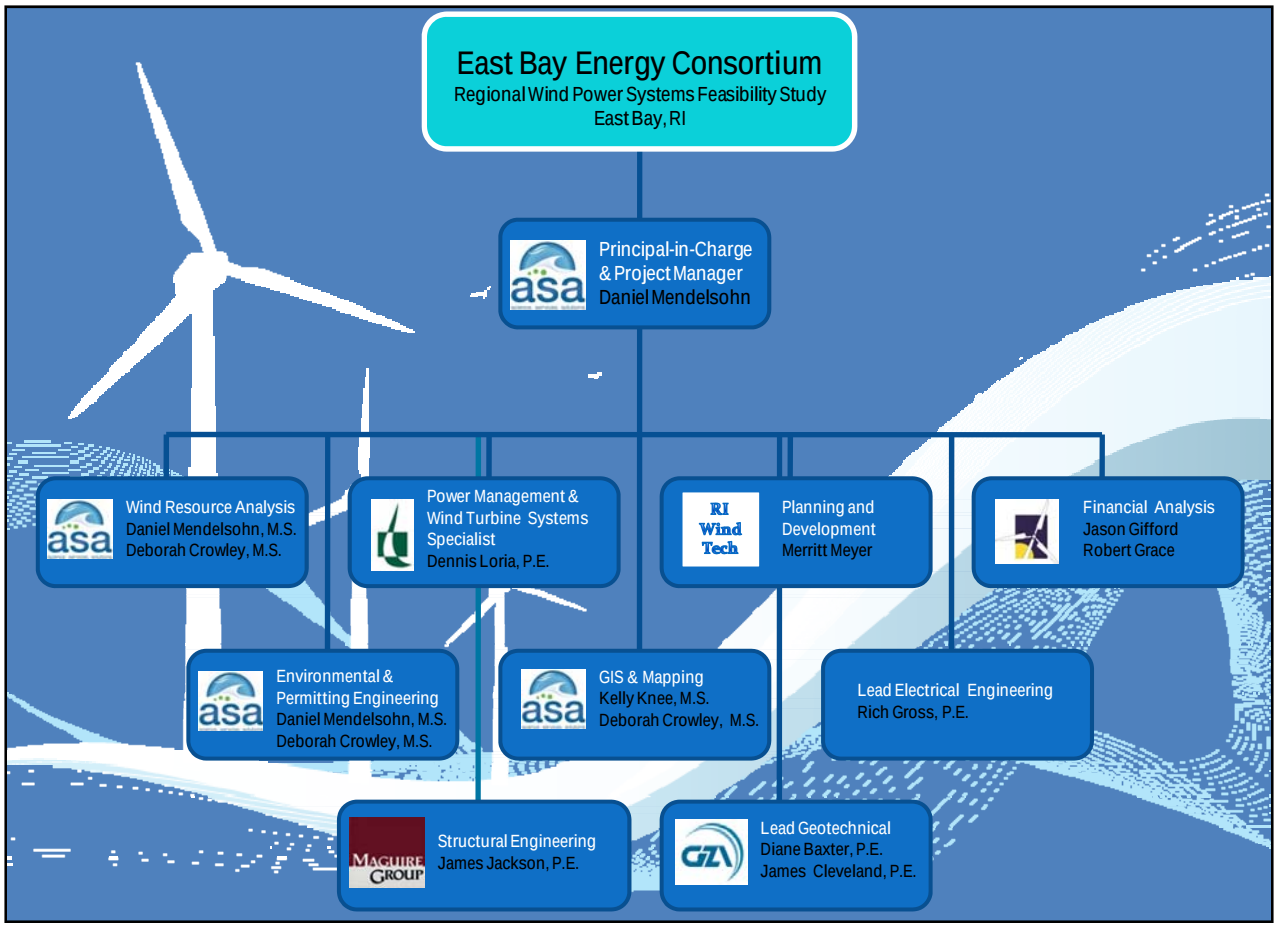
Pandion is designing educational materials for protection of a wood stork colony and associated wetlands and protection zones in a new residential development on St. Simon's Island, GA. The materials are targeted at construction workers, homeowners, and realtors. In addition to wood stork biology and protection, messages include: no entrance into primary zone, development design standards and covenants in the secondary zone, and compatible co-existence with wood storks through conservation and management.

Whooping Crane and Wind Farms White Paper

Pandion prepared a brief whitepaper on a Whooping Crane flock that is known to migrate from Texas to Canada through North Dakota. The white paper documents known information on Whooping Cranes, including factors that affect behavior and flight patterns and documents sitings in and around a proposed wind farm in Oliver County, ND. It also includes an assessment of risks that the proposed wind farm could present to migrating whooping cranes.

ORGANIZATIONAL CHART

The Key Personnel on the Project Team are all leaders within their respective discipline. Responsibilities will be assigned as shown below.



PERSONNEL QUALIFICATIONS

- Principal-In-Charge & Project Manager | ASA – Daniel Mendelsohn, M.S. is a Senior Principal at ASA as well as the Energy Resources Group Director. He provides 25 years of experience in the energy, environmental, and modeling fields. Mr. Mendelsohn has worked on numerous wind energy feasibility and development projects including serving as Principle-in-Charge and Engineer for the RIWINDS project to assess the feasibility of producing 15% of the state's aggregate electrical demand from wind generation and numerous municipal wind feasibility projects.

- Power Management & Wind Turbine Systems Specialty | Loria Emerging Energy Consulting – Dennis Loria, P.E. has focused his 25 years of diverse engineering experience managing complex and strategic power projects on the development of renewable energy projects. Mr. Loria is our turbine specialist and has lead many wind turbine siting and sizing projects throughout the area. He is well-versed in turbine technology and specifications.

- Planning & Development - Mr. Merritt Meyer, an architect and planner is also a founder/director/officer of the Rhode Island Wind Alliance, a not-for-profit organization that advocates the use of renewable sources to generate electricity and an integral part of the Bristol, RI planning community.

- Lead Electrical Interconnection Engineering – Rich Gross, P.E. is an electrical power systems engineer specializing in technical analyses and feasibility studies related to the integration of generation projects to electric utility distribution and transmission systems. Comprehensive background in the electric utility industry gained through more than 25 years of power system planning, design, and construction of electrical substations, transmission interconnections, and distribution systems. Mr. Gross is a Licensed Professional Engineer in the states of Massachusetts and New York.

- Financial Analysis | Sustainable Energy Advantage, LLC – Robert Grace and Jason Gifford of SEA have over 30 years combined experience in financial analyses of prospective wind and other power projects. SEA has direct and detailed experience developing and analyzing pro forma economic models of community-scale Wind power projects. Prior to joining SEA, Jason Gifford managed economic feasibility analyses for the Massachusetts Renewable Energy Trust's Community Wind Collaborative. As Industry Investment and Development Manager, Mr. Gifford focused on project financing for Community-scale wind power plants, including developing relationships with prospective corporate an institutional owners, wind project developers and municipal land owners to create unique ownership, financing and brand equity opportunities for all participants. Mr. Gifford continues this work focus at Sustainable Energy Advantage, having recently completed several economic feasibility models and analyses for community-scale wind power projects in both Massachusetts and Rhode Island.

  Robert C. Grace, president of Sustainable Energy Advantage, is a leader and innovator in technical and policy analysis of renewable energy markets and developing markets, opportunities and infrastructure for bulk renewable electricity supply. Trained as an interdisciplinary analyst in energy and environment, he has accumulated a diverse experience base over 22 years in the electricity industry, including working with a broad range of stakeholders and a diverse array of functions. He specializes in multi-stakeholder activities addressing complex and cutting edge challenges, and is known for doing so in a comprehensive, credible, creative and balanced manner. He is a frequent public speaker, author of several business plans, market assessments, RFPs, and policy white papers, and a regular participant in committees/workshops probing issues shaping the renewable power landscape in a competitive market environment.

  Mr. Grace previously headed up green power activities at AllEnergy Marketing Company, and was a Principal Analyst specializing in wholesale power marketing and industry restructuring for New England Power Company. Earlier, Mr. Grace served as a Senior Analyst for LaCapra Associates, supporting over 20 clients in the electric and gas utility sector. Mr. Grace holds a M.S. in Energy & Resources from U.C. Berkeley, and an Energy Studies B.S. from Brown University.

  Jason S. Gifford, project manager at Sustainable Energy Advantage, has over ten years of experience in the development of renewable energy policy in restructured electricity markets, market and financial analysis, REC market policy and development, and the development of community-scale renewable energy projects. Prior to joining Sustainable Energy Advantage, Mr. Gifford served as Industry Investment and Development Manager at the Massachusetts Technology Collaborative's Renewable Energy Trust. At MTC, Mr. Gifford focused on project finance, community-scale renewable energy development, and investment-related financial analysis and due diligence for the Renewable Energy Trust. From 1998 to 2002, Mr. Gifford was Manager of Regulatory Affairs and Business Development at Green Mountain Energy Company, where he led the Company's public policy efforts in PJM, Ohio and New England, and negotiated a contract to serve the nation's largest residential electric consumer aggregation. Jason Gifford holds a B.A. in Political Science from Bates College and an M.B.A. in Finance and Entrepreneurship from Babson College.

- Lead Environmental Engineering & Permitting | ASA – Daniel Mendelsohn, M.S. has more than 25 years experience in the implementation and management of engineering analyses, modeling studies, environmental impact assessments, resource assessment studies, site assessment and feasibility studies, field monitoring programs, data analysis, permitting issues and support to the energy industry. He has developed and applied numerous computer simulation models to address engineering problems in the environment, including hydrodynamics, meteorology, wind resource assessment, solar energy, water quality and pollutant transport and fates. Mr. Mendelsohn has completed the adaptation of a research mesoscale atmospheric model to operational status for the calculation of surface winds in the presence of complex coastal topography and integrated the system in a Geographical Information System (GIS) based, graphical user environment. His focus now is on the conceptual design, feasibility, planning and development of renewable energy system projects for

electric power cooperatives, municipalities, state government agencies, resort developments, and the offshore wind energy project development.

Deborah Crowley, M.S. is a natural resources engineer and numerical modeler with Applied Science Associates (ASA). She has experience in wind resource analysis, hydrodynamic, mass transport and water quality modeling. She has recently been involved with many renewable energy projects including wind turbine siting, turbine power production and site capacity analysis, environmental impacts assessment, visualization and regulatory, permitting and zoning issues.

- Lead Geotechnical/Structural Engineering | GZA - Diane Y. Baxter, Ph.D., P.E. joined GZA in 2000 as a geotechnical engineer for a variety of geotechnical, marine, and environmental engineering projects. She has acted as field engineer, project engineer, and project manager, and has experience providing foundation recommendations, geotechnical site investigations, construction monitoring, earth support system design, seepage analysis, liquefaction analysis, and slope stability analyses. Prior to joining GZA, Dr. Baxter has worked for Metcalf & Eddy Inc. in Wakefield, Massachusetts and James K. Mitchell in Blacksburg, Virginia on a variety of geotechnical and environmental consulting projects. Experience included finite element analysis, settlement analysis, dam inspections, specification preparation, drilling supervision, and well sampling.

  James Cleveland, P.E. is an Environmental Engineer and Senior Vice President with more than 30 years of managing multi-disciplined projects for government, industrial, process and power clients. He is the Energy Sector Leader for GZA. Energy work is GZA's fastest growing business sector and includes providing a broad array of services to electric, gas and communication providers. Projects include electric and gas transmission, renewable energy, MGP remediation, nuclear and hydroelectric assignments. Services include siting, permitting, risk management, remediation, and geotechnical/civil engineering services.

  GZA's approach to develop design and foundation recommendations will be to review available subsurface information including published geological data and in-house project information. From this data and anticipated turbine/tower loading requirements, the team will recommend preliminary foundation options for each site, and assess constructability of the cable runs.

- GIS & Mapping | ASA – Kelly Knee, M.S. is a water resources engineer and Geographic Information Systems (GIS) specialist with Applied Science Associates (ASA). She has a broad engineering and scientific background, including experience in water quality modeling, operational systems engineering, statistics, geographic information systems (GIS), hydrology, and numerical methods. Over her three years at ASA she has created custom GIS solutions for a range of projects including coastal flooding, pipeline spill management, and bathymetry data integration. Her visualizations of coastal flooding have gained national attention. Prior to joining ASA in 2004 she used a Fulbright Fellowship to study the impacts of sea level rise and storm surge flooding in the country of Mauritius.

  Deborah Crowley, M.S. is a natural resources engineer and numerical modeler with Applied Science Associates (ASA). She has experience in wind resource analysis, hydrodynamic, mass transport and water quality modeling. She has recently been involved with many renewable energy projects including wind turbine siting, turbine power production and site capacity analysis, environmental impacts assessment, visualization and regulatory, permitting and zoning issues.

At present, the ASA Team members have no projects that would adversely affect our ability to complete the tasks required for this project on schedule with the personnel we have proposed herein. The Project Manager and project staff can and will commit to providing the East Bay Energy Consortium with the required level of service along with the necessary resources to ensure timely completion of the East Bay Wind Power Feasibility study.

Successful completion of assignments given to ASA is a function of the dedication of a project team comprised of appropriately skilled technical professionals and superior project management. We believe ASA satisfies both these criteria.

Daniel Mendelsohn — Senior Principal | Project Manager

EDUCATION

M.S.	Mechanical Engineering and Applied Mechanics, University of Rhode Island	1988
B.S.	Mechanical Engineering and Applied Mechanics, University of Rhode Island	1982

QUALIFICATIONS

Mr. Mendelsohn has more than 25 years experience in numerical model development and application with a focus on environmental hydrodynamics, meteorology, water quality and support to the energy industry. His experience is in the implementation and management of engineering analyses, modeling studies, environmental impact assessments, site assessment and feasibility studies, field monitoring programs and data analysis.

He has developed and applied numerous computer simulation models to address engineering problems in the environment and has provided support to the public and private sector for environmental and permitting issues, environmental resource assessment and model prediction including meteorological, hydrodynamics and pollutant transport and fates. Mr. Mendelsohn has recently adapted a research mesoscale atmospheric model to operational status for the calculation of surface winds in the presence of complex coastal topography and integrated the system in a Geographical Information System (GIS) based, graphical user environment. His focus now is on the conceptual design, feasibility, planning and development of renewable energy system projects for electric power cooperatives, municipalities, state government agencies, resort developments, and the offshore wind energy project for the State of Rhode Island.

EXPERTISE

- Renewable energy resource assessment and feasibility studies
- Marine, freshwater and atmospheric environmental engineering
- Wind resource analysis
- Meso-scale meteorological modeling
- Wind-wave dynamics
- Environmental heat transfer and atmospheric thermodynamics
- Heat transfer and thermodynamics
- Numerical modeling of estuarine, coastal and ocean hydrodynamics
- Numerical modeling of river, lake and reservoir processes
- Water quality modeling
- Oil spill transport and fates modeling
- Geographic Information Systems (GIS)
- Graphical data display systems development
- Data acquisition systems

PROFESSIONAL MEMBERSHIPS & AFFILIATIONS

- American Geophysical Union
- American Society of Mechanical Engineers
- American Wind Energy Association
- Northeast Energy and Commerce Association
- American Society of Civil Engineers
- Rhode Island Society of Environmental Professionals
- Water Environment Federation
-

EXPERIENCE

Applied Science Associates, Inc. — **1985 - 2001 & 2008 to present**
Principal | Project Manager

Applied Technology & Management, Inc. — **2001 - 2008**
Northeast Regional Director / Energy Resources Division Leader

Project Manager or Senior Scientist in the following representative projects:

Rhode Island – Principal-in-Charge and project manager for the RIWINDS project for the Governor's Office of Energy resources, to assess the feasibility of producing 15% of the state's aggregate electrical demand from wind generation.

West Glocester,, RI – Principal-in-Charge and project manager for a siting study and follow on technical and economic feasibility study for a wind power system for the FM Global corporate research facilities.

North Kingstown, RI – Principal-in-Charge and project manager for a technical and economic feasibility study for wind power for the North Kingstown School Department at the Hamilton Elementary School and NK High School facilities.

Portsmouth, RI – Principal-in-Charge and project manager for a technical and economic feasibility study for wind power at the Town of Portsmouth Middle School and High School facilities.

Portsmouth, RI – Program review and evaluation as "Clerk of the Works" for the Town of Portsmouth wind turbine construction project at the Portsmouth High School facility.

Barnstable, MA – Principal-in-Charge and project manager for a technical and economic feasibility study and environmental impacts assessment for a wind power production facility for the Cape and Vineyard Electric Cooperative.

Plymouth, MA – Principal-in-Charge and project manager for a technical and economic feasibility study for wind power at the Plymouth County Correctional Facility. Project is part of a continuing services contract with Massachusetts Department of Capital and Asset Management (DCAM), in coordination with American Development Institute (ADI).

Boston, MA – Principal-in-Charge and project manager for a technical and economic feasibility study for renewable energy focusing on geothermal and wind power Spectacle Island in Boston Harbor. Project is part of a continuing services contract with DCAM, in coordination with ADI.

Boston, MA – Principal-in-Charge and project manager for a technical and economic feasibility study for renewable energy focusing on wind power for the Peddocks Island Eco-retreat re-development project in Boston Harbor. Project is part of a continuing services contract with DCAM, in coordination with ADI.

Salt Cay Development, Turks & Caicos – Project manager for the evaluation of the feasibility of implementing a stand alone, sustainable energy generation system to meet an estimated 10MW load for a proposed island resort and marina facility. The study focused on using proven technologies from the wind, solar and waste to energy (W2E) industries in addition to experimental ocean thermal energy conversion (OTEC) and sea water air conditioning technologies. An assessment was made of both the technical and economic feasibility of the energy system.

Jamestown, RI – Principal-in-Charge and project manager for a technical and economic feasibility study and environmental impacts assessment of wind power generation at three potential sites on Conanicut Island, for the Town of Jamestown.

Alyeska Pipline Service – Development and application of a meso-scale meteorological model system for the operational prediction of surface winds in complex coastal regions.

