

8-31-2009

Wind Power Feasibility Study: Proposal to East Bay Energy Consortium

KEMA, Inc.

Follow this and additional works at: <http://docs.rwu.edu/ebec>



Part of the [Environmental Sciences Commons](#)

Recommended Citation

KEMA, Inc., "Wind Power Feasibility Study: Proposal to East Bay Energy Consortium" (2009). *East Bay Energy Consortium Documents*. Paper 18.
<http://docs.rwu.edu/ebec/18>

This Article is brought to you for free and open access by the East Bay/RWU Information Collaborative at DOCS@RWU. It has been accepted for inclusion in East Bay Energy Consortium Documents by an authorized administrator of DOCS@RWU. For more information, please contact mwu@rwu.edu.



Wind Power Feasibility Study

Proposal to East Bay Energy Consortium



Contact: Andrew Brydges, Principal Consultant
(781) 418-5715 or Andrew.Brydges@Kema.com

Proposal number 09-1865, Burlington, Massachusetts, August 31, 2009



Copyright © 2009, KEMA, Inc.

The information contained in this document is the exclusive, confidential and proprietary property of KEMA, Inc. and is protected under the trade secret and copyright laws of the U.S. and other international laws, treaties and conventions. No part of this work may be disclosed to any third party or used, reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, without first receiving the express written permission of KEMA, Inc. Except as otherwise noted, all trademarks appearing herein are proprietary to KEMA, Inc.



Table of Contents

| | |
|---|----|
| 1. Executive Summary | 3 |
| 1.1 Advantages of the KEMA Team | 3 |
| 1.1.1 KEMA Consulting Services..... | 4 |
| 1.2 Approach to working with the Consortium | 5 |
| 2. Qualifications | 6 |
| 2.1 KEMA Qualifications..... | 6 |
| 3. Staff Qualifications | 11 |
| 3.1 KEMA Staff | 12 |
| 4. References..... | 17 |
| Massachusetts Renewable Energy Trust | 17 |
| 5. Scope of Work | 18 |
| 5.1 Stage 1 – Preliminary Analysis of Sites..... | 18 |
| 5.2 Stage 2 | 19 |
| 6. Certificate of Insurance | 23 |
| Appendix A – Resumes | 1 |
| Appendix B – Ecology and Environment Proposal | 1 |
| Appendix C – KEMA Standard Terms and Conditions | 1 |



Table of Contents

1. Executive Summary

KEMA and its subcontractor Ecology & Environment (the KEMA Team) are pleased to present this proposal to the East Bay Energy Consortium to provide a wind power feasibility study. The Executive Summary below provides a summary of our organization, our relevant qualifications, and our proposed approach to working with the Consortium to develop a viable plan for siting, funding, and constructing land-based wind turbines in the East Bay area.

1.1 Advantages of the KEMA Team

The KEMA project team is ideally suited for this project. KEMA has a long history of successful consulting engagements on wind energy in both North America and in Europe. KEMA is an independent company, globally dedicated to providing technical and management consulting, testing, inspections and certification for businesses and other stakeholders in the energy industry. Our parent company – KEMA N.V., was founded in 1927 and is headquartered in Arnhem, the Netherlands. Our U.S. headquarters is located in Burlington, Massachusetts.

We wish to emphasize that KEMA's independence has been of particular benefit and importance to our previous wind consulting engagements with municipalities. Because KEMA does not have a future stake in the technical design, construction, ownership, or operation of wind turbines, we can be completely objective in our assessment of sites, resources, and ownership and operating structures. We also make it a priority to rigorously evaluate and quantify project uncertainties, providing a depth of analysis unequalled by other consultants, and of significant benefit to municipalities who are, correctly, highly risk averse with the expenditure of public funds and particularly sensitive to variability in annual budgets.

Ecology & Environment is committed to providing professional services so that global sustainable economic and human development may proceed with minimum negative environmental impact. E & E employs specialists in over 75 scientific, engineering, and technical disciplines, based in offices in major cities across the U.S. and around the globe. Their client list includes governments; commercial industries and multinational corporations. Since its founding in 1970, E & E has provided practical solutions to human health and environmental problems for over 25,000 environmental assignments in over 80 countries.