Prince William Sound, AK – Meso-scale meteorological model application to the hindecast of surface winds in the Sound following the Exxon Valdez oil spill.

Holbox Resort Development, Holbox Island, Mexico - Project Manager, technical and economic feasibility of implementing sustainable energy generators to offset the electrical energy needs for a proposed island resort. The study evaluated the use of renewable energy sources independently and in combination with conventional and emergency conventional sources of energy, focused on using proven renewable technologies from the wind, solar PV and thermal, and waste to energy industries.

PUBLICATIONS

Mr. Mendelsohn has authored or coauthored numerous journal articles, technical reports, and conference proceedings.

Deborah Crowley — Natural Resources Engineer

EDUCATION

M.S.	Civil & Environmental Engineering, University of Rhode Island, Rhode Island	2006
B.S.	Mechanical Engineering, Worcester Polytechnic Institute, Massachusetts	1996

QUALIFICATIONS

Ms. Crowley is a natural resources engineer and numerical modeler with Applied Science Associates (ASA). She has experience in wind resource analysis, hydrodynamic, mass transport and water quality modeling. She has recently been involved with many renewable energy projects including wind turbine siting, turbine power production and site capacity analysis, environmental impacts assessment, visualization and regulatory, permitting and zoning issues.

EXPERTISE

- Numerical modeling
- Hydrodynamic & mass transport modeling
- Water quality analysis
- Geographic information systems (GIS)
- Wind resource analysis
- Wind turbine siting
- Environmental Impact Assessments

EXPERIENCE

Applied Science Associates, Inc. **2009 to present**

- Hydrodynamic modeling
- Data analysis of oceanographic observations
- Wind resource and production analysis
- Regulatory review for wind energy projects

Resource Engineer, Applied Technology and Management (ATM), Newport, RI **2006-2009**

Data analysis of meteorological and oceanographic observations to support site characterization including wind resources analysis for wind energy projects, oceanographic and water quality data analysis for hydrodynamic and water quality modeling. Supported wind feasibility studies through site suitability analysis using GIS software, wind resource and turbine production estimates, regulatory analysis and assessment of project visual impacts through photo simulations.

Research and Teaching Assistant, University of Rhode Island (URI), Kingston, RI **2005-2006**

Field work to support watershed based water quality studies including flow gaging and water sampling and laboratory analysis. Oversaw hydraulics laboratory experiments used to teach undergraduate hydraulics engineering class.

Mechanical Engineer, Raytheon, Portsmouth, RI **1996-2005**

Analyzed electronic systems to determine the effect of thermal and structural loads on product survivability. Generated electronics packaging designs to optimize thermal and structural performance. Generated test plans to adequately assess products performance while subjected to testing loads simulating extreme environmental conditions. Analyzed test data to verify test validity and component performance.

Scientist in the following renewable energy representative projects:

RIWINDS Turbine Siting Study, State of Rhode Island – Analyzed wind resources onshore and offshore within the state of RI extending into federal waters abutting state limits. Site suitability analyses were performed using GIS software. Site capacity predictions were performed based on turbine characteristics and statistical profile of site wind resources.

Wind Power Feasibility Study, Portsmouth, RI – A technical and economic feasibility study for wind power at the Town of Portsmouth Middle School and High School facilities.

Wind Power Feasibility Study, Barnstable, MA – A technical and economic feasibility study and environmental impacts assessment including a visualization study for a wind power production facility for the Cape and Vineyard Electric Cooperative.

Wind Power Feasibility Study, Plymouth, MA – Project scientist for a technical and economic feasibility study for wind power at the Plymouth County Correctional Facility. Project is part of a continuing services contract with Massachusetts Department of Capital and Asset Management (DCAM), in coordination with American Development Institute (ADI).

Renewable Energy Feasibility Study, Boston, MA – Project scientist for a technical and economic feasibility study for renewable energy focusing on geothermal and wind power Spectacle Island in Boston Harbor. Project was part of a continuing services contract with DCAM, in coordination with ADI.

Holbox Resort Marina Flushing Analysis, Holbox Island, Mexico - The flushing characteristics of a proposed resort marina facility including a network of interior island canals were evaluated to determine if implementing a hydraulic connection across the island would provide sufficient basin and canal flushing while sustaining reasonable current velocities within the canals.

Renewable Energy Feasibility Study, Salt Cay Development, Turks & Caicos – Project scientist for the evaluation of the feasibility of implementing sustainable energy generators to meet the proposed island resort demand. The preliminary phase of this study evaluated the technical and economic feasibility of a variety of proven technologies including wind, solar and waste to energy (W2E). The second phase of this study focused on solidifying a viable concept design of a wind/diesel hybrid system capable of handling the resorts peak 10 MW load as well as maintain grid stability during periods of lower demands.

Renewable Energy Feasibility Study, Holbox Resort Development, Holbox Island, Mexico - Project scientist for evaluating the feasibility of implementing sustainable energy generators for offsetting the electrical energy needs for a proposed island resort. A technical feasibility study was performed which evaluated the implementation of renewable energy sources used independently or in combination with conventional energy to offset the developments estimated demand.

Wind Power Feasibility Study, Peddocks Island, Boston, MA – Project scientist for a technical and economic feasibility study for renewable energy focusing on wind power for the Peddocks Island Eco-retreat re-development project in Boston Harbor. Project was part of a continuing services contract with DCAM, in coordination with ADI.

REP Wind Farm, Plymouth Connecticut – Project engineer for the planning, layout and economic assessment for a small wind park in western Connecticut. The first phase of the project is focused the developing a proposal for funding of the project through the Connecticut Clean Energy Fund Grant program.

Wind Power Feasibility Study, Jamestown, RI – Project scientist for a technical and economic feasibility study and environmental impacts assessment including a visualization study for a wind power production facility at various candidate sites in Jamestown, RI.

Kelly Knee — Water Resources Engineer | GIS Specialist

EDUCATION

M.S.	Water Resources Engineering, Tufts University	2003
B.S.	Environmental Engineering, Tufts University	2001

QUALIFICATIONS

Ms. Knee is a water resources engineer and Geographic Information Systems (GIS) specialist with Applied Science Associates (ASA). She has a broad engineering and scientific background, including experience in water quality modeling, operational systems engineering, statistics, geographic information systems (GIS), hydrology, and numerical methods. Over her five years at ASA she has created custom GIS solutions for a range of projects including coastal flooding, pipeline spill management, and bathymetry data integration. She has also integrated many of ASA's water quality models into ArcGIS systems including OILMAP, AIRMAP, CHEMMAP, and SARMAP. Her visualizations of coastal flooding have gained national attention and her coastal risk analyses have been used for both educational and engineering purposes. Prior to joining ASA in 2004 she used a Fulbright Fellowship to study the impacts of sea level rise and storm surge flooding in the country of Mauritius.

EXPERTISE

- Flooding Simulation and Visualization
- Geographic Information Systems (GIS)
- Custom GIS tool development with ArcObjects
- Land-based oil spill modeling
- Cost-benefit analysis
- Water quality modeling
- Assessment and modeling of coastal flooding
- GIS data generation, management, and analysis

HONORS AND AWARDS

- Fulbright Fellow
- Member, National Engineering Honor Society (Tau Beta Pi)
- Member, Golden Key National Honor Society
- Professional Engineer in Training

EXPERIENCE

Applied Science Associates, Inc. **2004 to present**

Geographic Information Systems

- Design and implementation of custom ArcGIS tools for coastal flooding, pipeline spill management, bathymetry data integration, and water quality modeling
- Extensive GIS data acquisition on regional, national, and international scales in support of a variety of modeling projects including topography and flood elevations for coastal inundation modeling and topography, hydrography, and land cover in support of pipeline spill modeling.
- Processing of non-ESRI compatible data (e.g. NetCDF format) for import and analysis in GIS systems
- Management of large and complex datasets using ArcSDE including the National Elevation Dataset at both 10 and 30 meter scales and the National Hydrography Dataset at both high and medium resolutions.
- Data analysis, both manual and scripted, in support of a multitude of projecting including IOOS pilot projects for Naval Sea-basing and Marine Mammal Avoidance.
- Assisted in the update and management of a user-friendly environmental database and mapping system for Alaskan environmental data.
- Design of data delivery system for the Massachusetts Ocean Partnership's whale and fisheries data

Environmental Modeling

- Execute pipeline breach impact assessments by modeling the fate and transport of oil spills from new or redesigned pipeline systems using ASA's OILMAPLand system.
- Modeled potential oil spills from a series of proposed oil development around the world using ASA's stochastic OILMAP model to assess the potential impacts of the spills and define worst-case scenarios for further trajectory and fate modeling.
- Simulation and visualization of sea level rise and storm surge flooding for a variety of clients using a custom ArcGIS/Google Earth tool to easily visualize and animate potential flooding in a given area.
- Coastal risk analyses for industrial facilities including surge, seiche, and wave run-up.

Data Management, Mapping, and Analysis

- Designed custom bathymetry blending system to merge disparate bathymetry datasets into a single high-resolution dataset.
- Applied GIS techniques to estimate tidal flooding changes resulting from constriction removal in Gooseneck Cove, Newport, RI.
- Developed ArcObjects extension for determination of tidal boundary conditions for input into hydrodynamic models.

Course Instruction

- Conduct training courses in the use of oil, chemical, and search and rescue modeling using ASA's suite of water quality models, OILMAP, OILMAPLand, CHEMMAP, & SARMAP.

Fulbright Fellowship – Republic of Mauritius **2003**

- Implemented time-series analysis and GIS modeling to assess physical and economic impacts of sea level rise and storm surge flooding.
- Equated physical and economic stresses with environmental and social impacts.
- Implemented extensive field program to survey and map coastal land-use and coastal protection structures. Compiled nationwide GIS database of shore-types, land-uses, and coastal protection structures.

Tufts University – Research Assistant **2001 to 2003**

- Developed GIS model of sea level rise impacts for the coastal zone of metro Boston.
- Utilized historic data to predict future flooding scenarios using bootstrapping techniques and Monte Carlo simulation.
- Developed simulation model of storm-surge flooding impacts under various adaptation scenarios.
- Evaluated structural and non-structural methods of coastal protection.

Coastal Resources Center – University of Rhode Island **1999**

- Developed hazard mitigation plans for local municipalities.
- Cooperated with local governments to assess natural hazards and perform risk assessment.
- Evaluated and reported water use in local sole-source aquifers.

PUBLICATIONS

Kirshen, P. and K. Knee and M. Ruth, 2008. Climate change and coastal flooding in Metro Boston: impacts and adaptation strategies, Climatic Change, Vol. 90, No. 4, October 2008, p. 453-473.

Knee, K. and E. Comerma, 2008. The COASTMAP Inundation Module: A Framework for Modeling Coastal Flooding, Proceedings of the Hydrotechnique Society of France New Approaches of Coastal Risks Conference, Paris, France. January 30-31, 2008.

Knee, K. and C. Galagan, 2008. Coastal risk analysis: combined effects of storm surge and rainfall, Proceedings of the 5th American Water Resources Association Conference on GIS and Water Resources, San Mateo, CA. March 17-19, 2008.

SUMMARY

Mr. Loria formed Loria Emerging Energy Consulting, LLC ("EEC") in 2005 to provide technical, business and strategic advisory services to developers of renewable energy and distributed generation projects. Throughout his career, Mr. Loria has managed a wide range of emerging and conventional power technologies projects, from inception through commercial operation, and has assessed developmental technologies. This wide reaching and comprehensive experience gives Mr. Loria the knowledge and understanding to successful implement new energy technologies into the ever changing electric power industry.

Prior to forming EEC, Mr. Loria was a Principal and Senior Director at R. W. Beck, Inc. With over 25 years of power engineering experience, he was the Client Services Director for the Energy Services Practice in the firm's Boston office. Mr. Loria had business development and project execution responsibility for this Practice, which provided technical services for power production and delivery facilities. Examples of his relevant experience are summarized below.

RELEVENT EXPERIENCE

Renewable and Emerging Power Technologies

WIND PROJECT DEVELOPMENT
Minuteman Wind, LLC

Principle in Minuteman Wind, LLC which is developing a 12 MW wind project in Savoy, MA. The project has collecting 3 years of onsite wind data, was awarded a pre-development grant from the Massachusetts Technology Collaborative Renewable Energy Trust, and helped Town pass zoning by-law. Mr. Loria is directing wind resource analysis, financial analysis, and engineering support and participating in negotiation of power purchase agreements.

FUEL CELL INDEPENDENT POWER PLANTS
FuelCell Energy, Inc.

Providing strategic, financial and technical advisory services to FuelCell Energy, Inc. for the development of multi-MW, independent fuel cell projects. Currently, managing the development a first of a kind, 9 MW hybrid fuel cell project in Milford, CT. Mr. Loria has been integrally involved in the aforementioned from proposal preparation through directing the interconnection studies, geotechnical investigation, and preliminary engineering.

SOLAR THERMAL POWER PROJECT
MMR Power Solutions, LLC

Providing advisory services for the development of 50 MW to 250 MW concentrating solar power (CSP) project under development in CA, CO, and AZ. Mr. Loria has been integrally involved in all aspects of project development including site selection, proposal preparation, major equipment procurement, , environmental permitting, and investors meetings.

WIND PROJECT FEASIBILITY STUDY
Yale University

Prime consultant evaluating the feasibility of 5 MW wind farm in CT. Mr. Loria is the managing the services of subconsultants to evaluate the wind resource, environmental permitting issues, and the electric interconnection options.

SALT CAY RENEWABLE ENERGY STUDY
Applied Technology and Management

Prepared feasibility study of renewable power options for a new, island wide resort development in Salt Cay in the Turks & Caicos islands. Evaluated wind energy, solar energy, and ocean thermal energy conversion to provide all power requirements (approximately 10 MW peak load) of the island.

RHODE ISLAND STATEWIDE WIND SITING STUDY
RI Economic Development Corporation

RIWINDS is a Program to promote the development of wind energy to meet 15% of the state's electric demand, approximately 400 MW in wind energy capacity. Successfully assembled and led team of consultants in proposal and short list presentation for this strongly competed project. Managed study for Applied Technology and Management. The Study identified and prioritized the most viable areas for on-shore and offshore wind energy development and determined that the Program's goals can be met with competitive wind generated electricity.

SOLID FUEL PROJECT DEVELOPMENT
BSG Energy, Inc.

Teamed with BSG Energy to evaluate the viability of a 15 MW waste-to-energy IPP on a major Caribbean island. This facility will include a MRF separation facility and will use an advanced thermal conversion technology. Mr. Loria is also providing strategic advice to structure other solid fuel, renewable energy projects using advanced combustion technologies.

RENEWABLE ENERGY TECHNOLOGY ASSESSMENTS
The Abell Foundation, Baltimore Maryland

In support of the Abell Foundations venture capital investments, provided technical and economic assessments of new wind turbine, wave energy conversion, ocean current, and ocean thermal energy conversion technologies. These assessments have included evaluate of the energy performance, competitive market position, economic competitiveness, commercial maturity, and technical and commercial risks.

OCEAN THERMAL ENERGY CONVERSION
Sea Solar Power, International (SSPI)

Provided advisory services for the development of a commercial OTEC project. SSPI's unique OTEC cycle will produce electricity and of desalinated water continuously. Mr. Loria participated in site evaluation and power and water purchase agreement negotiations and is advising on technical development strategy.

COMMUNITY WIND FEASIBILITY STUDIES
Multiple Clients

With Applied Technology and Management, conducted wind energy feasibility studies for the Town of Portsmouth, RI, Plymouth County Sheriff's Department, MA, and Town of Jamestown, RI.

PROJECT EXPERIENCE WITH R. W. BECK –1989 to 2005

FLOATING OCEAN THERMAL ENERGY CONVERSION/HYDROGEN PRODUCTION FACILITY, Office of Naval Research, Port Huineme, CA

Mr. Loria was the Principle Investigator for this study to evaluate the feasibility of a combined, floating ocean thermal energy conversion/hydrogen production facility. The study evaluated alternate methods of hydrogen production and hydrogen storage through a range of capacities from 40 to 400 MW equivalent. The study also produced a computer model to predict the cost of hydrogen production for military and commercial use.

POWER SYSTEM EXPANSION
Vineland Municipal Electric Utility, Vineland, NJ

Responsible for the technical aspects of the owner engineering services for the development of a new 100 MW combined cycle power plant to replace aging steam generation and expand Vineland's generating capacity. Services included evaluation of an alternate combined cycle plant, development of the EPC construction bidding documents, and bid phase services.

POWER PLANT EXPANSION
Freeport Electric, Freeport, New York

Responsible for providing development advice and owner engineering services for the development of a two, 50 MW, GE LM6000 combustion turbine power plant. Services included: a) support of negotiations for a PPA with Long Island Power Authority and of a joint development agreement with a third party developer; b) development of procurement contracts and negotiation support for the CTG and for the emission control system; and c) development of separate construction contracts for the EPC construction of the on-site facilities and for the 2.5 mile natural gas line and 69 kV, underground transmission line. Project went into operation in 2004.

LANDFILL GAS TO ENERGY PROJECT
Resource Technology Corporation, Chicago, IL

Responsible for the valuation of two landfill gas plants with nominal rating of 5 and 15 MW, respectively, using combustion turbine generators.

CLEAN COAL DEMONSTRATION PROJECT
University of Alaska, Fairbanks, Alaska

As proposal and project manager, responsible for the team selection and subsequent design of a DOE-sponsored project to advance the state of the art of clean coal technology by the utilization of Alaskan coal in a utility scale diesel engine generator. The project includes all systems from coal unloading, coal cleaning, coal-water mixture processing and power production through pollution control and continuous emission monitoring. The 10 MW diesel cogeneration project went into operation in 1999.

TEN-YEAR GENERATION EXPANSION PROGRAM
Caribbean Utilities Company, Ltd, Cayman Islands, B.W.I.

Led proposal effort for this competitively selection and directed the owner engineering contract for CUC's ten year generation expansion program. Under this program, Mr. Loria led the developed a strategic alliance partnership between CUC and a major equipment manufacturer for

construction of all diesel engine generation expansions during this program. The Team prepared the EPC contact and administering the successful first phase of the Project. Mr. Loria was integrally involved in the negotiation of the agreements, monitoring the construction of the project and approving contractor invoices. The first 14 MW phase of the program went into operation in 1999.

ALTERNATIVE ENERGY EVALUATION
Caribbean Utilities Company, Cayman Islands, B.W.I.

Mr. Loria was responsible for the evaluation of alternative energy technologies in an effort to decrease CUC's dependence on imported oil. The technologies included: solar thermal, wind, biomass, ocean thermal energy conversion (OTEC), combustion turbines, microturbines, and fuel cells. The study found that (OTEC) and wind energy hold sufficient promise for CUC that they are worthy of further investigation. A program is now underway to accurately assess the wind potential and CUC has entered into a memorandum of understanding for the development of a 10 MW OTEC plant with Sea Solar Power Company.

ALTERNATIVE ENERGY EVALUATION
Caribbean Utilities Company, Cayman Islands, B.W.I.

Mr. Loria was responsible for the assessment of alternate cooling systems to replace the air-cooled radiators used to cool this 60 MW power plant. The evaluation included consideration of fresh and salt water cooling towers, once-through systems using seawater and once-through systems using groundwater. The study concluded that a groundwater once-through cooling water system could reduce auxiliary loads (i.e., radiator fan motors) sufficiently to result in a payback period of less than one year.

INDEPENDENT ENGINEERING REVIEW
240 MW Lakewood Cogeneration Facility, Lakewood, New Jersey

Responsible for the independent engineering review of the Lakewood Cogeneration Facility for the lending institutions. The power island for the project was provided by ABB and included ABB GT11N-1 combustion turbines and an ABB steam turbine. Mr. Loria's role was to verify that the facility would be designed and constructed in accordance with EPC contract and other applicable project documents to mitigate lender's risk. The plant has been operational since 1994.

INDEPENDENT ENGINEERING REVIEW
45 MW Craven County Biomass Facility, New Bern, North Carolina

Responsible for the technical aspects of the independent engineering review during the construction and performance testing of the Craven County Biomass Project. The facility burns waste wood in a vibrating stoker fired boiler since 1992. Mr. Loria's role was to verify that the facility would be designed and constructed in accordance with EPC contract and other applicable project documents. This included design review, construction monitoring, review of performance test procedures, and witnessing and approving the performance test results.

MATEP DIVESTITURE ECONOMIC EVALUATION
Cogeneration Management Company
Boston, Massachusetts

Mr. Loria led the economic evaluation of alternate configurations for an existing this 70 MW total energy plant in support of divestiture. The study took into consideration all relevant issues including: environmental permitting, natural gas availability, and space constraints. The study evaluated means of decreasing operating costs and expanding steam and electric sales. Power generation options included addition of combustion turbines and diesel generators, conversion of existing diesel engines to natural gas, and installation of a gas insulated substation to avoid utility distribution charges. The results of the evaluation significantly increased the value of the plant to the benefit of the seller.

REPOWERING PRELIMINARY DESIGN REPORT
Florida Municipal Power Agency, Vero Beach, Florida

Mr. Loria was responsible for the preliminary design of repowering of the Vero Beach Power Plant with a large 150 MW combustion turbines generator ("CTG"). Both General Electric Frame 7FA and Siemens/Westinghouse 501F CTG were considered. The limitations of the steam turbines and the potential modifications to the steam turbines due to differences in steam conditions were considered. Cycle performance enhancement techniques were evaluated including inlet cooling and chilling, duct firing and steam injection. The comprehensive report took into consideration the availability of natural gas to fuel the plant and of the transmission system to export the power. Heat balances and water balances and preliminary design drawings were prepared. Air emission controls equipment was also defined to meet anticipated air permit limitations.

COGENERATION FEASIBILITY STUDIES

Mr. Loria has led numerous feasibility studies for applying cogeneration to existing industrial facetious throughout the United States and Canada. These studies included the development of performance estimates, cost estimates and economic analyses. Both combined- and simple-cogeneration cycles have been analyzed using combustion turbine and reciprocating engines in size ranges from 1 MW to 80 MW. These studies have either identified ways to lower energy costs through the more efficient simultaneous production of electric and thermal energy or through lower negotiated electric rates or they have avoided further development costs by showing that cogeneration was not an economic alternative. Clients include UTC Hamilton Standard, UTC Sikorsky Aircraft, Stanley Bostitch and others.

ON-SITE THERMAL/POWER PLANT
Massachusetts Water Resources Authority, Boston, Massachusetts

Lead Mechanical Engineer and Assistant Project Engineer. Mr. Loria was responsible for the design of the $100 M On-Site Thermal/Power Plant (OSTPP) for a new wastewater treatment facility. The 70-MW power plant includes two 26-MW simple-cycle combustion turbines and an 18-MW steam cogeneration cycle to meet the thermal and electrical demands of the treatment plant. The plant supplies thermal energy to the treatment facility through a high temperature hot water district heating system. The plant also includes a treatment system for removal of hydrogen sulfide from digester gas prior to being burned in the boilers. Mr. Loria led the team that prepared the initial tradeoff study of alternate plant arrangements. The selected alternative,

had lower estimated life-cycle cost compared to combined-cycle arrangements proposed by others. The plant has been operational since 1994.

PROJECT EXPERIENCE WITH STONE & WEBSTER ENGINEERING CORPORATION – 1981 to 1989

25 MW COMPRESSED AIR ENERGY STORAGE CONCEPTUAL DESIGN
Pacer Energy Systems

As the energy storage specialist for a previous employer Mr. Loria was responsible for overall mechanical design of the plant. His activities included preparation of mechanical design basis, P&IDs, general arrangement drawing, plot plan, equipment data sheets and performance estimates. The system consists basically of a compression train to compress air to 2,000 psi and consume power, air storage vessels to store the potential energy, and an expansion train to generate power.

80 MW SOLAR THERMAL POWER PLANT
Lux International Limited, California

Mr. Loria participated in the design review of a parabolic trough solar thermal power plant. The review included site-inspection of the facility as well as evaluation of the solar collector design and power conversion plant design.

100 kW PHOTOVOLTAIC DEMONSTRATION PROJECT
Department of Energy

Mr. Loria was responsible for the operational oversight for one of the first 100 kW photovoltaic demonstration projects in the Country, Beverly, MA. This project was built in 1981 at the Beverly, Massachusetts High School to demonstrate new, single crystal PV technology. This two-year O&M review assessed the life of the PV and the inverter technology.

PRATT & WITNEY AIRCRAFT CORPORATION –1978 to 1981

Experimental test engineer responsible for designing and executing tests on combustion turbine hardware for FAA approval and failure analysis.

EDUCATION

Bachelor of Science, Mechanical Engineering, Lafayette College, 1978

Master of Science, Mechanical Engineering, Northeastern University, 1984

AFFILIATIONS

Resolute Marine Energy – Board of Directors

Power-Gen International Conference – Emerging/Renewable Technology Program Planning Committee

Power-Gen Renewable Energy Conference – Planning Committee

REGISTRATIONS

Massachusetts and Connecticut

Sustainable Energy Advantage, LLC

Robert C. Grace

Sustainable Energy Advantage, L.L.C. (Framingham, MA)

President and founder, 1999-present (1998-1999, operated as Sustainable Energy Solutions)

SEA assists energy businesses, governments and non-profit organizations in developing renewable electricity markets, opportunities, policies and infrastructure. By applying comprehensive and interdisciplinary expertise in renewable energy supply, demand, and delivery, SEA provides strategic, technical, financial, modeling, and policy analysis of renewable energy markets. Assist in developing wholesale and retail renewable electricity businesses and generation projects, as well as market infrastructure and viable policies and programs supporting the role of renewable resources in electric markets. SEA is instrumental in developing and implementing public policies in support of renewable energy including state Renewable Portfolio Standards and funding programs to expand renewable supply and demand, as well as wholesale market rules and accounting/verification programs for renewable energy.

AllEnergy Marketing Company, LLC (A venture of the New England Electric System) (Waltham, MA)

Director, ReGen Division, *1997-1998*

Championed ReGen, the "green" power marketing division, created business plan, designed wholesale and distribution channel strategy, from conception to implementation. Responsible for management and budget; supply procurement, portfolio management & delivery; product design and pricing; marketing and sales; and policy activities in highly uncertain market.

Accomplishments in Business Innovation and Policy Leadership:

- Developed the first competitive retail product offering in the New England electric market, and the first competitive green power offering in the eastern U.S., an innovative, high-value retail renewable energy credit-based offering designed to overcome market obstacles and uncertainties.
- Developed and negotiated innovative, low cost and flexible supply contracts, options and strategic partnerships/alliances with renewable power suppliers, facilitating early development of new renewable resources to serve opening competitive retail markets.
- Negotiated first-of-its-kind joint windpower development agreement.
- Built solid relationships with target distribution channels.
- Developed and maintained strong market-based relationships with allies of environmentally preferable power; negotiated unprecedented "Cooperative Agreement" with Environmental Defense Fund to advise on business plan, charter, product definition and communications; and built ReGen reputation for integrity and excellence among influencers.
- Served as a founding Board Member of the Renewable Energy Alliance trade group.
- Key negotiator in multi-stakeholder Green-e (NE) green power certification program.
- Played consensus-building role in regulatory, legislative, settlement and technical workshop processes developing market rules, regulations, standards of conduct, and legislation to support disclosure, tracking, and workable markets for renewable electricity.

New England Power Company (a subsidiary of the New England Electric System (Westborough, MA)

Generation Marketing Dept: Principal Analyst, *1994-1997****, Senior Analyst*** *1993-94*

Instrumental in successfully shepherding NEES, a pioneer in deregulation/restructuring, through the first complete integrated electric utility restructuring in the US.

- Served as Wholesale Business Unit representative to all NEES industry restructuring teams developing strategy to implement unbundling and retail choice, and supporting Federal and state industry restructuring proceedings, including drafting testimony and market rules.
- Developed company position and strategy, and analyzed financial impact and risk of Standard Offer service, eliminating fuel clause, and instituting virtual direct access.
- Developed electric market price projections for internal analysis, stranded cost recovery support.
- Played instrumental role in developing comparable open access transmission & ancillary services tariffs.

Power Marketing Accomplishments:

- Developed wholesale "green" marketing business plan.
- Managed winning proposal for long-term all-requirements power supply to Nantucket Electric Company which led to corporate acquisition.
- Developed strategy, analyzed markets for retail competition.
- Participated in NH and MA electric choice retail pilot program, including development of pilot programs and wholesale supply of "commodity" and "green" competitors.
- Negotiated monthly to multi-year power sales and purchase contracts.
- Wrote short-term marketing plan and developed new wholesale products.
- Led team optimizing operations, fuel switching to minimize environmental compliance costs and risks. Participated in teams developing incentive-based rates and implementing Clean Air Act compliance.

U.C. Berkeley - Project funded by the Electric Power Research Institute -- Environment Div.

Graduate Student Research Assistant, 1993

Investigated the potential of intermittent redispatch of electric power systems as an ozone abatement strategy as member of team awarded research grant.

California Public Utilities Commission *(Division of Strategic Planning)* ***and***

Pacific Gas & Electric Company *(Corporate Planning Dept.)*

Graduate Student Intern/Independent Contractor/Special Project*, 1992-93*

Initiated and performed jointly supported feasibility and cost-effectiveness study of intermittent, emission-biased electric system dispatch for combating smog episodes. Optimized operational vs. engineering emission control techniques using production modeling to demonstrate cost saving potential of nearly $100 million.

La Capra Associates (Boston, MA) -- ***Senior Analyst****, 1985-91*

Consulting work specializing in utility resource planning, cost analysis, rate design, load management, budgeting, financial and load forecasting, computer modeling and regulatory support for over 20 electric and gas utility clients.

- Managed power supply portfolio management function for an electric utility.
- Managed and performed least cost, need analyses for IPP cogeneration plant siting approvals.
- Testified as an expert witness on power supply valuation and cost issues.
- Prepared, recommended, analyzed and evaluated financial and power supply restructuring proposals during debt restructuring negotiations between a utility and its creditors.
- Prepared least-cost supply plan and developed probabilistic dispatch modeling methodology for a transmission isolated electric system's resource plan filing; performed dispatch modeling and production cost analysis of numerous electric & gas systems.
- Assisted IPP developer in market evaluation and power sales.
- Negotiated lease of electric transmission capacity.
- Served as representative on utility task force planning the import of power from Hydro-Quebec.
- Developed capacity planning, financial forecasting, load analysis, rate design computer models.

Applied Resources Group (Brookline, MA) -- ***Energy Analyst/Programmer****, 1985*

Designed rate analysis, demand modeling and load management software; tested, refined and documented energy management software; performed feasibility studies of cogeneration and photovoltaic systems.

QED/Seaver Associates (Needham, MA) -- ***Energy Management Research Associate****, 1983-84*

Performed computer analysis of solar thermal heating, energy efficiency, and thermal storage.

Education

Energy & Resources Group, University of California, Berkeley

M.S., Energy & Resources, 1991-93 - U.C. Regents Fellow

Thesis: *Intermittent Environmental Dispatch of Electric Power Systems for Ozone Control.*

Brown University

Sc.B., Energy Studies*, 1980-84* - Magna Cum Laude; Elected to Sigma Xi

Senior Project: *The Power of Dynamic Simulation as a Solar Building Design Tool.*

Other Coursework

Environmental Regulation (Tufts Univ.); Statistics, Accounting, Finance (Harvard University Ext.)

Committees & Memberships

Current:

- Co-Chair Northeast Energy & Commerce Association Renewable Energy Subcommittee
- Editor, New England Wind Forum
- American Wind Energy Association
- American Council on Renewable Energy
- Massachusetts Technology Collaborative's Green Power Working Group
- NEPOOL Generation Information System Working Group

Past:

- New England Green-e Advisory Committee
- Center for Resource Solutions' Tradable Renewable Certificates working group
- Green-e national TRC certification standard committee
- New England Disclosure Working Group
- National Council on Competitiveness, Electricity Consumer Information Disclosure Regional Workshop
- Planning committees for DOE Wind Powering America & National Wind Coordinating Council regional wind issues forums
- Peer review of various publications
- NYSERDA and Connecticut Clean Energy Fund Technical Evaluation Panels.

Robert C. Grace – Presentations, Lectures and Testimony

California Energy Commission Staff Workshop: *Exploring Feed-in Tariffs for California - Feed-in Tariff Design and Implementation Issues and Options*, Sacramento, CA, June 30, 2008.

New England Clean Energy Council's Clean Energy Fellowship Program (Lecture): *Understanding U.S. & New England Renewable Energy Policies: Renewable Energy Portfolio Standards, Feed-in Tariffs, & other Renewable Energy Policy Tools*, Cambridge, MA, June 11, 2008.

Northeast Energy & Commerce Assoc. 15th Annual New England Energy Conference, *Renewable Energy Resources in New England…Will they be there when we need them?*, Newport, RI, May 14, 2008.

Massachusetts Institute of Technology, Energy Policies for a Sustainable Future, MIT-Wide Energy and Environment Graduate Course (guest lecture), *Renewable Energy Portfolio Standards, Feed-in Tariffs, & other Renewable Energy Policy Tools*, April 7, 2008.

Environmental Business Council of New England Seminar Series on Land-Based Wind Energy, Session 1: Projects, Pipeline & Early Siting Issues, *Land-Based Wind Energy in New England*, Boston, MA, April 2, 2008.

Northeast Energy & Commerce Assoc. Renewable Energy Conference, *Renewable Energy Market Update for New England (Put on your seatbelt…)*, Westborough, MA, March 5, 2008.

Written & Oral Comments (on behalf of The Connecticut Clean Energy Fund) to the Connecticut Energy Advisory Board on The Proposed Integrated Resources Plan of the Connecticut Light & Power Company and the United Illuminating Company, Feb. 7, 2008.

Oral expert witness testimony (on behalf of The Connecticut Clean Energy Fund) in DPUC Docket 07-06-61: DPUC Examination of Electric Distribution Company Contracts for Renewable Energy Certificates, Feb. 7, 2008.

Written Testimony (on behalf of The Connecticut Clean Energy Fund) in DPUC Docket 07-04-27, DPUC REVIEW OF LONG TERM ENERGY CONTRACTS-PROJECT 100, ROUND 2 RESULTS, October 5, 2007.

American Wind Energy Association WindPower 2007 Conference, Grace, Robert C. & Thomas H. Rawls, *Untangling the Interaction between Renewable Energy Markets/Policies and Emission Cap & Trade Regulation*, poster presentation, Los Angeles, CA June 2007.

Oral expert witness testimony (on behalf of The Connecticut Clean Energy Fund) on design of next round of the Connecticut Clean Energy Options program in Docket No. 07-01-09, DPUC CONSIDERATION OF THE CONNECTICUT CLEAN ENERGY OPTIONS PROGRAM FOR 2008, May 7, 2007.

Massachusetts Institute of Technology, graduate course Developing Energy/Environmental Policies for a Sustainable Future (guest lecture), *Renewable Energy Support Policy: Renewable Energy Portfolio Standards*, March 19, 2007.

California Energy Commission IEPR Workshop, *Clarifying the Interaction between REC & Emission Policies & Markets: Treatment of Renewable Energy under the RGGI Model Rule and Other Markets & Policies*, March 13, 2007.

Northeast Energy & Commerce Assoc. Renewable Energy Conference, *Seeking Clarity between REC and Emission Markets: Creating a Clear Role for RE in Policies and Markets*, Newton, MA , March 1, 2007.

Presentation and oral comment (on behalf of The Connecticut Clean Energy Fund) before the Connecticut DPUC in Docket 06-01-08PH01 Technical Meeting, *Overview: The Hedge Value of Renewable Energy to Generators & Customers*, February 1, 2007.