E&E has assisted with all facets of wind project development for numerous customers worldwide. Their work includes initial feasibility assessments, regulatory involvement assessment, facility siting, permit applications, environmental and social impact assessments, including avian and bat surveying, and environmental monitoring during installations. These activities involved identification of threatened and endangered (T/E) species' habitats and avian migration patterns.

E & E is also a consulting member of the American Wind Energy Association (AWEA). Their staff members are active participants on the AWEA siting committee and have presented training sessions and technical papers at AWEA national conferences and special workshops on topics such as avian impacts, visual analysis, permitting, offshore wind energy development, and public involvement. We are cognizant of the unique issues associated with wind energy development. Our network of experienced environmental staff gives us the geographic presence to understand state and local issues and the depth and breadth of specialists required to complete specialized studies necessary to permit even the toughest projects cost effectively and on schedule.

1.1.1 KEMA Consulting Services

KEMA is respected as an industry leader in developing and supporting wind energy as well as understanding retail energy markets. We have over 15 years of experience in wind and renewable energy both nationally and internationally.

Outside of the wind industry, KEMA provides a full range of strategic technical and business advice grounded in a commitment to providing impartial, objective, and expert services to energy and utility industry clients. We offer a full complement of services to clients involved in generation, transmission and distribution, markets and regulations, power exchange/energy trading, and retail and demand side management. Our consulting service professionals are active in offices worldwide serving clients in over 50 countries in regions including Asia, Asia-Pacific, North America, South America, Europe and Australia.

KEMA has a proven track record of working with municipalities and other public sector clients on wind and other renewable energy engagements. KEMA has been working since 2004 with the Massachusetts Technology Collaborative as a technical consultant to the Community Wind Collaborative. KEMA's independent advice, adaptability, and willingness to meet the varying demands of each community has been of proven value to the 8 communities for which we have performed site assessment and feasibility study work under the MTC's Community Wind program. KEMA is very proud of the fact that two of our Community Wind projects, Falmouth

and Scituate, seem poised to be the first Community Wind projects to be developed in Massachusetts.

1.2 Approach to working with the Consortium

We plan to staff this project primarily with Massachusetts-based staff (KEMA) and Rhode Island-based staff (Ecology & Environment) to keep travel costs as low as possible. Interconnection studies and potential load flow analyses would be led by KEMA's staff in Raleigh, North Carolina; however, we do not anticipate that travel would necessarily be required for those projects. KEMA employees in other offices or worldwide may be called on to provide additional expertise in the fields of project finance or site development; however, any travel expenses for those employees will not be charged to the project. The KEMA Team has the depth of staff and project management capabilities to manage this engagement effectively and efficiently, as we have with many other similar engagements that are described below. The Project Manager, and analysts, as needed, would be available for biweekly teleconferences or meetings with the Consortium technical subcommittee, and meetings with the Consortium on a monthly basis. The KEMA Team believes in open and routine two-way Client communication, and we have found in other community wind engagements that local stakeholders are the key to effective project implementation. We fully intend to engage and utilize the expertise of the Consortium members in completing the study and developing strategies to complete the best projects.

The listed staff are available to work on the project within the estimated project timeline of September to November 2009 (Stage 1) and November 2009 to June 2010 (Stage 2). Our team believes this schedule is reasonable; however, we note that if sufficient wind data is not available to model wind resources at the proposed locations, installation of meteorological towers and collection of additional data could delay Stage 2 of the project.

Below, in Section 2, we describe other relevant projects that KEMA has completed. In Section 3, we further describe our comprehensive team of specialized consultants, all of which are dedicated to technical excellence and superior customer service. In Section 4, we describe our proposed Scope of Work and the filters we'll use to identify and assess sites for wind turbines within the Consortium's boundaries. Information on Ecology & Environment, including an overview of their project approach, qualifications, and resumes of proposed staff, are in Appendix B.