Oral testimony (on behalf of The Connecticut Clean Energy Fund) before the Connecticut DPUC in Docket 06-01-08PH0, DPUC DEVELOPMENT AND REVIEW OF STANDARD SERVICE AND SUPPLIER OF LAST RESORT SERVICE -PLAN APPROVAL, on hedge value of renewable energy, December 18, 2006.

German Marshall Fund of the U.S. Local Approaches to a Sustainable Energy Future Conference, *Experience with RPS Effectiveness in Eastern U.S. Competitive Markets*, Boston, MA, November 16, 2006.

Illinois Commerce Commission technical workshop in Docket 06-0390 Rulemaking regarding renewable energy, *Renewable Portfolio Standard: Orientation to Design & Implementation Best Practices*, presented in Docket 06-0390 Rulemaking on behalf of the Illinois Attorney General, Chicago, IL, October 4, 2006.

Coalition of Northeast Governors regional roundtable: Smart Energy Choices, Opportunities for Renewable Energy in Changing Energy Markets, *Renewable Energy for Electric Generation: Expanding the Market for Renewable Generation*, September 14, 2006.

Direct testimony (on behalf of the Illinois Attorney General) before the Illinois Commerce Commission, in Docket 06-270, Petition of Commonwealth Edison Company for Approval Pursuant to Section 7-102 of the Public Utilities Act of the Entry Into Certain Contracts Relating to Wind Generation and Approval Under Section 9-201 of a Tariff Concerning the Governor's Sustainable Energy Plan and the Illinois Commerce Commission's Resolution In Docket No. 05-0437, July 7, 2006.

American Wind Energy Association WindPower 2006 Conference, *Indicators for RPS Effectiveness in Stimulating WindPower in the Eastern U.S.*, June 7, 2006.

Maine Land Use Regulation Commission wind power workshop, *Wind Power Issues: A Primer*, Bangor, ME, April 5, 2006.

American Wind Energy Association Renewable Portfolio Standards Workshop, *RPS Policies in Restructured Markets: RPS in the New England*, March 8, 2006.

Northeast Energy & Commerce Association - Successful Renewable Energy Development in New England, *Overview: The Hedge Value of Renewable Energy to Generators & Customers*, March 1, 2006.

Oral comments on behalf of Union of Concerned Scientists at a public hearing before the Massachusetts Department of Telecommunications and Energy in Docket D.T.E. 04-115 regarding the role of long-term contracting with renewable in stabilizing basic service costs and reducing RPS compliance costs. June 2005.

American Wind Energy Association WindPower 2005 Conference, *Birth of a New Market: Financing Wind Projects via Long Term Hedge Contracts with Large End-Users*, May 16, 2005.

EUCI Renewable Portfolio Standards Conference: The Eastern Perspective, *RPS Roundtable: In A Perfect World… RPS Experience, the Good, the Bad, and the Ugly*, April 13, 2005.

The Future of the Nevada RPS – Workshop: *Renewable Energy Credit Trading and Tracking in the West*, November 4, 2004.

Utility Wind Interest Group Wind Integration Technical Workshop, *Wind Project Developments: What's Happening in New England*, October 27, 2004.

Global Wind Power 2004, Session Chair for Panel on *Definition and Control of Green Attributes*, March 30, 2004.

Northeast Energy & Commerce Association 2004 Renewable Energy Conference – *New England Renewable Energy Supply and Demand Outlook*, March 18, 2004.

New York Public Service Commission CASE 03-E-0188 (Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard), appeared under oath in a technical conference for the purpose of affording parties the opportunity to discuss with and question myself and colleagues responsible for the New York Renewable Portfolio Standard Cost Study Report II, Volume A issued February 19, 2004, Volume A. March 17, 2004.

Commonwealth of Massachusetts before the Department of Telecommunications and Energy, D.T.E. 03-100 Petition of Boston Edison Company, Cambridge Electric Light Company and Commonwealth Electric Company d/b/a NSTAR Electric pursuant to G.L. c. 164 § 94 and 220 C.M.R. §§ 5 et seq. for approval of a new renewable power supply offering, *direct testimony on behalf of the Cape Light Compact and Massachusetts Energy Consumers Alliance*. January 2004.

Northeast Energy and Commerce Association Conference: Wholesale Power Markets in New England – After LMP and the Blackout - *Expanding the Connecticut Renewable Portfolio Standard*, November 20, 2003.

Rhode Island Renewable Energy Customer Aggregation - University Workshop - *Current Renewable Energy Development in New England*, November 13, 2003.

The Energy Consortium -*Renewable Portfolio Standard: An Update*, October 22, 2003.

The Energy Consortium - Using Wind Power to Hedge Large End-Users' Electric Bills, October 22, 2003.

Oral Comments (on behalf of the Union of Concerned Scientists) before the Connecticut DPUC in Docket 02-04-14 (Connecticut RPS), Public Hearing - September 25, 2003

New York RPS Modeling Workshop, (NY PSC Docket 03-E-0188 – Proceeding on Motion of the Commission Regarding a Retail Renewable Portfolio Standard), *Modeling the Impacts of a NY Renewable Portfolio Standard*, June 27, 2003.

Massachusetts Restructuring Roundtable - *Renewable Energy Markets: Trends in the Northeast*, June 12, 2003.

Northeast Energy and Commerce Association, 10th Annual New England Energy Conference - *Renewable Energy Markets: Trends in the Northeast*, June 3, 2003.

Testimony before R.I. House Environment & Natural Resources Committee, In the Matter of HB5533 (RPS Legislation), May 28, 2003.

American Wind Energy Association WindPower 2003 Conference - *Using Wind Power to Hedge Large End-Users' Electric Bills*, May 21, 2003.

National Geothermal Collaborative - Creating Geothermal Markets: *Evaluating Experience with State Renewables Portfolio Standards*, May 12, 2003.

National Conference of State Legislators - *Policy Tools for State Support of Renewable Energy*, April 25, 2003.

New York RPS Collaborative Forum - *Crafting an RPS for New York: An Orientation to State RPS Policy Experience and Design*, April 7, 2003.

New York RPS Collaborative Forum - *Transacting Generation Attributes Across Market Boundaries: Eligibility Options & Implications*, April 7, 2003.

Green-e New England Advisory Committee Meeting - *New England Renewable Energy Supply Outlook*, March 12, 2003.

Green-e New England Advisory Committee Meeting - *Rhode Island Renewable Energy Fund Green Power Supply and Demand Programs*, March 12, 2003.

Rhode Island Greenhouse Gas Action Plan Stakeholder Group - *RI's Renewable Portfolio Standard: Overview of Design Recommendations*, February 12, 2003.

Rhode Island Greenhouse Gas Action Plan Renewable Portfolio Standard Working Group:

RI's Renewable Portfolio Standard: Remaining Design Decisions, January 24, 2003.

Rhode Island's Renewable Portfolio Standard: A Draft Design Proposal, December 4, 2002.

Crafting a Renewable Portfolio Standard for Rhode Island, October 15, 2002.

Massachusetts Renewable Portfolio Standard Advisory Group - *Massachusetts RPS: 2002 Cost Analysis Update – Sensitivity Analysis*, December 16, 2002.

Massachusetts Restructuring Roundtable - *Transacting Generation Attributes Across Market Boundaries: Eligibility Options & Implications*, December 13, 2002.

Massachusetts Renewable Portfolio Standard Advisory Group - *Massachusetts RPS: 2002 Update to December 2000 Report of Certificate Costs*, November 7, 2002.

Seventh National Green Power Marketing Conference - "Expanding Markets Through Innovation" - *Status of Green Power in the Northeast*, September 30, 2002.

Northeast Sustainable Energy Assoc. Building Energy 2002 - *Rhode Island Renewable Energy Collaborative – A Progress Report* , March 21, 2002.

New England Regional Wind Issues Workshop - *Policies & Programs to Support Renewable Energy in New England*, October 25, 2001.

New England Renewable Power Producers Assoc. Second Annual Meeting - *Policy Drivers for Renewable Energy in the Northeast*, September 19, 2001.

NREL Energy Analysis Forum - *Renewable Energy Outlook for the Northeast*, August 13, 2001

Renewable Energy Workshop for Federal Facility Managers – *Federal Procurement of Green Power*, May 23, 2001.

Northeast Sustainable Energy Assoc. Building Energy 2001 - *Renewable Portfolio Standards in the Northeast*, March 23, 2001.

Association of State Energy Research and Technology Transfer Institutions Fall Meeting - *Renewable Credit Trading and RPS Compliance: Necessities & Complexities in a Retail Choice Environment*, October 18, 2000.

Northeast Energy & Commerce Association – 7th Annual Conference for the New England Energy Industry – *Competitive Renewable Power: Tradable Credits, Power Exchanges, and Other Business Opportunities*, May 17, 2000.

Ontario Power Generation – QUEST Sessions – *The Role of Green Power in a Deregulated Market*, March 21, 2000.

Massachusetts Division of Energy Resources - Renewable Portfolio Standard Advisory Group:

Massachusetts RPS: Administration Issues & Information Requirements, March 30, 2000.

Massachusetts' RPS: Other Accounting-Related Policy Coordination Issues, March 30, 2000.

Massachusetts' RPS: Accounting & Verification Mechanisms ands Policy Coordination, March 9, 2000.

Massachusetts' RPS: New Renewable Early Start Trigger, February 17, 2000.

Massachusetts Renewable Portfolio Standard: Design Issues, February 17, 2000.

Massachusetts Renewable Portfolio Standard: Eligibility, January 27, 2000.

Massachusetts Renewable Portfolio Standard: Treatment of Existing Renewables, December 9, 1999.

Massachusetts Renewable Portfolio Standard: Applicability Issues, November 22, 1999.

Massachusetts' Renewable Portfolio Standard: An Issues Overview, October 27, 1999.

Implementing the New Environmental Standards – RPS, Information Disclosure and GPS - *Obtain Power Supply From Renewable Resources to "Green-up" Your Portfolio*, January 21, 2000.

Implementing the New Environmental Standards – RPS, Information Disclosure and GPS - *Policy Coordination of Environmental Standards: A Massachusetts Case Study*, (also moderator of Policy Coordination workshop), January 20, 2000.

Wind Power and the Environment Workshop – Doing it Right in the Northeast – *Prospects for Developing Regional Wind Siting Standards/Guidelines for the Northeast*, July 14, 1998.

Boston Bar Association (Energy Law and Clean Air Committees) - *"Green" Power – the Next Frontier for Personal and Corporate Environmental Action, and AllEnergy's ReGen Renewable Power Upgrade Service*, June 3, 1998.

EnviroExpo NE – *"Green" Power – the Next Frontier for Personal and Corporate Environmental Action*, May 5, 1998

Independent Energy Producers of Maine Annual Mtg. (Keynote address) *A View of the Future for Renewable Energy*, Dec. 3, 1997.

National Wind Coordinating Council Wind Energy Issues Forum - *Transmission Challenges Faced by Wind Power in New England* - November 7, 1997.

National Wind Coordinating Council Wind Energy Issues Forum - *Market Risks and Uncertainties Facing New England Wind Development* - November 7, 1997.

Center for Energy Efficiency and Renewable Technologies/ John Merck Fund - Promoting Green Power in New England Meeting: *Opportunities for "Green" Power in a Deregulated Electricity Market* - July 28, 1997.

Council of State Governments - Eastern Regional Conference: Forum on Electric Industry Restructuring in the Northeast - *The Role of Renewable Energy in a Deregulated Electricity Market* - July 27, 1997.

New England Disclosure Working Group - *Disclosure, Verification and Certification in Competitive Electric Markets: A Green Marketer's Perspective* - June 1997.

National Council on Competitiveness, Electricity Consumer Information Disclosure Eastern Regional Workshop: *Disclosure, Verification and Certification in Competitive Electric Markets: A Green Marketer's Perspective* - June 1997.

Clean Power '97 Conference - *Requirements for a Vibrant Wholesale Green Power Market* - May 28, 1997.

Assoc. of Energy Services Professionals -*"Green" Power Marketing for New England's Competitive Markets* -May 21, 1997.

EPRI Second National Green Pricing and Green Power Marketing Conference - *Mutual Funds as a Model for Green Power Marketing Disclosure, Verification and Certification* - May 13, 1997.

EPRI Second National Green Pricing and Green Power Marketing Conference: *The Challenge of Selling "Green" Power in Competitive Markets* - May 13, 1997.

Select List of Publications

Bolinger, Mark, Robert Grace, Douglas Smith, Ryan Wiser, et al, *Using Wind Power to Hedge Volatile Electricity Prices for Commercial and Industrial Customers in New York*, Report prepared for the New York State Energy Research and Development Authority, 05/03. See: http://www.nyserda.org/programs/pdfs/WindHedgeFinalcomplete.pdf

Grace, Robert C., Andrew Aulisi, Brent Beerley, Mark Crowdis & Theresa Howland, *Birth of a New Market: Financing Wind Projects via Long Term Hedge Contracts with Large End-Users*, Conference Proceedings of the American Wind Energy Association – Windpower 2005, 05/05.

Grace, Robert C., Mark Bolinger, Ryan Wiser et al, *Using Wind Power To Hedge Large End-Users' Electric Bills in New York*, Conference Proceedings of the American Wind Energy Association - WINDPOWER 2003, 05/03.

Grace, Robert C. and R. Wiser, *Transacting Generation Attributes Across Market Boundaries - Compatible Information Systems and the Treatment of Imports and Exports*, Prepared for U. S. Department of Energy and New York State Energy Research & Development Authority, published as a Lawrence Berkeley National Laboratory report, 11/02. See: http://eetd.lbl.gov/ea/EMS/reports/51703_exsum.pdf

Massachusetts Renewable Portfolio Standard Series: Project manager; primary or co-author on series of technical and policy white papers and reports on aspects, implications, designs, accounting and verification, and costs of Renewable Portfolio Standard. See: http://www.state.ma.us/doer/programs/renew/rps.htm

Rickerson , Wilson and Robert C. Grace, *The Debate over Fixed Price Incentives for Renewable Electricity in Europe and the United States: Fallout and Future Directions*, A White Paper Prepared for The Heinrich Böll Foundation, Feb. 2007

Rickerson, Wilson H., Janet L. Sawin and Robert C. Grace, *If the Shoe FITs: Using Feed-in Tariffs to Meet U.S. Renewable Electricity Targets*, The Electricity Journal, Vol. 20 (4), May 2007

Wiser, Ryan, Kevin Porter, Robert Grace, *Evaluating Experience with Renewables Portfolio Standards in the United States*, Prepared for the Conference Proceedings of Global Windpower 2004 Chicago, Illinois: March 28-31, 2004, published as a Lawrence Berkeley National Laboratory report, March 2004. See: http://eetd.lbl.gov/ea/ems/reports/54439.pdf

Wiser, Ryan, Kevin Porter, Robert Grace, and Chase Kappel, *Evaluating State Renewable Portfolio Standards: A Focus on Geothermal Energy*, Published by the National Geothermal Collaborative Report, 6/03. http://www.geocollaborative.org/publications/RPS.pdf

Wiser, Ryan, Kevin Porter & Robert Grace, *Evaluating Experience with Renewables Portfolio Standards in the United States*, Mitigation and Adaptation Strategies for Global Change (2005) 10: 237–263, Springer, 2005.

Select List of Reports

Numerous reports, studies, business plans, market assessments, RFPs, for clients including:

Blunden, Julie, Robert Grace, Jan Hamrin, Meredith Wingate and Ryan Wiser, *Customer Credit Account Research and Analysis Supporting the California Energy Commission's Renewable Energy Program Preparation of the Customer Credit Account Report for the Legislature*, Consultant's Report to California Energy Commission, 01/03. (Responsible for Appendix C: *Oregon and New York REC-Based Utility Buy-Through Programs*)

Grace, Robert C., *Generation Information System Development: RFP Experience in Texas, New England and Ontario*, report to California Energy Commission for use by Western Renewable Energy Generation Information System working groups, 01/04.

Grace, Robert C. and R. Wiser, *Crafting a Renewables Portfolio Standard for Rhode Island: Design Choices, Best Practices, and Recommendations*, prepared for the Rhode Island RPS Working group to the RI Greenhouse Gas Working Group, 11/02.

Grace, Robert C., R. Wiser, and M. Bolinger, *Renewable Power Market Analysis* of United States, for [confidential client], 1/02

Grace, Robert C. K. Cory and D. Smith, *Cost Estimate of N.Y. Executive Order 111 Renewable Energy Purchase Provisions*, for New York State Energy Research & Development Authority, 10/01

Grace, Robert C., Analysis of the Impact of ISO-NY Rules on Intermittent Renewable Resources, for Pace Energy Project 8/99

Grace, Robert C., *Report on the May 30, 2001 New England Wind Power Brainstorming Meeting*, for National Renewable Energy Laboratory – Wind Powering America Program, 7/01

Grace, Robert C., M. Tennis, R. Wiser, M. Bolinger, *RIREC – The Next Generation: An Assessment of the Opportunities for the Next Phase of Activity by the Rhode Island Renewable Energy Collaborative*, Rhode Island Renewable Energy Collaborative, 11/00

Porter, Kevin, Robert Grace, and Ryan Wiser. *Summary of Recommendations: Legislative and Regulatory Actions to Consider For Ensuring the Long-Term Effectiveness of the Nevada Renewable Portfolio Standard*. Prepared for the Nevada Renewable Energy Task Force, December 3, 2004. http://energy.state.nv.us/taskforce/Annual%20Report/05%20RETF%20report%20Vol.%20III_final.pdf

Wiser, Ryan H., R. O'Connell, M. Bolinger, R. Grace, and R. Pletka, *Building a "Margin of Safety" Into Renewable Energy Procurements: A Review of Experience with Contract Failure*, Consultant's Report to California Energy Commission, January 2006.

Green power business plans or market assessments for AllEnergy Marketing Company, New England Power Co., Ontario Power Generation, Connecticut Energy Cooperative, Cooperative Pioneers, (confidential) multi-national generation company/power marketer

Renewable energy solicitations for Connecticut Clean Energy Fund, Connecticut Energy Cooperative, Massachusetts Energy Consumers Alliance, New York State Energy Research and Development Authority, Ontario Power Generation, PowerOptions, R.I. Renewable Energy Fund, State of New York, State of Rhode Island, and UPC Wind Management.

Sustainable Energy Advantage, LLC

JASON S. GIFFORD

Sustainable Energy Advantage, LLC

Sustainable Energy Advantage, L.L.C. (Framingham, MA)

Consultant (2006 – Present)

- Develop and enhance project-specific financial models for renewable energy project developers; analyze developer, lender and tax equity returns under varied financing scenarios. Analyses range from single turbine community-sponsored installations to multi-project portfolios.
- Advised public and private sector clients on a range of renewable energy policy and project development matters.
- Forecast long-term renewable energy supply and demand by maintaining and analyzing current information on over 400 renewable energy projects under development throughout New England.
- Develop client-specific strategies to use renewable energy as a long-term hedge against electricity price volatility and participate in community-scale renewable energy projects.

Massachusetts Renewable Energy Trust (Westborough, MA)

Manager, Strategy & Special Projects (2004 – 2006)

Strategic Policy and New Project Development

- Manage program to project finance community scale wind power plants. Develop relationships and negotiate with prospective corporate and institutional owners, wind project developers and municipal land-owners to create unique ownership, financing and brand equity opportunities for all participants.
- Perform financial modeling, analysis and due diligence for innovative project financings and direct investments in renewable energy companies.
- Serve as a new product and new program development incubator, by aligning the needs of industry entrepreneurs with the interests of the Trust.

Green Mountain Energy Company (Burlington, VT)

Manager, New Market Development (2000-2002)

- Led Company due diligence, bidding, and negotiation efforts to acquire new business in New England, New York, and Ohio.
- Co-negotiated $400M contract to serve nation's largest electricity-buying aggregation. Resulted in 400% increase in Company's total number of customers, exceeding shareholder targets and enabling subsequent rounds of corporate financing.

- Established strategic relationships with key stakeholders to promote Company presence and influence, and managed relationships with competitors.

Manager, Regulatory Affairs (1998-2000)

- Negotiated new rules for electricity deregulation in Pennsylvania, New Jersey, and Maryland.
- Co-author of "Standards for Uniform Business Rules" – an industry white paper underscoring the importance of nation-wide uniformity in industry transactions.
- Member of Sustainable Energy Fund Advisory Board. Provided strategic oversight to a $12 million Fund created to develop renewable energy businesses in Pennsylvania.

Education

F.W. Olin Graduate School of Business (Wellesley, MA)

Master of Business Administration, Finance & Entrepreneurship (2004)

Cum Laude

Bates College (Lewiston, ME)

Bachelor of Arts, Political Science (1997)

Selected Presentations

Windustry, Community Wind Energy 2006, *Supporting Community Wind with State Clean Energy Funds*, March 7, 2006

New York State Energy Research & Development Authority, Workshop on Renewable Portfolio Standard Interaction with Voluntary Markets, *Massachusetts Green Power Partnership – Helping Project Finance and Renewable Energy Credit Market Liquidity*, June 9, 2005

NESEA, Building Energy 2005 Conference, Community Wind Project Ownership & Financing, March 17, 2005

Cape & Island's Self-Reliance, Municipal Wind Workshop, *Comparative Analysis of Community Wind Ownership Options*, November 19, 2004

Selected Committees

- Massachusetts Wind Working Group Policy Sub-Committee
- PJM Generation Attributes Tracking System Working Group (co-founder)
- Pennsylvania Electric & Metropolitan Edison Sustainable Energy Fund
- Coalition for Uniform Business Rules
- Ohio Electric Restructuring Working Groups
- Pennsylvania Disclosure & Electric Restructuring Working Groups

RÉSUMÉ OF RICHARD C. GROSS

SUMMARY

An electrical power systems engineer specializing in technical analyses and feasibility studies related to the integration of generation projects to electric utility distribution and transmission systems. Comprehensive background in the electric utility industry gained through more than 25 years of power system planning, design, and construction of electrical substations, transmission interconnections, and distribution systems. Mr. Gross is a Licensed Professional Engineer in the states of Massachusetts and New York.

RELEVANT PROJECT EXPERIENCE

- Technical advisor to the Independent Observer for the Hawaiian Electric Company, Inc. 2008 Request for Proposals for 100 MW of Renewable Energy Projects for the Island of Oahu. Services included the review of existing grid codes and technical performance requirements for generator ramp rates, frequency regulation, voltage ride through, and frequency ride through. Provided technical support during bidder conferences, bidder information requests, and proposal evaluation.

- Owner's Engineer for the Iberdrola USA 24 MW wind farm located in Lempster, NH consisting of twelve (12) Gamesa G87 2.0 MW wind turbine generators. Provided technical representation for the project in discussions with ISO-NE and PSNH. Developed electrical interconnection application, project relay and metering one line diagram, and 34.5 kV collection system layout. Prepared project technical data submittals to PSNH, reviewed contractor submittals, participated in construction progress meetings, and assisted with the 2008 project commissioning and start-up.

- Reviewed New England transmission system to determine potential wind project locations for wind project developer in 2008. Obtained load flow results from NERC based cases modeled in commercial software. Utilized ISO-NE Regional System Plans, CELT Forecast Reports, and National Grid Five Year Statements to identify existing and planned transmission facilities. Reviewed Interconnection Request queue to determine locations of competing projects.

- Prepared the electrical one line diagram and interconnection application for the 115 kV interconnection of the Steel Winds 19.9 MW wind farm that went into commercial operation in 2007 on the shore of Lake Erie in Lackawanna, NY. Performed Owner's Engineer review of the existing 115 kV – 13.8 kV interconnection substation that was utilized for the project interconnection and provided technical assistance during construction. Developed interconnection plans for up to an additional 60 MW project at the same location. Participated in scoping meeting and system impact study review with National Grid and NY ISO for both projects.

10 SPEEN STREET • FRAMINGHAM, MASSACHUSETTS 01701
PHONE: 508-665-5805 EMAIL: RGROSS@IEEE.ORG

- Prepared the electrical interconnection plan and application to the Midwest ISO for the Heritage Sustainable Energy, LLC 20 MW wind power project near Cadillac, Michigan. Assisted with the development of the wind turbine PSS/E ™ Stability Model as necessary for the project system impact study. Performed Owner's Engineer review of the system impact and detailed facility studies prepared by MISO and the transmission owner. Reviewed the Large Generator Interconnection Agreement and provided technical support during negotiations. Provided technical support during the design and construction of the 69 kV interconnection substation and the 34.5 kV collection system. The first two wind turbines (Fuhrlaender FL 2500 2.5 MW, each) were placed into commercial operation in 2008.

- Prepared transmission interconnection feasibility studies and prepared interconnection applications for numerous wind generation projects for interconnection to transmission facilities in the ISO-NE, NY ISO, PJM, MISO, ERCOT, and SPP control areas. Developed conceptual design plans for the interconnection and collection substations as required by the interconnection procedures. Reviewed feasibility study, system impact study, and detailed facility study results and provided technical support to project developers during the interconnection process.

- Prepared the electrical interconnection plans for a GE 1.5 MW wind turbine generator that was installed at the Jiminy Peak Ski Center in 2007. Prepared the Notice of Intent for Interconnection to National Grid, assembled generator and interconnection equipment details, and prepared the project relay and metering one line diagram. The wind turbine generator was interconnected behind the Jiminy Peak electric meter to maximize the economic benefit of the project.

- Developed electrical interconnection relay and metering one line diagram and the 23 kV collection system design plans for a 12.5 MW wind farm to be located in Savoy, MA. Prepared the Notice of Intent for Interconnection to Western Massachusetts Electric Company. Performed detailed electrical load flow analysis of the Western Massachusetts Electric Company 23 kV distribution system to evaluate the system impact of the wind farm. The project is in the development phase and is expected to be constructed in 2010.

- Developed the electrical interconnection plans for ten (10) behind the meter wind power projects under the Massachusetts Technology Collaborative Large Onsite Renewables Initiative (LORI) program in Massachusetts over the period 2007 to the present.

- Project engineer for a wind generation project to be installed at Varian Semiconductor Equipment Corporation in Gloucester, MA. Tasks included a technical review of the National Grid 23 kV electrical distribution supply system to Varian and the development of electrical interconnection plans for two (2) 2,500 kW wind turbine generators. Prepared the Notice of Intent for Interconnection to National Grid, assembled generator and interconnection equipment details, and prepared the project relay and metering one line diagram. Prepared the project Attachment 1 (Generator Proposed Plan Application) to ISO-NE Planning Procedure 5-1. The project is expected to be constructed in 2010.

- Electrical load flow analysis of the 115 kV and 230 kV transmission facilities located within 10 miles of the Lake Erie shore in NY to identify the capacity for the interconnection of Offshore Wind Farms in Lake Erie for NYSERDA.

- Performed load flow and contingency analyses of high voltage transmission systems, identified transmission interconnection options, and quantified interconnection costs for numerous wind generation projects. Evaluated load flow performance, identified pre-existing overload conditions during contingency cases, and proposed system upgrades or switching procedures to improve system performance.

- Developed the detailed electrical design drawings for the electrical interconnection of a 660 kW wind turbine generator that was installed in 2006 at the Portsmouth Abbey School in Portsmouth, Rhode Island. Project tasks included the preparation of the electrical one line diagram and Notice of Intent for Interconnection to the Narragansett Electric Company 4.16 kV distribution system. Specified the technical details of the major electrical interconnection equipment including the 4.16 kV switchgear and 4.16 kV – 690 volt generator step-up transformer.

- Owner's Engineer for the 13.2 kV interconnection of the 3.2 MW CommonWealth Resource Management New Bedford Landfill Gas Generator Project to the NSTAR Electric distribution system. Prepared the Notice of Intent for Interconnection to NSTAR Electric, assembled generator and interconnection equipment details, and prepared the 13.2 kV electrical substation relay and metering one line diagram. Represented the developer during the review of the NSTAR system impact study including the review of NSTAR load flow and short circuit analyses. Provided technical guidance to the developer regarding generator reactive power capabilities and reactive compensation at the interconnection substation. This project is in operation.

- Project engineer for the conceptual design of the 400 kV electric utility interconnection substation and 110 kV offshore substation for the 250 MW Slupsk Shoals Offshore Wind Project (Poland) and the conceptual design of the 110 kV interconnection substation for the 60 MW Suwalki Wind Power Project (Poland).

- Project manager and lead electrical engineer for the detailed design, major equipment procurement, and construction/commissioning of 115 kV substations. Prepared relay and metering one line diagrams, three line diagrams, electrical arrangement drawings, control schematics, cable and conduit schedules, substation ground grid design, and lightning shielding design. Supervised civil and structural engineers during preparation of foundation and control house design drawings. Wrote technical specifications for the substation major electrical equipment including 115 kV circuit switchers, 115 kV disconnect switches, 115 kV CCVT's, power transformers, 13.8 kV metalclad switchgear, and 13.8 kV substation capacitor banks. Evaluated major equipment bids and recommended contract award. Reviewed shop drawings for major equipment and coordinated design details. Wrote substation construction specifications, evaluated contractor bids, and recommended award. Projects include the 115 kV and 13.8 kV Expansion of the North Attleborough (Massachusetts) Sherman Substation, replacement of the 115 kV circuit switchers and 23 kV circuit breakers of the Middleton (Massachusetts) Essex Substation, and the 115 kV and 24.5 kV expansion of the Littleton (Massachusetts) Beaver Brook Substation.

PROFESSIONAL EXPERIENCE

Richard C. Gross P.E., Inc. **2002 – Present**

President

Provides professional electrical power engineering services for the design and development of distributed energy projects. Services include project interconnection and integration, feasibility analysis, site screening, technology assessment, project support and project management.

PLM Electric Power Engineering **1987 – 2001**

Principal

Co-Founded and developed the company into a 25 person consulting and design firm providing electric system planning and detailed design services for the electric utilities in New York and New England. Project manager and lead engineer on numerous substation projects including the multi-phase expansion of the 115 kV - 69 kV – 13.8 kV supply substation to the North Attleborough Electric Department in Massachusetts. Project manager and lead engineer on the interconnection of numerous distributed generators including the 4.8 kV interconnection of the BFI Landfill Gas Generator Project in Chicopee, Massachusetts and a 250 kW fuel cell at Westover Air Force Base in Massachusetts.

Power Line Models, Inc. **1984 – 1987**

Principal Engineer

Project manager and lead engineer for electric utility distribution system planning and design projects at system voltage levels from 4.16 kV through 23 kV. Prepared detailed design plans and construction specifications for distribution supply substations. Prepared technical specifications for power transformers, high voltage circuit breakers, and other major equipment. Performed power quality assessments including the specification and installation of power disturbance analyzers and the development of mitigation measures.

RW Beck and Associates **1980 – 1984**

Supervising Engineer

Lead engineer for the load flow and short circuit analysis of the MBTA 13.8 kV transit power supply system and 115 kV – 13.8 kV bulk power supply system in Boston, Massachusetts. Project engineer for the design of the MBTA 115 kV – 13.8 kV bulk power substation. Evaluated protective relay coordination of the 13.8 kV transit power supply system and gas turbine generator.

EDUCATION

M.S., Electrical Engineering, Northeastern University, 1983
B.S., Electrical Engineering, Northeastern University, 1980

10 SPEEN STREET • FRAMINGHAM, MASSACHUSETTS 01701
PHONE: 508-665-5805 EMAIL: RGROSS@IEEE.ORG

PROFESSIONAL ORGANIZATIONS

Institute of Electrical and Electronics Engineers (IEEE)
American Wind Energy Association (AWEA)
Northeast Energy and Commerce Association (NECA)

10 SPEEN STREET • FRAMINGHAM, MASSACHUSETTS 01701
PHONE: 508-665-5805 EMAIL: RGROSS@IEEE.ORG

James A. Cleveland, P.E.

Principal-in-Charge

RESUME

Education

B.S., 1971, Civil Engineering, University of Maine
M.S., 1972, Environmental and Water Resource Engineering, Vanderbilt University

Professional Registrations

1977, Professional Engineer, Massachusetts, 28814
1990, Professional Engineer, Indiana, 60910172
1995, Professional Engineer, New York, 071914-1

Areas of Specialization

Site Selection and Permitting
Power Plant Engineering & Design
Hazardous Waste Remediation
Advanced Technology Commercialization
Wastewater Treatment
Contract Management

Summary of Experience

Mr. Cleveland is an Environmental Engineer and Senior Vice President with more than 30 years of managing multi-disciplined projects for government, industrial, process and power clients. He is the Energy Sector Leader for GZA. Energy work is GZA's fastest growing business sector and includes providing a broad array of services to electric, gas and communication providers. Projects include electric and gas transmission, renewable energy, MGP remediation, nuclear and hydroelectric assignments. Services include siting, permitting, risk management, remediation, and geotechnical/civil engineering services.

Mr. Cleveland's experience includes consulting, engineering, design and construction assignments. Project and management experience in power plant engineering and design, site selection and permitting, hazardous waste remediation, pollution prevention, commercialization of new technologies, and nuclear decontamination and decommissioning (D & D) programs and projects. He is responsible for strategic planning, risk management, business development, contract negotiation, program and project management, and client relations.

Relevant Project Experience

Principal-in-Charge, Wind Farm Support Services, Confidential Maine Client. GZA is developing regulatory compliance program for a 90 MWe wind farm. Program includes detailed requirements for all permits, licenses and agreements for operation of a wind turbine facility.

Principal-In-Charge, Hull Offshore Wind Energy Project Geotechnical Investigation, Hull, Massachusetts. Developed and managed offshore geotechnical investigation for a 4-turbine offshore wind farm. Investigation included geophysical survey, vibracores and borings. Borings were taken from a liftboat in approximately 50 feet of water. Prepared geotechnical report with foundation design recommendations.

Principal-In-Charge, Cape Wind Geotechnical Investigation, Nantucket Sound, Massachusetts. Developed and managed offshore geotechnical test boring program in the Nantucket Sound, at a proposed offshore wind farm site. Prepared geotechnical report addressing subsurface conditions and foundation design recommendations for construction of 130 offshore wind turbines.

Principal-In-Charge, Cape Wind Geotechnical Investigation, Nantucket Sound, Massachusetts. Documented/observed offshore geotechnical borings performed from a liftboat in the Nantucket Sound at a proposed offshore wind farm site. Prepared geotechnical report addressing subsurface conditions and foundation design recommendations for construction of offshore meteorological tower.

Principal-in-Charge, Maine Yankee Geotechnical Borings and Environmental Services, Stone & Webster Engineering Corporation, Wiscasset, Maine. For the decommissioning of Maine Yankee, a 600MW nuclear power plant in Wiscasset, Maine, GZA provided NQA borings and field instrumentation in support of foundation design for an interim spent nuclear fuel storage facility. On a separate assignment for Stone & Webster at the facility, GZA developed the Site Environmental Protection Program. The Plan was prepared in

accordance with ISO 14000 Guidelines and addressed all environmental aspects and regulatory programs at local, state and federal level.

Account Executive, Geotechnical Services for Maritimes & Northeast Pipeline, LLC, Eliot, Maine. GZA is working with Spectra Energy and it's subsidiary, Maritimes & Northeast Pipeline, LLC under a continuing services agreement to provide geotechnical and environmental services. For the Eliot substation, GZA expedited mobilization of drill rigs to the site to support a geotechnical investigation of a gabion retaining wall supported on the Presumpscott Clay formation.

Principal-in-Charge, On-Call Engineering Support of Hydroelectric, Pumped Storage Transmission, and Fossil Power Generation Facilities, New York Power Authority. GZA was the principal subcontractor to Proto-Power, providing geotechnical, environmental and dam engineering services at 5 NYPA generation station locations throughout the state. Services range from environmental and geotechnical investigations and studies to engineering and design of marine structures. Tasks were completed from thee GZA office locations – Buffalo, NY, Manhattan, NY and Norwood, MA.