2. Qualifications

For over 80 years, KEMA has provided valuable energy consulting, technology implementation and market expertise to hundreds of energy and utility clients in over 70 countries worldwide. We serve the complete spectrum of participants in the energy marketplace and offer a full complement of services supporting generation through the consumer side of the meter.

2.1 KEMA Qualifications

Examples of relevant KEMA experience in providing technical wind consulting services are provided below. Qualifications for Ecology & Environment are included in Appendix B.

MTC's Community Wind Collaborative

The Massachusetts Renewable Energy Trust's Community Wind Collaborative (CWC) helps cities and towns across the Commonwealth develop small-scale, community-owned wind projects. KEMA has been a technical consultant to this initiative since 2004, providing wind project site assessment, wind project feasibility studies, development support services, and education and communication strategies for communities that participate in this program. KEMA has worked or is currently working with the following municipalities: Falmouth, Kingston, Scituate, Yarmouth, Milton, Cohasset, Quincy, and Plymouth through this program. In addition, KEMA has supported the MTC in development of its project finance model, and is currently working to refine and complete that model, including preparing documentation to support it. Falmouth and Scituate are currently planning on going forward with construction.

Department of Capital Asset Management – Feasibility Studies

KEMA is currently working with DCAM to assess the economic and technical feasibility of wind projects and solar projects at several Massachusetts State-owned facilities. These analyses include feasibility, planning, and site assessment. Several of these sites are going forward with construction.

Wind Energy Feasibility on Aruba – WEB Aruba.

In 2003 KEMA performed a feasibility study of wind energy options on Aruba for the Aruba utility company. The study included assessment of suitable sites based on the landscape considerations, wind potential, and grid connection implications. The study also included evaluating wind farm design options, as well as economical feasibility.

Transmission Alternatives for Large-scale Wind Generation

KEMA was retained by SDG&E to identify a preferred transmission expansion plan capable of integrating up to 1,200 MW of wind resources in SDG&E's east county service area. KEMA performed load flow calculations in PSLF in order to assess the possible thermal violations to the purposed transmission alternatives. Based on these calculations, voltage and thermal violations were identified under base case and contingency conditions. After the thermal analysis, KEMA performed dynamic stability studies in PSLF aimed to determine the possible impact of the new wind generation into the system and the possible dynamic reactive power compensation mitigation measures using STATCOMs. KEMA also evaluated each of the alternatives based on possible routing, environmental impacts and estimated costs.

Intermittent Wind Generation Grid System Impact Report – California Energy Commission

KEMA assessed whether the addition of intermittent resources to an interconnected electrical system results in operational impacts that act as impediments to that addition. The study examined the impacts experienced in other areas, here and abroad where wind has been added on a large scale. The study also addresses how thermal and hydro facility operation can be adjusted to accommodate the addition of significant amounts of intermittent resources.

Interconnection Standards – Grenlec

KEMA developed draft and final interconnection standards for Grenlec for Grenada. These standards were designed specifically for solar and small wind projects. Mr. McPhee was the senior engineer on this project.

Garland Power and Light

KEMA performed a technical and economic feasibility study for Garland Power and Light, a municipal utility in Garland, Texas. The utility was seeking to develop a three to four turbine wind project at one of their power plant sites. Our scope of services included fatal flaws analysis, wind resource analysis, interconnection feasibility, permitting review, and economic analysis of the proposed project.

Wind Due Diligence – Varian Semiconductor

For Varian Semiconductor, KEMA performed a due diligence review of the findings of its wind energy feasibility study. As part of the review, KEMA examined site-specific construction and permitting issues, evaluated the project layout, performed an assessment of the wind resource, and analyzed expected project financial performance.

California Energy Commission's Renewable Energy Program

KEMA is the prime contractor for a ten-company team that supports over \$2 million of contracting activities for the CEC's Renewable Energy Program. KEMA has led the research for the CEC on renewable energy credits use for renewable energy accounting systems and in wholesale and retail commercial markets. In addition, KEMA provides strategic marketing, policy advice and technical services related the CEC's implementation of California's Renewables Portfolio Standard, the Emerging Renewables Program and the Customer-side Account. As the prime contractor, KEMA developed a project management website to facilitate communications and share files between the CEC and KEMA. A Renewable Market Outlook Team was established to respond to the market, political and regulatory changes for the renewable energy markets and the Renewable Energy Program.

Vermont Wind Policy Task Force, Vermont Department of Public Service. KEMA worked with the DPS and a Governor appointed Commission to review the current process, capture public feedback, and develop recommendations for changes to the process. KEMA facilitated all of the Commissions meetings, developed technical materials, held three widely attended public hearings and developed a report that summarized the Commissions findings. The findings of the Commission were turned into legislation that was passed in 2005.

Development of 6000 MW of offshore wind energy – Dutch Ministry of Economic Affairs (through Novem)

The Dutch government has set a goal of developing 6000 MW of offshore wind energy by 2020. In co-operation with the Technical University of Delft, and by order of Novem (Netherlands Agency for Energy and the Environment), KEMA was hired to assess the technical, economic, financial, and legal impacts of this expanded offshore capacity. KEMA's study found that the target was technically and economically feasible, although modifications to the electricity grid would be necessary. KEMA also found that uncertainties arising from short-term wind fluctuations could be overcome, but that long-term fluctuations are likely to increase, resulting in a need for additional capacity. The study concluded that the need for this additional capacity could be limited by carefully evaluating wind forecasts and calculation methodologies.

Management of Bid Book for offshore wind farm procurement– North Sea Wind (Siemens, Heijmans, Van Oord AZC).

The Dutch government called for proposals for the construction and operation of a wind pilot project near shore wind farm in the North Sea – the first of its kind. KEMA was hired to coordinate the proposal submitted by North Sea Wind Power (NSWP). KEMA's work consisted

of formulating key messages, supervising the team of authors, serving as liaison between this team and the clients' managers involved, and preparing the executive summary.

Wind Power Pre-Feasibility Study – Braintree Electric Light Department. KEMA worked with Braintree Electric Light Department to identify and evaluate potential wind development sites. This work involved a site evaluation, wind resource assessment, wind system sizing, energy modeling, financial analysis, and recommendations for next steps.

Feasibility of Wind Energy in Sheffield – Municipality of Sheffield (UK). For the municipality of Sheffield the feasibility of potential wind energy sites has been assessed. The study included: (1) wind resource assessment in complex terrain. (2) Calculations of environmental effects, i.e. noise, visual impact and shadowing. (3) initial design of wind farm lay-out.

Feasibility Study of Wind Energy in Municipalities – Municipalities of Veghel and Bernheze.

KEMA was hired by the municipalities of Veghel and Bernheze to perform a wind farm feasibility study. KEMA initiated discussions between the two municipalities, which resulted in the cooperative development of a wind farm located jointly on each municipality. As part of the feasibility process, KEMA studied a variety of potential locations. Included in the study was an assessment of economic feasibility, layout design, investigation into other potential concerns (e.g., cast shadow and noise), and an evaluation of landscape suitability.

Wind Energy Feasibility Study in British Guyana – Delta Caribbean. KEMA performed a detailed wind power feasibility study for British Guyana with wind project developer Delta Caribbean. The comprehensive study included selection of suitable sites, wind potential studies, grid connection analysis, site design, environmental impact analysis, detailed cost analysis, financing considerations, and detailed economic optimization.

Due Diligence Wind Farm Blacklaw – Scottish Power. For Scottish Power, KEMA was hired to improve and reduce uncertainty in energy yield estimates for a proposed wind farm. KEMA also was asked to confirm whether the loads caused by terrain features and the layout of the wind farm would be consistent with the IEC standard for Class I A wind turbines. In doing so, KEMA performed the following tasks: 1) gathering of data of terrain features, 2) calculation of the turbulence distribution across the entire site using WASP Engineering, estimation of the effect of the 1-hour averaging period on the turbulence level, 3) calculation of the fatigue loading of the rotor blades and masts according the Design Guidelines for Simple Terrain Wind Farms,

taking into account existing turbulence and added turbulence due to wake effects. Based on these calculations, KEMA provided recommendations regarding site layout and design.