Principal-In-Charge for the $46 million Hydro Relicensing Program for the Federal Energy Regulatory Commission. This five-year project dealt with the relicensing of hydro facilities across the country and addressed issues on need for power, fisheries, archeology and recreational use.

Program Sponsor, Tank Relocation Project, PG&E Generating, Manchester Street Station, Providence, Rhode Island. The proposed relocation of the Interstate 195 and Interstate 95 interchange in Providence will necessitate taking of land now owned by the PG&E Generating facility. The roadway alignment south of the Providence Hurricane Barrier will require the relocation of a backup 5.7 million gallon fuel oil storage tank. The 170-foot-diameter tank is to be replaced by a new tank, pump house and fire foam house in an area south of the existing tank. GZA prepared all the site work design for the facility to include storm water drainage, oil/water separators, retention basins, fuel piping, utility realignment structural foundations and soil densification. Additional design problems at the site include the crossing of the hurricane barrier with the utilities and relocation of a contaminated soil berm to make way for the new utilities. Environmental issues at this site require permitting with various state environmental agencies, local building officials, the coastal management council, and the US Army Corps of Engineers.

Program Sponsor, Site Civil Design for Power Generating Facility, North Smithfield, Rhode Island. The construction of a new gas-fired, 350-megawatt electric generating facility is planned by Indeck Energy Services, Inc. in North Smithfield, near the intersection of the power grid and gas main line. The site is located in a rural area adjacent to a reservoir and aquifer, requiring careful site planning and design due to the environmentally sensitive nature of the site. The GZA team prepared preliminary siting and grading plans for the facility designed to minimize visual and noise impacts to the community. GZA was responsible for updating and completing all topographic survey data and base maps as well as locations of all defined wetland edges. Preliminary site plans were developed for planning and permitting use. Final site plan designs included building and equipment layouts and setbacks, access road designs, site storm drainage system and retention basins, sewage force main design, and other site utility designs.

Professional Activities

Member - Society of American Military Engineers - Senior Executives Group
Member - Northeast Energy and Commerce Association
TAU BETA PI Engineering Honor Society

Diane Y. Baxter, Ph.D., P.E.

Project Manager

RESUME

Education

B.S., 1990, Civil Engineering, Tufts University
M.S., 1994, Civil Engineering, Purdue University
Ph.D., 2000, Civil Engineering, Virginia Tech

Professional Registrations

Registered Professional Engineer, Rhode Island

Areas of Specialization

Geotechnical Engineering
Civil Engineering
Marine/Offshore
Alternative Energy/Sustainability

Summary of Experience

Dr. Baxter joined GZA in 2000 as a geotechnical engineer for a variety of geotechnical, marine, and environmental engineering projects. She has acted as field engineer, project engineer, and project manager, and has experience providing foundation recommendations, geotechnical site investigations, construction monitoring, earth support system design, seepage analysis, liquefaction analysis, and slope stability analyses. Prior to joining GZA, Dr. Baxter has worked for Metcalf & Eddy Inc. in Wakefield, Massachusetts and James K. Mitchell in Blacksburg, Virginia on a variety of geotechnical and environmental consulting projects. Experience included finite element analysis, settlement analysis, dam inspections, specification preparation, drilling supervision, and well sampling. Relevant project experience includes:

Relevant Project Experience

WIND ENERGY PROJECTS

Project Manager, Deepwater Wind Rhode Island Wind Farm Project, Offshore Rhode Island. GZA is currently providing a desktop study to evaluate subsurface conditions offshore Rhode Island, and the impact on offshore wind turbine foundation design.

Project Manager, Cape Wind Project, Nantucket Sound, Massachusetts. Managed permitting phase of project. Project entailed the proposed construction of 130 offshore wind turbines in Nantucket Sound, Massachusetts. GZA provided geotechnical consulting services to evaluate US Minerals Management Service (MMS) geotechnical permitting requirements. GZA presented to MMS in Washington DC with project team regarding 2007 MMS regulations and their relationship to offshore wind farm projects. In other phases of the project, GZA also provided the offshore geotechnical boring program and geotechnical report, as well as on-land cable route geotechnical investigations and geotechnical report.

Project Engineer, Beaver Ridge Wind Turbine Foundation Investigation and Design, Freedom, Maine. Provided review of foundation design. GZA provided geotechnical investigation and foundation design of on-shore wind turbine shallow foundations for three 1.3 MW GE wind turbines. GZA also provided structural and geotechnical support during installation.

GEOTECHNICAL ENGINEERING

Project Manager, Waterplace Park Condominiums, Providence, Rhode Island. GZA provided geotechnical and environmental subsurface investigation, environmental testing and permitting, foundation design, and construction monitoring services for the foundations of two 19-story condominium buildings and underground parking garage. Site was located next to Woonasquatucket River in downtown Providence. GZA designed precast piles, 1100 ft of steel sheeting with tiebacks, temporary dewatering groundwater treatment, permanent underslab underdrain system, underslab cofferdams, anchored soldier pile temporary construction ramp, foundation design for two tower cranes. GZA also provided field inspection services for all of the above.

Project Manager, Foundry Parking Garage, Providence, Rhode Island. GZA provided geotechnical and environmental subsurface investigation, foundation recommendations, and field observations for pressure injected footings for 3 story parking garage.

Project Manager, Warren Bridge Replacement, Warren Rhode Island. GZA provided value engineering for redesign of marine cofferdams. GZA designed an innovative steel frame in order to drive steel sheeting into shallow rock under strong currents. Other services included vibration monitoring, WEAP analysis of piles, and preconstruction surveys.

Project Manager, Barrington Bridge Replacement, Barrington Rhode Island. GZA provided value engineering for redesign of cofferdams on land and in water. Other services included value engineering for construction sequence and phasing of work, vibration monitoring, WEAP analysis of piles, and preconstruction surveys.

Project Engineer, PSEG Power Plant Intake Tunnels, Bridgeport, Connecticut. Performed subsurface investigation and determined cause of failure of pile supported 6-foot diameter buried concrete tunnels. Designed new tunnels and foundation by pipe jacking new fiberglass pipe inside existing concrete pipe.

Project Engineer, Bristol Harbour Condominiums, Bristol, Rhode Island. Provided design, field observations, and on-site laboratory QA/QC testing for a soil-bentonite cutoff wall. The cutoff wall was installed adjacent to Bristol Harbor to enclose contaminated soils and prevent off-site migration of contaminants.

Geotechnical Consultant, I-15 Reconstruction, Salt Lake City, Utah. Performed finite element analysis of deep soil mixing alternative for embankment support. Performed finite element analysis of performance of first field prototype of VERT wall technology in College Station, Texas.

Project Engineer, Super Stop & Shop, Holyoke, Massachusetts. Provided engineering calculations of sheet pile wall and soldier pile earth support system for construction of new retaining walls and retail buildings.

Project Engineer, Boston Harbor Cleanup Project, Deer Island, Massachusetts. Provided foundation recommendations and other geotechnical support for a new 1270-mgd secondary wastewater treatment facility at Deer Island for the Massachusetts Water Resources Authority's Boston Harbor Cleanup project. Evaluated the slope stability of a stone revetment using computer modeling and analyzed the filter criteria of the stone revetment. Designed preload and wick drains to accelerate the consolidation of Boston Blue Clay. Calculated settlement and time to complete 100% primary consolidation. Analyzed as-built geotechnical settlement instrumentation data and correlated instrumentation data with predicted settlement. Developed pipe jacking and silt fence specifications.

Project Engineer, Improvements to I195, Providence, Rhode Island. Provided liquefaction analysis of soil conditions beneath highway embankment under design earthquake.

ENVIRONMENTAL

Project Engineer, Bristol Harbour Condominiums, Bristol, Rhode Island. Provided design recommendations, field observations, and on-site laboratory QA/QC testing for a soil-bentonite cutoff wall. The cutoff wall was installed adjacent to Bristol Harbor to enclose contaminated soils and prevent off-site migration of contaminants.

Field Engineer, Slope Stability of Final Cover for Phase II/III at Central Landfill, Johnston, Rhode Island. Determined material and interface friction properties for components of a final cover of a landfill. Provided engineering calculations for stability of the cover using a computer program.

WATERFRONT PROJECTS

Project Manager, Warren Bridge Replacement, Warren Rhode Island. GZA provided value engineering for redesign of marine cofferdams. GZA designed an innovative steel frame in order to drive steel sheeting into

shallow rock under strong currents. Other services included vibration monitoring, WEAP analysis of piles, and preconstruction surveys.

Project Manager, Barrington Bridge Replacement, Barrington Rhode Island. GZA provided value engineering for redesign of cofferdams on land and in water. Other services included value engineering for construction sequence and phasing of work, vibration monitoring, WEAP analysis of piles, and preconstruction surveys.

Project Manager, Dredging Study for Happy Hollow Pond, Cumberland, Rhode Island. Provided study of assessment of sediments in drinking water supply reservoirs including bathymetric survey, sediment sampling, and sediment testing. Provided study of dredging options and preliminary dredging plan.

Field Engineer, American Shipyard, Newport, Rhode Island. Provided onsite engineering support of off-shore pile installations and concrete pour for construction of a new pier.

Field Engineer, Village at Mount Hope Bay, Tiverton, Rhode Island. Provided field inspection of off-shore borings and inspections of existing marine structures.

Field Engineer, Port of Galilee Bulkhead, Galilee, Rhode Island. Generated subsurface profiles from existing subsurface borings and test pits. Provided engineering calculations for stability of a sheet pile bulkhead.

Field Engineer, United States Coast Guard Seawall, New London, Connecticut. Provided field inspection of borings and stability analysis of existing seawall under proposed dredging depths.

Professional Activities

Member, American Society of Civil Engineers
Member, Rhode Island Society of Professional Engineers
Member, Women in Transportation Seminar (WTS-Rhode Island)

Professional Development

Troxler Certified
First Aid Trained

Publications

Baxter, D. Y. and Filz, G. M. (2007). "Deformation Predictions of Ground Adjacent to Soil-Bentonite Cutoff Walls using the Finite Element Method." American Society of Civil Engineers Proceedings, Session of Geo-Denver 2007, Geotechnical Special Publication No. 163. http://dx.doi.org/10.1061/40907(226)7

Baxter, D. Y., Filz, G. M., and Heslin, G. M. (2005). "Strength and Compressibility of Soil-Bentonite Mixtures for Cutoff Walls." Waste Containment and Remediation, Proceedings, Sessions of the Geo-Frontiers 2005 Congress, American Society of Civil Engineers, Geotechnical Special Publication No. 142.

Baxter, D. Y. (2000). "Mechanical Behavior of Soil-Bentonite Cutoff Walls," Ph.D. Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Filz, G. M., Baxter, D. Y., Bentler, D. J., and Davidson, R. R. (1999) "Ground Deformations Adjacent to a Soil-Bentonite Cutoff Wall," Proceedings of the 3rd National Conference, Geo-Engineering for Underground Facilities, ASCE, Geotechnical Special Publication No. 90, 121-139.

Heslin, G. M., G. M., and Baxter, D. Y. (1997). "An Improved Method for Interpreting API Filter Press Hydraulic Conductivity Test Results" Proceedings, International Containment Technology Conference, 71-77.

Abedi, H., Risitano, J., Yamane, D., Chin K. (1993) "Performance of Wick Drains in Boston Blue Clay." Third International Conference on Case Histories in Geotechnical Engineering, Vol. I, 1035-1038.

Merritt K. Meyer, President

Education

1967 Dartmouth College, B.A. — Major: Philosophy; Minor: Architectural design, history, theory

1971 Cornell University, B. Arch. — Professional degree in architecture was awarded with highest honor, the *Aplha Rho Chi* Medal for 1971. Areas of concentration: architectural and urban design, planning, architectural history and theory, philosophy at Cornell's Sage (graduate) School of Philosophy

1973 Columbia University, M. A. in Architectural History and Theory. Except for my dissertation on Art Nouveau architecture, all requirements for Ph.D. were completed. Concurrently, a special program in architectural preservation was completed under the direction of Prof. James M. Fitch, founder and long-time director of the preservation program at Columbia.

Some General Skills and Experience

- Problem definition and analysis
- Design and conceptual strategies — conventional and unconventional — to address problems
- Successful experience in all phases of development, design, and planning
- Pragmatic (*i.e.* feasible as opposed to ideal) project conception
- Physical and conceptual planning at large, medium, and small scales
- Developing methods, structures, teams, and resources to implement plans
- Identification and weighting of elements of project feasibility
- Creating tools to overcome impediments to project feasibility
- Financial analysis and modeling
- Cultivating methods and sources of project financing
- Risk analysis — anticipating and weighing main threats to project viability
- Developing ways to address and limit risk (to project feasibility)
- Management to anticipate and avoid potential crises and finding means to address crises
- Analysis of relevant regulations and familiarity with regulatory processes and bureaucracies

Professional Experience

1972-73 New York City Landmarks Preservation Commission — Special Consultant for building research and Architectural Photographer for the 502 buildings that comprise the Cast Iron District —SOHO. The documentation served as the basis for the historic district designation.

1975-85 President and founder of Commons Planning Corporation, a not-for-profit corporation engaged in neighborhood planning, preservation, and revitalization in New York City. In 1979 Commons published the 5-year plan for the West Harlem community and the West Harlem Community Organization. The detailed study created several strategies for saving the existing neighborhood fabric and the economic rebuilding of many blocks in West Harlem. The plan was adopted by the City of New York and served as the blueprint for a phased, multi-year, multi-million dollar redevelopment of the area in and near Morningside Heights.

1975-86 Simon Thoresen and Associates, Architects and Planners. Main design projects included Randall Avenue Townhouses, Bronx; Whitefield in Southampton, New York — recipient of the New York State Historic Preservation Award for 1982; Beachwood in Scarborough New York — recipient of the New York Historic Preservation Award for 1984; 156 Townhouses in Coney Island.

1975-86 MTS Associates — founder, owner, president — a development corporation formed to undertake work in architectural and neighborhood preservation. Main projects included Coney Island Townhouses, Whitefield in Southampton, New York, and Beachwood in Scarborough, New York.

1977-79 Teaching graduate seminars in American architectural history, theory and planning at Long Island University.

RIWindTech – Rhode Island Wind Technologies

328 High Street Bristol, RI 02809 401.253.8040 mkm67@cox.net

1983-95 MKM Associates — founder, owner, president — a development firm specializing in preservation

- Rushmore Estate, 220 homes in Orange County , New York;
- Avondale Farm, Westerly, Rhode Island 1986-98
- River Farm, West Warwick, Rhode Island 1994-7 – Site design, Typical house designs (8), project *pro forma* MKM Associates also designed, developed, built, and marketed more than 1,200 affordable dwellings in New York City in public/private partnership with the City of New York under the HUD 235 home ownership program.

1994-99 AMPOTECH Corporation — founder, president — a firm established to undertake the production of electricity by means of gas turbines operating in combined cycle. Extensive negotiations with local officials, government officials in gas and electricity purchases and transmission, and with General Electric demonstrated the conditions for feasibility of a 450 MW facility in Zory, Poland.

1999-present AMPOLTECH Corporation — founder, president — a Polish-American corporation established to plan, establish the feasibility of the plan, and implement onshore wind generation facilities in Poland.

2005-present RIWindRech — founder president — a company formed to plan and develop onshore wind facilities in Rhode Island.

Miscellaneous

Extensive work for and on not-for-profit organizations:

- 1975-77 West Harlem Community Organization
- 1979-1985 Astella Community Development Corporation
- 1980-87 Founder/director/officer 400 West End Cooperative, New York, New York
- 1989-2002 Director/officer Association of US Postal Lessors — a national association representing more than $3 billion in property interests. Conducted ongoing negotiations with US Postal service on facility planning
- 1992-present Founder/director/officer of Mosaico Community Development Corporation — created and helped fund and implement multi-phase plan for the Kaiser Mill residential redevelopment and neighborhood revitalization in Bristol, Rhode Island
- 2002-present Director/founder/officer Save Bristol Harbor — conceived plan for habitat model of Bristol harbor
- 2006-08 Stakeholder Task Force on Distributive Generation, Office of Energy Resources, Rhode Island
- 2006-present Founder/director/officer Rhode Island Wind Alliance
- 2006-present Founder/director/officer Bristol Wind Group

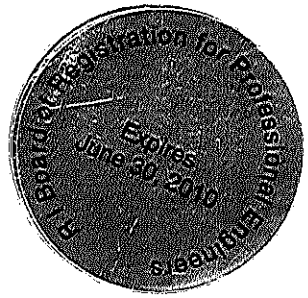
Lectures and presentations on wind facility projects in general and on onshore projects in Rhode Island specifically

- University of Rhode Island
- Rhode Island League of Cities and Towns
- Roger Williams University
- Salve Regina University

Participation in zoning and planning revisions

- Southampton, New York .1979-80 introduced cluster plan zoning ordinance that was adopted
- Briarcliff Manor, New York 1980-81 introduced cluster plan ordinance that was adopted
- Bristol, Rhode Island 1990-91 Comprehensive Plan Committee
- Bristol, Rhode Island 1992-6 Zoning Ordinance and Planning Regulation Revision Committee
- Bristol, Rhode Island 2007-08 Comprehensive Plan Committee

STATE OF RHODE ISLAND



STATE BOARD OF REGISTRATION

FOR PROFESSIONAL ENGINEERS

BE IT KNOWN THAT

APPLIED SCIENCE ASSOCIATES, INC.

having given satisfactory evidence that having the qualifications required by law is hereby authorized to practice

Professional Engineering

IN THE STATE OF RHODE ISLAND

as a Corporation

IN WITNESS WHEREOF, THE BOARD HAS ISSUED THIS CERTIFICATE OF REGISTRATION NO. 5247 UNDER THE SEAL OF THE BOARD THIS 13th DAY OF OCTOBER 1993.

STATE BOARD OF REGISTRATION FOR PROFESSIONAL ENGINEERS

CHAIRMAN *SECRETARY*

INSURANCE INFORMATION

ASA's Professional and General Liability Insurance are held through Starkweather & Shepley. Listed are the types of insurance and monetary levels carried.