Brightfield Project Feasibility Study - City of Brockton.

For the City of Brockton, Massachusetts KEMA prepared a feasibility study and business plan for the development of a 1 MW utility scale solar power plant on a Brownfield site. This study and plan was funded by the Massachusetts Renewable Energy Trust. The financial feasibility study involved the development of a large-scale solar energy (based on NREL's PV Watts) and financial model to determine the project's revenue requirements as well as determine the most viable type of ownership (i.e., not-for-profit, or for-profit). The feasibility study also involved significant research into development, capital, and operating costs, and review of the preliminary design and related assumptions. Assuming a not-for-profit model, the business plan included detailed research into financial and marketing options, and a detailed plan for moving forward with the business and technical elements of the project.

KEMA Collaborative on Large-Scale Offshore Energy Storage System Innovative "Energy Island" Key Technology for a Sustainable Energy Future

KEMA, in partnership with civil engineering firm Bureau Lievense and technology illustrators Rudolph and Robert Das, has developed an "Energy Island" concept to store power generated from an offshore wind farm. The innovative concept design is the initial result of an on-going feasibility study being conducted for Dutch energy companies.

The Energy Island designed by KEMA, Lievense and the Das brothers incorporates a new concept in pumped hydro storage – an inverse offshore pump accumulation station (IOPAC). On the Energy Island when there is a surplus of wind energy, the excess energy is used to pump sea water out of the interior 'subsurface-lake' into the surrounding sea. When there is a shortage of wind power, sea water is allowed to flow back into the interior 'lake' through commercially available generators to produce energy. The IOPAC is unique from conventional pumped hydro storage systems in that it would be stationed on an artificial island off the Dutch coast in the North Sea and comprised of a ring of dikes surrounding a 50 meter deep reservoir. The island itself would be built from materials dredged to deepen the interior reservoir. KEMA analysis estimates that the proposed Energy Island storage system would have a maximum generation capacity of 1,500 MW, depending on the water level. It also would have an annual storage capacity of more than 20 GWh – enough energy to offset 500 to 840 kilotons of CO₂ emissions. In the next phase of the feasibility study, which is underway, KEMA is further analyzing the costs and benefits of additional regulating reserve, download wind power, CO₂ reduction, and environmental impact.

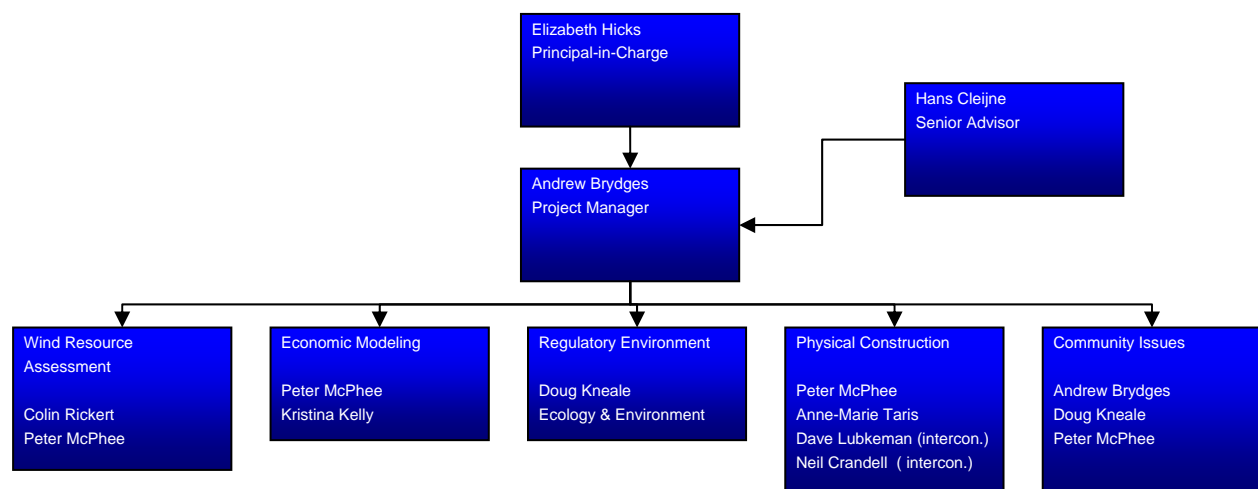
Utilizing stored energy can help reduce the overall amount of CO2 emissions associated with electricity production, especially when combined with wind or other renewable energy resources. Investment in large scale energy storage can increase the efficiency of conventional power plants as well as offset investments in replacing or developing new conventional peak production capacity. In addition to providing an alternative for large scale electricity storage, the energy island concept has the potential to provide coastal protection, harbor and/or LNG terminal facilities, aquatic biomass, and eco-tourism opportunities. Construction of the energy island is dependent on seabed composition. The North Sea site studied includes a seabed with a thick layer of clay.