- General Liability:
  - General Aggregate Limit - $2,000,000.00
  - Products-Completed Operations Aggregate Limit - $2,000,000.00
  - Personal & Advertising Injury Limit - $2,000,000.00
  - Fire Damage Limit: any one fire - $50,000.00
  - Medical Expense Limit: any one person - $5,000.00
  - Damages to Rented Premises: each occurrence - $500,000.00
- Automobile Liability:
  - Hired Automobile, Non-owned Automobile: each accident - $1,000,000.00
- Workmen's Compensation & Employers' Liability:
  - Employers' Liability: each accident - $1,000,000.00
  - Employers' Liability Disease: each employee / policy limit - $1,000,000.00
- Professional Pollution:
  - Contractor's Pollution Liability Limit - $2,000,000.00
  - Professional Liability Limit: each claim limit - $2,000,000.00

2. Relevant Experience

Project Description	Participating Team Members	Year Completed
RIWINDS Statewide Siting and Feasibility Study	Daniel Mendelsohn, Deborah Crowley, Dennis Loria, Jason Gifford, Richard Gross, James Jackson	2007
FM Global Wind Energy Fatal Flaw Analysis, West Glocester, RI	Daniel Mendelsohn, Deborah Crowley, Diane Baxter	Ongoing
North Kingstown School Department Wind Feasibility Study, North Kingstown, RI	Daniel Mendelsohn, Deborah Crowley, Dennis Loria, Jason Gifford, Richard Gross, James Jackson, Diane Baxter, James Cleveland	Ongoing
Town of Portsmouth Wind Feasibility Study, Portsmouth, RI	Daniel Mendelsohn, Deborah Crowley, Dennis Loria, Jason Gifford, Richard Gross	2008
Town of Portsmouth Wind Turbine Development Support, Portsmouth, RI	Daniel Mendelsohn, Diane Baxter, James Cleveland, Richard Gross	2009
Town of Jamestown Wind Feasibility Study, Jamestown, RI	Daniel Mendelsohn, Deborah Crowley, Dennis Loria, Jason Gifford, Richard Gross	2009
Ninigret Hamlet Wind Feasibility Study, Charlestown, RI	Daniel Mendelsohn, Deborah Crowley	Ongoing
UMass Medical Center research Campus Fatal Flaw Analysis, Shrewsbury, MA	Daniel Mendelsohn, Deborah Crowley	2009
RIDEM/Narragansett Wind Onshore Wind Partnership Project Feasibility Study for Chevron	Daniel Mendelsohn, Deborah Crowley	2009
ACT, Co. Wind Resource Assessment for 80 Sites Across the USA	Daniel Mendelsohn, Deborah Crowley, Dennis Loria	2009
REP Wind Park Preliminary Layout, Plymouth, CT	Daniel Mendelsohn, Deborah Crowley	2008
Cape and Vineyard Electric Cooperative Wind Feasibility: Phase I, Cape Cod, MA	Daniel Mendelsohn, Deborah Crowley, Dennis Loria, Jason Gifford	2008
Town of Falmouth Wind Feasibility, Falmouth, MA	Dennis Loria, Jason Gifford	2008
Plymouth County Correctional Wind Feasibility Study, Plymouth, MA	Daniel Mendelsohn, Deborah Crowley, Dennis Loria, Jason Gifford, Richard Gross	2008
Spectacle Island Renewable Energy Feasibility Study, Boston, MA	Daniel Mendelsohn, Deborah Crowley	2008
Peddocks Island Renewable Energy Feasibility Study, Boston, MA	Daniel Mendelsohn, Deborah Crowley	2009
Varian Semiconductor Equipment Corporation Feasibility Study, Gloucester, MA	Richard Gross	Ongoing
Savoy Wind Generation Development Project, Savoy, MA	Dennis Loria, Richard Gross	Ongoing
Jiminy Peak, Hancock, MA	Richard Gross	2008
Salt Cay Renewable Energy Feasibility Study, Turks & Caicos	Daniel Mendelsohn, Deborah Crowley, Dennis Loria, Richard Gross	2008
Holbox Island Renewable Energy Feasibility Study, Yucatan, Mexico	Daniel Mendelsohn, Deborah Crowley	2008

Portsmouth Abbey Wind Turbine Development Support, Portsmouth, RI	Richard Gross	2006
Owner's Engineer for Iberdrola USA's 24MW Lempster Wind Project, Leominster, NH	Richard Gross	2009
Interconnect Analysis and Design for 20MW Steel Winds Project, Lackawanna, NY	Richard Gross	2007
Transmission Interconnect Study for ISO-NE, NY ISO, PJM, MISO, ERCOT, and SPP Control Areas	Richard Gross	2006
Cape and Vineyard Electrical Cooperative Financial Structure Development, Barnstable, MA	Jason Gifford	2007
New England Transmission System Review to Determine Potential Wind Project Locations	Richard Gross	2008
Regulatory Compliance Program Development for 90 MW Wind Farm, ME	James Cleveland	2007
Hull Offshore Wind Energy Project Geotechnical Investigation, Hull, MA	James Cleveland, Diane Baxter	2008
Cape Wind Geotechnical Investigation, Nantucket Sound, MA	James Cleveland, Diane Baxter	2005
Geotechnical Investigation for Deepwater Wind Rhode Island Wind Farm Project, Block Island Sound, MA	Diane Baxter	Ongoing
Wind project assessment and development experience statements available upon request for many additional projects.		

3. Proposed Scope of Work & Schedule

Applied Science Associates, Inc (ASA, the Consultant, or the Team) herein proposes to provide an Evaluation of the Feasibility of Erecting a Regional Wind Energy System within the East Bay of RI, in response to the Request for Proposal issued by the East Bay Energy Consortium (the EBEC or the Client) for determining the feasibility of the development of utility scale wind turbines in one or more locations within the East Bay area of RI. The ASA team proposes to address each of the tasks outlined in the feasibility study scope of work provided with the RFP. The proposed scope of services and approach to the study are described in detail in the following section.

Project Approach

Task 1 - Pre-Feasibility Study

Kick Off Meeting

Effective client-consultant communication is the foundation for all successful project development efforts starting with siting and feasibility studies such as this. To help ensure effective communications, ASA will conduct a kick off meeting with the client to review the scope of services and open up the channels of communication between the client and the consulting team and to obtain and review available data. Prior to the meeting ASA will develop an agenda, tailored towards gathering all relevant information to proceed with the pre-feasibility study. ASA will depend upon the support of the EBEC and the towns to obtain the data necessary to perform the detailed analyses for this comprehensive study.

ASA will collect available information to perform the study including, but not limited to the following:

- EBEC Goals
- Individual Town Goals
- Confirmation of areas to be evaluated by the study
- Parcel delineation and ownership of areas to be evaluated by the study
- Participating Town GIS data
- Participating Town utility, facility and electrical load data
- Participating Town Zoning Ordinances and interpretation of guidelines potentially affecting wind energy project development
- Participating Town zoning maps
- Participating Town environmental & historic resource data
- Any existing wind energy project data and reports.

Site Prospecting and Evaluation Tasks

It is understood that the EBEC goal of the pre-feasibility study is to determine all viable areas worthy of pursuing a detailed feasibility study through the development of a Go/No-Go criteria. The ASA team will develop such criteria and evaluate all municipal owned sites, and any other potential sites as requested by the EBEC, based on the criteria parameters including but not limited to average annual wind speed, available area for wind turbine placement, site abutters, sensitive environmental resources, proximity to any existing wind turbines, local zoning restrictions, development restrictions, distance to adequate transmission line, existence of an onsite load as well as any other relevant information furnished by the EBEC.

The ASA team consists of the same group that performed the RIWINDS siting and feasibility study that evaluated all of Rhode Island, including the East Bay area, for its wind resource potential. The RIWINDS project was essentially similar to the proposed study but the focus was on a larger, state-wide scale. In addition, members of the ASA team have been involved in the conceptual development of the EBEC and given much thought to the goals of the consortium and its constituent communities and the potential structure and configuration of the proposed project. The ASA team will use data and insight gained through these exercises and employ them in pursuit of the present project, but will by no means be limited by those studies, but will work closely with the EBEC to develop the concept and bounds of the project as it develops. The proposed siting and evaluation study will be performed through the execution of, but shall not be limited by, the following tasks:

- Wind turbine siting considerations and constraints
- Site(s) assessment criteria development, site(s) identification and evaluation, in coordination with the EBEC
- Available wind resources, based on wind data available in the public domain
- Facility electrical consumption (current and proposed) and cost
- Preliminary electrical interconnection requirements
- Environmental impacts and permitting requirements
- Preliminary project economics for potential turbine development

The product of this assessment will not only be the fatal flaw analysis culminating in a Go or No-Go finding but also preliminary ranking of the sites relative to each other. Furthermore the methodology and findings and all underlying assumptions will be documented in a report which will elaborate on the viability of any of the projects that pass through the fatal flaw assessment and provide recommendations for further steps if applicable. An ASA team representative will be available to meet with EBEC and discuss the report and recommendations.

Task 2 – Detailed Feasibility Study

The following approach and scope for a detailed feasibility study is proposed for any sites desired to be pursued by the EBEC based on the findings of the pre-feasibility study. The proposed scope has been developed to respond to the suggested considerations outlined in the RFP. The parameters of this study are as outlined below.

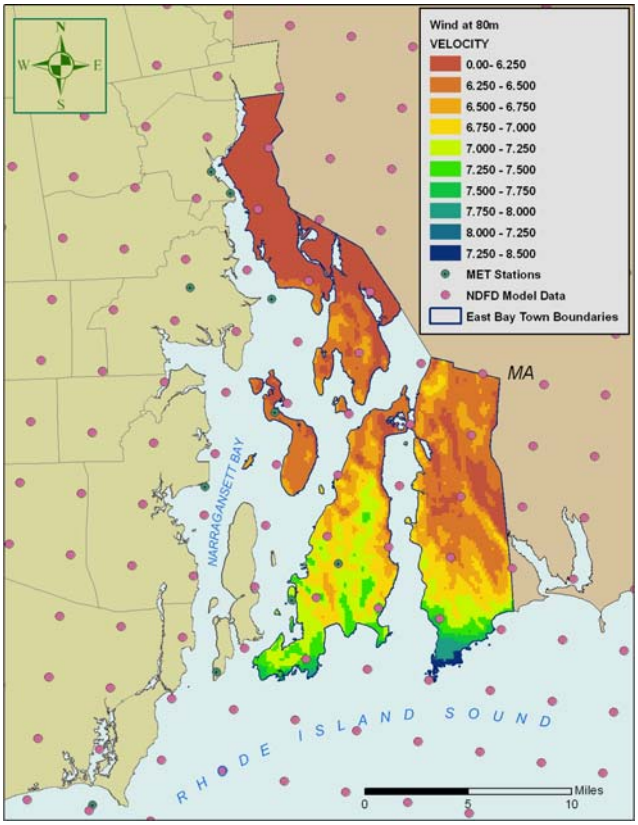
Technical Assessment

Wind Resource Assessment

The economic feasibility of a wind energy project is dependent on the wind resources. Wind resources are described by the wind speed, wind direction, wind statistics and the vertical profile of the site. ASA has a database of observation data as well as large in-house environmental data archives, proven in-house computer models and AWS Truewind annual average predictions which will be used to characterize the wind at each site. Observations records that will be used will come from, but not be limited to local stations known to report hourly wind speed and direction:

- Weatherflow Beavertail Station
- NOAA NWS Newport State Airport
- NOAA NWS TF Green State Airport
- NOAA Ports Quonset Point
- NOAA Ports Potters Cove
- NOAA Ports Naval Station Newport

- NOAA Ports Providence
- NBC MET Tower



This data will be evaluated to determine the spatial and temporal variability in wind characteristics in the study area. The long term records and environmental data archives will be used along with the AWS model predicted spatially variant average annual wind speed to determine the appropriate correlation between the candidate wind turbine placement sites and sites with long term data records. Furthermore the AWS Truewind model predictions at different elevations will be used to develop the vertical profile of wind at each candidate wind site. These profiles will then be used to estimate the annual wind statistics at the candidate wind turbine hub height.

For sites with a potential for multiple turbines or sites within close proximity to other potential wind turbines an analysis of the frequency distribution of speed and speed direction (wind rose) of the wind at each site which will be used for optimum placement of wind turbine generators (WTG) at each site. If the site is in close proximity to a long term local met data stations the method described above can be used effectively. If however the site is more remote a long term time series of wind speed and direction can be obtained through analysis of two additional model systems, the National Digital Forecast Database (NDFD) archived, re-analysis on a 5 km grid and the North American Model (NAM) on a 12 km grid, both of which are publically available through the National Weather Service and the National Center for Environmental Prediction (NCEP), and are employed by ASA on a regular basis. The NDFD grid spacing over the East Bay area is shown in the figure above.

Turbine Screening

ASA will evaluate suitable wind turbines based on performance characteristics as well as cost and availability. Depending on the constraints of the sites to be pursued in the detailed feasibility study a variety of sizes and capacity may be evaluated. Availability is a function of the balance of supply and demand. While WTG's were recently under high demand, at this time due to economic constraints on development projects demand has eased. Delivery lead time is currently over one year for many WTG's however. In general, there is more demand (longer lead time) for larger turbines over 1.5 MW so this evaluation will be affected by the size of the turbines selected for the project. The supply of turbines is changing continually as vendors expand their manufacturing capability and new vendors enter the market. The demand for turbines will also be affected by the extension of the Tax Credits and other federal government grants and bonds. Based on the cost, schedule of availability and the desired schedule of the project ASA will determine the most suitable turbine for each site.

Energy Production Estimates

In order to accurately estimate the power production potential for each of the selected sites it is proposed to develop 50th percentile annual wind statistical, 1-year, time series at each site. The 50th percentile winds reflect the distribution of hourly wind speeds over the course of the year which can be expected to be exceeded 50 percent of the time. The power production will be calculated using the wind time series and manufacturer supplied wind turbine power curves for the selected WTG. A sensitivity analysis to the wind speed will also be performed to show the associated production variance associated within the bounds of reasonably anticipated distribution of wind speeds. Furthermore the monthly estimates can be provided as an output of the

analysis. The output of the power production estimates (time series and sensitivity) will be used on the economic assessment to determine the project net benefit and the detailed key figures of merit discussed in the sections below.

Turbine Siting Considerations

The optimum location for wind turbines on each site will be determined using available site characteristics which can be supplemented by a site visit to map site characteristics if desired. Based on the existing site land use and lot boundaries the turbine will be located such that it adheres to all zoning requirements, minimizes noise and shadow flicker impacts to the lot abutters, and avoids sensitive environmental resources to the highest degree possible. Additionally, the siting will take advantage of any existing features that may help to minimize project costs such proximity to interconnection point or use of previously or naturally cleared areas.

Foundation Requirements

The ASA team will conduct a preliminary geotechnical analysis for each site considered in the detailed feasibility study to develop the foundation requirements. The analysis will consist of a site inspection to note any visible geologic features including rock outcrops, swamps and signs of filled areas. The sites will also be evaluated based on available geologic records and published information including foundation plans for nearby structures and records from geotechnical reports if available. Based on this information the implications to the potential turbine foundation requirements and relative cost of foundations will be evaluated. This will be used to determine suitability of the proposed sites for turbine construction and to assess the relative costs to construct foundations at the sites.

Access and Constructability Assessment

ASA will evaluate available site access at each site to determine if there are constraints that may impact construction of the turbines. Delivery and construction of the turbines will require access to the sites by oversized trucks and may require modifications to the existing roads and construction of temporary roads and improvements. The proposed access improvements will be evaluated at each site to assess potential environmental, aesthetic and cost impacts.

Transportation of the turbine to the site will also be evaluated as part of this task. Transportation to the East Bay area is anticipated to be feasible as was demonstrated with the 1.5 MW AAER turbine, 65m tower components and 77m rotor that was delivered to Portsmouth, RI. Similarly a 660kW Vestas wind turbine was also delivered to Portsmouth, RI.

Electrical Connection and Integration Assessment

ASA will evaluate the electrical interconnection issues associated with the each site undergoing the detailed feasibility assessment. The required interconnection voltage will be dependent on the size of the project. An estimate of the interconnection cost and T&D improvement cost, if any, will be prepared, taking into consideration the existing electrical infrastructure and National Grid's interconnection requirements. This cost estimate will be included in the project cost estimate described above. This infrastructure assessment will appropriately address the following three issues:

- Connectivity to grid or load
- Existing Electrical Infrastructure
- Transmission Requirements and Costs

Permitting Requirement

The permitting requirements required for the development at each site will be investigated as part of a detailed feasibility analysis. The permitting requirements will be evaluated in parallel with the turbine siting to avoid any permit or regulatory triggers (i.e. placement in wetlands) where possible. This task will be carried out in coordination with the EBEC legal consultant and RWU Law School fellows who have been tasked with investigating some of the legal intricacies associated with a wind energy development project as a consortium. It is recommended at the onset of this task that a transfer of knowledge between the legal group and the ASA team takes place to avoid duplication of any efforts.

The permitting analysis will address federal, state and local agency requirements. Permitting requirements are site and project size specific and therefore all required permits will not be known until the sites and projects have been identified. At a minimum the following issues will be addressed.

Environmental Impact

The ASA team will address both the environmental and legal requirements associated with the potential projects pursued in the detailed feasibility study. Each site will be evaluated to assess the visual and noise impacts of the project as well as potential impacts on rare species, vegetation, land use and recreation, wetlands and water quality due to development of the land and operational equipment. If possible each site will be visited to obtain a cursory review of the site characteristics. All studies will be based on resources identified during the site visit and literature and data found from existing sources.

Avian and Bat Impact Assessment

While existing studies indicate that the majority of birds demonstrate behavioral avoidance, a small number of individuals do encounter the rotor swept zone of a wind turbine. Most individuals will pass through the rotor swept zone unharmed; however some individuals may be killed or injured by the rotating turbines blades. The risk of these collisions is a function of the abundance of birds and bats, their flight height and movement patterns through the wind resource are and their proximate exposure to the rotating turbine blades.

This wildlife study involves developing a qualitative risk assessment of the potential for collisions, sometimes known as a Phase I study or a Tier 1 Study. This bird and bat risk assessment will be based on a review of the literature for Rhode Island; phone interviews with local and regional experts on bird and bat occurrence, abundance and their potential occurrence at the proposed sites. The occurrence of rare, threatened, and endangered species and the potential risks to these species will be included in this assessment. Based on this information and information on the potential for collisions due to exposure to the proposed wind turbine each site will be assessed and described. Any specific concerns of Rhode Island and Federal wildlife resource agencies and environmental organizations will be identified and incorporated into the risk assessment.

Noise, Light & Shadow Flicker

The noise study will be based on manufacturer's noise data from the turbine unit chosen. Noise impacts to sensitive receptors will then be calculated based on distance of the project from sensitive receptors, and literature values for ambient noise levels. No ambient noise monitoring is proposed.

For the light and shadow analysis for selected sites, a projection of the turbine rotor sweep on the map will be made for winter months when the arc of the sun is the lowest in the southern sky. An arc of the area swept on the map will be plotted to understand the potential light/shadow flicker impact to local residents. The same analysis will be made for the summer months for comparison purposes.

Visualizations

Visualization is a valuable tool for assisting community members in understanding what the project will look like. Familiarity and understanding of the project and its impacts, positive and negative, can often decrease public opposition.

A visualization study will be performed using site characteristics (coordinates, elevation) and local topography and photographs of the area. WindFarm software will be used to generate a rendering of the turbine or turbines at each site. Photosimulations will be prepared for up to 3 vantage points for each site, the locations of which will be developed in close coordination with the EBEC.

Economic Assessment

To provide a framework for assessing the estimated capital and operating costs including project decommissioning, expected power production, capacity and REC revenue, and all applicable avoided electricity charges, the Consultant will construct a pro forma financial model (the model) to assess each potential wind project location. The model will be set up to evaluate multiple different ownership structures including municipal government, private sector project finance, and any feasible combination thereof. The model will include a Base Case financing option based on one of the above ownership structures and will then be modified for each additional financing/ownership scenario. The model will include key capital and operating cost assumptions as well as power and REC revenue assumptions estimated by the Consultant for this feasibility study. It will show the projected cash and tax benefit flows to the owner of the project. The model will estimate the financial performance of the wind project using three indices: the internal rate of return (IRR), net present value (NPV), and pay-back period for the project's initial capital costs (Pay-Back Period) which in the aggregate are referred to as the Financial Return Indices. Note that the IRR and Pay-Back Period metrics apply only to cases where the project owner makes an initial cash equity contribution. The relevant assumptions and results of each case will be summarized and presented for a relative comparison of the different options.

The Consultant also will conduct selected sensitivity analyses for three main factors regarding the wind project's likely financial performance. These sensitivity analyses will include varying (i) the projected wind resource, (ii) varying the total installed capital cost, and (iii) varying the market value of production (via either the forecasted value of avoided electricity charges, or the price of RECs, assuming a third party buyer).

Project Cost Estimates

Wind energy projects are capital intensive and the economics are highly dependent on the up-front capital costs. The ASA Team has extensive engineering and cost estimate experience on which to develop accurate cost estimates impacting the results of the economic analysis. The project cost estimates will be developed for each site considered for the detailed feasibility study. The estimates will include all project costs including engineering, capital (equipment), installation, operation & maintenance including insurance and decommissioning as well as financing. The project cost estimates will include the discount for all applicable incentives such as the 30% Federal incentive currently offered for development of wind energy projects.

Project Revenue Estimates

The project revenues will be estimated based on the avoided utility costs derived from the power production estimates, REC revenue payments and tax benefits within the project pro forma model.

Project Ownership Options

Relative to fossil fuel-powered generation, wind power projects are distinguished by higher initial capital costs and lower operating costs. On a life-cycle basis, a wind project can be cost-competitive. Important aspects include the ability to amortize the capital costs over time and the ability to utilize Federal tax incentives. A key consideration for this project is the financial

profile of the project owner. The Consultant will seek input from the EBEC as to its interest and capability to secure internal funding and/or to mobilize sufficient third party funds for the initial capital costs of the project. The Consultant will also seek input from the EBEC on the relative importance of retaining ownership or control over the project. Based on this input, the Consultant will identify potential ownership and financing options for the project. As mentioned in the Pro-forma description the options will include ownership by a municipal government, private sector entity, and possibly shared or hybrid ownership (either with or without an ownership "flip" after the initial (private) owner reaches a pre-arranged rate of return). The Consultant will outline how the ownership decision affects the financing options. Potential financing options may include 100% equity (the majority of US wind projects are financed in this manner), 100% debt (which may be possible if municipal bonds are being considered), or combinations of private and tax equity, and either commercial or governmental debt. The availability of grants and subsidized financing will also be explored.

The Consultant will summarize its analysis of the financial performance of the Base Case in the economic analysis of the final report. The write-up will identify the key assumptions and include selected charts and tables to illustrate the Base Case as compared to all alternative cases and sensitivity analyses. In this write-up, the Consultant will also address the request for a discussion of any necessary or advisable legislative or regulatory changes.

Estimated Project Revenue and Cash Flows

The estimated project revenue and cash flows will be demonstrated through execution of the above tasks.

Calculation of Key Figures of Merit

The project will be ultimately evaluated based on the economic analysis estimates of key figures of merit including Net Present Value (NPV) Internal Rate of Return (IRR), Simple Payback Period, Benefit to Cost Ratio and the Annual and Cumulative Cash Flow Analysis. These metrics will be returned for each scenario of ownership/financing method evaluated as well as for the scenarios included in the sensitivity analysis.

Stakeholder Meetings Prior to Conclusion of Tasks 1 & 2

It is recommended that the EBEC hold a series of stakeholder meeting to inform the constituent public and promote public buy-in to the project. ASA will participate in at least two (2) stakeholder meetings at the conclusion of Tasks 1 and 2 of the project. ASA personnel have had many years of experience of participation in stakeholder meetings and can act as facilitators or simply be available for technical support (scientific and economic).

Meetings

The Consultant will support the EBEC and EBEC technical subcommittees meetings either in person or through conference calling as needed throughout the pre-feasibility analysis as well as any potential follow on phases/studies or construction management. Additionally, ASA team members will be available for any communications regarding the project with all EBEC committee/sub-committee members through phone or email.

Deliverables

ASA will deliver biweekly progress reports to EBEC from project kickoff through completion. ASA will document the findings of the pre-feasibility study in a Draft and Final report as well as provide a Draft and Final report of the detailed feasibility study if pursued based on the findings of the pre-feasibility study.

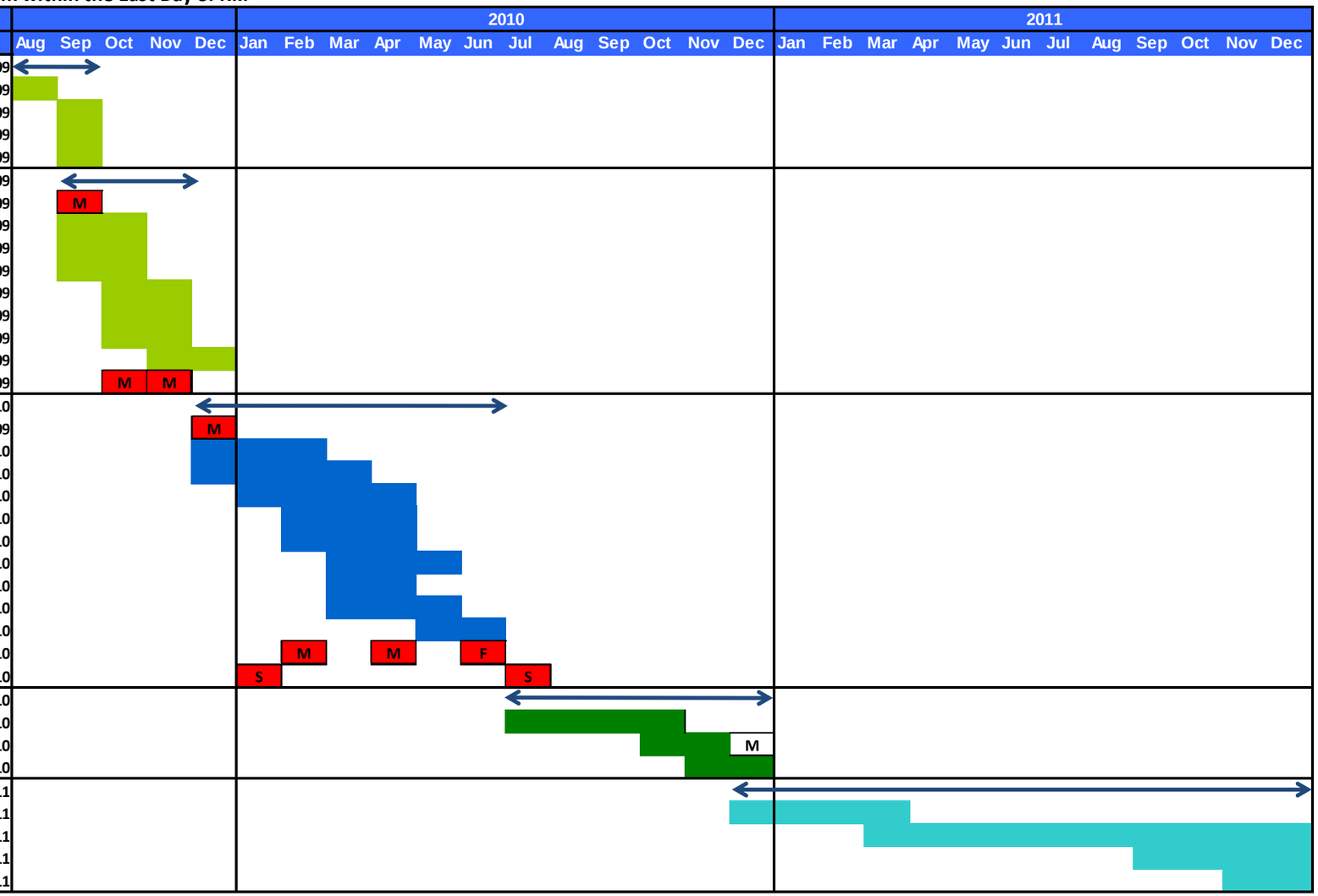
Project Schedule

The proposed schedule presented here with calendar dates included is highly dependent on receipt by the Consultant of all of the necessary municipal data as listed in the Pre-Feasibility Study data need description. The schedule is subject to slide if the data is not forthcoming in a timely manner. Data needs, acquisition, compilation and scheduling will be discussed on an ongoing bases with the EBEC working group as a meter of course. The following schedule also includes an approximation of the project development and construction, as an indication of the full project timeline, based on previous experience.

East Bay Energy Consortium

Evaluation of the Feasibility of Erecting a regional wind energy system within the East Bay of R.I.

Task	Task Name	Start		Finish	
-	***Proposal and Project Startup***	Aug	2009	Sep	2009
	Submit Proposal	Aug	2009	Aug	2009
	Consultant Interviews	Sep	2009	Sep	2009
	Consultant Selected by Work Group	Sep	2009	Sep	2009
	Contract Documents Developed	Sep	2009	Sep	2009
I	***Pre-Feasibility Study***	Sep	2009	Nov	2009
	Kickoff Meeting / Planning Session	Sep	2009	Sep	2009
	WTG Siting Considerations and Constraints	Sep	2009	Oct	2009
	Sites Identification and Evaluation	Sep	2009	Oct	2009
	Wind Resources Assessment	Sep	2009	Oct	2009
	Electrical Load Evaluation	Oct	2009	Nov	2009
	Prelim. Interconnection Requirements	Oct	2009	Nov	2009
	Perlim. Environmental and Permitting Issues	Oct	2009	Nov	2009
	Prelim. Project Economics	Nov	2009	Dec	2009
	Coordination Meetings	Oct	2009	Nov	2009
II	***Detailed Feasibility Study***	Dec	2009	Jun	2010
	Work/Planning Session	Dec	2009	Dec	2009
	Detailed Site Assessment	Dec	2009	Feb	2010
	Wind Resource & Power Production	Dec	2009	Mar	2010
	Regulatory Assessment	Jan	2010	Apr	2010
	Environmental Assessment	Feb	2010	Apr	2010
	Physical Construction Assessment	Feb	2010	Apr	2010
	Economic Assessment	Mar	2010	May	2010
	Cost Estimation	Mar	2010	Apr	2010
	Finacial Model	Mar	2010	May	2010
	Report Preparation	May	2010	Jun	2010
	Coordination Meetings	Dec	2009	Jun	2010
	Potential Stakeholder Meetings	Jan	2010	Jun	2010
III	***Construction Documents (Estimated)***	Jul	2010	Dec	2010
	Technical Design	Jul	2010	Oct	2010
	Bid Proposals	Oct	2010	Nov	2010
	Construction Schedule Developemnt	Nov	2010	Dec	2010
IV	***Construction Management (Estimated)***	Dec	2010	Dec	2011
	Design and engineering	Dec	2010	Mar	2011
	Construction	Mar	2011	Dec	2011
	Installation	Sep	2011	Dec	2011
	Completion and Commissioning	Nov	2011	Dec	2011



M	EBEC Coordination Meeting
F	Final Results Presentation Meeting
S	Stakeholder Meeting

4. Cost Proposal

Evaluation of the Feasibility of Erecting a Regional Wind Energy System within the East Bay of RI

Applied Science Associates, Inc. has provided a cost proposal in a separate submittal.

5. REFERENCES

Bidder: Applied Science Associates, Inc.
RFQ Title: Evaluation of the Feasibility of Erecting a Regional Wind Energy System within the East Bay of R.I.

1. RIWINDS Wind Feasibility Assessment
Reference: Rhode Island Governors Office
Contact: Andrew Dzykewicz, former Chief Advisor to the Governor on Energy
Rhode Island Office of Energy Resources
Address: One Capital Hill
Providence, RI 02908
Phone: 401-574-9100
Fax: 401-574-9125

Description and date(s) of supplies or services provided: June 2006 through January 2008

The Team completed a project for the Rhode Island Economic Development Corporation (RIEDC) to assess the feasibility of providing 15% of the aggregate electrical demand within Rhode Island through wind generation. Phase I of the study provided site locations with sufficient wind energy for viable power generation. Sites were specified considering the following factors; wind resource, permitting, financial feasibility, turbine sitting/sizing, electrical interconnection, and public sensitivity. ATM continues working with the RIEDC and the Governor's Office of Energy Resources in an ongoing stakeholder process and public outreach for development of the wind farm project.

Staff members: Daniel Mendelsohn, Dennis Loria, Deborah Crowley, Jason Gifford, James Jackson, Rich Gross

2. Portsmouth Wind Resource and Economic Feasibility & Wind Turbine Development Project Oversight, Portsmouth, RI
Reference: Portsmouth Economic Development Committee
Contact: Gary Gump, Chairman PEDC Sustainable Energy Subcommittee
Address: 37 Aquidneck Avenue
Portsmouth, RI 02871
Phone: 401-741-1011
Fax: 401-683-3736
Alt. Phone: 401-683-6308

Description and date(s) of supplies or services provided: April 2007 - ongoing

Daniel Mendelsohn led the team in a technical and economic feasibility assessment for placement of behind-the-meter wind turbines *at two proposed school* sites. The project included detailed wind resource, electrical interconnect, energy use, and financial analyses for different turbine sizes at the two potential locations. ATM is continuing on as the Town's representative, reviewing plans and activities during the construction process of the final turbine project at the High School.

Staff members: Daniel Mendelsohn, Dennis Loria, Deborah Crowley, Jason Gifford, Rich Gross

3. Jamestown Wind Power Feasibility Study Project
Reference: City of Jamestown, RI
Address: 36 Narragansett Ave.
Contact: Donald Weinberg
Phone: 401-453-6400
Cell: 401-301-1485

Description and date(s) of supplies or services provided: 2008 - ongoing

The Team recently began work for the Town of Jamestown to evaluate the potential for wind power generation on Conanicut Island, where the Town is located. The Team is providing a technical and economic feasibility assessment for potential projects, including single, behind-the-meter, and multiple, grid-connected wind turbine systems. The project includes a fatal flaw analysis,

reducing the number of candidate sites from 10 to three, detailed wind-resource assessment, electrical interconnect, energy use, and financial analyses for various turbine capacities.

Staff members: Daniel Mendelsohn, Dennis Loria, Deborah Crowley, Jason Gifford, Rich Gross

4. Massachusetts Department of Capital and Asset Management, Boston, MA

Reference: American Development Institute
Address: 36 Spring Water Way
Woonsocket, RI 02895

Contact: John Rizzo, P.E., Director
Phone: 401-524-5334
Fax: 206-309-0853

Description and date(s) of supplies or services provided: Dates: December 2007 - ongoing

The Team, along with American Development Institute, is providing services for a continuing services contract with the State of Massachusetts, Department of Capital and Asset Management (DCAM) to perform renewable energy feasibility and design studies for selected state facilities. Recent project examples include: a wind power feasibility study for the Plymouth County Correctional Institute and wind and geothermal energy assessments for Spectacle Island in Boston Harbor.

Staff members: Daniel Mendelsohn, Dennis Loria, Deborah Crowley, Jason Gifford

5. Met Tower, Providence, RI

Reference: Narragansett Bay Commission
Address: One Service Road
Providence, RI 02905

Contact: Barry Wenskowicz
Phone: 401-461-8848 x329
Fax: 401-461-6540

Description and date(s) of supplies or services provided: March 2007

Daniel Mendelsohn and Lorax Energy Systems provided wind turbine feasibility consulting services and planning, layout and installation of an NRG 50m Tall Tower met station with a 9200-Plus data logger for the Narragansett Bay Commission (Providence Municipal Sewer Authority). The Authority plans to install a behind-the-meter system to offset operational electric costs for the wastewater treatment facility.

Staff members: Daniel Mendelsohn