Additional information on the Energy Island, including the report executive summary with renderings, is available at http://www.kema.com/press_releases.

Generator connection studies for Hawaiian Electric: KEMA Performed generator connection studies for several proposed generators located on Oahu and Lanai in the Hawaiian Islands.

3. Staff Qualifications

As shown on the organizational chart below, Andrew Brydges will serve as project manager for KEMA, and will have primary responsibility for contact and communications with the Consortium. Liz Hicks will serve as Principal-in-Charge for the project.



Full resumes for KEMA's proposed staff and subcontractors are included in Appendix A. Below we include biographies of KEMA's staff, organized alphabetically. Resumes and bios for Ecology and Environment staff are included in Appendix B.

3.1 KEMA Staff

Andrew Brydges is a Principal Consultant at KEMA and has seventeen years of experience in the energy and environmental sector working with public and private clients on a variety of strategic management consulting projects.

Mr. Brydges specializes in helping clients to develop communication tools to educate project stakeholders on complex technical, legal, and political issues. Mr. Brydges designs, delivers, and manages outreach and education programs for a variety of clients providing technical assistance to stakeholders on issues of energy efficiency and renewable energy. He is KEMA's project manager for its contract as a Technical Consultant to the Massachusetts Technology Collaborative Community Wind program, directing feasibility studies and project financial modeling on behalf of municipalities exploring development of wind power.

In the field of energy efficiency, Mr. Brydges also assists clients to evaluate energy efficiency programs and identify opportunities and viable strategies for increasing the adoption of energy efficient measures in the residential, commercial, and industrial sectors.

At KEMA, Mr. Brydges previously managed a long-term operations management contract, and served as Executive Director, for the North East Solid Waste Committee, working with 23 regional municipal governments to develop and negotiate creative solutions to issues in solid waste management. Prior to his work at KEMA and NESWC, he worked closely with the Massachusetts state transportation agencies to implement environmental compliance assessments and hazardous waste cleanups at hundreds of maintenance depots and stations, while also designing and conducting extensive training and communication programs and facilitating the successful implementation of environmental management systems.

Mr. Brydges earned his Bachelor of Science degree, with distinction, at Carleton College in Northfield, Minnesota.

Hans Cleijne focuses on renewable energy, with particular expertise in wind energy. He will serve as a senior advisor to this project. Mr. Cleijne has extensive experience in performing feasibility studies and strategic analysis of renewable energy projects. His recent work has

involved technical consulting projects on wind potential, short term wind energy forecasting, and renewable energy economics. For the Dutch Ministry of Economic Affairs, he recently completed a project that examined the implications of connecting 6000 MW of off-shore wind energy to the Dutch electricity grid. He was also project manager for a due diligence study of wind availability for a potential wind farm development project led by Scottish Power, UK. Mr. Cleijne graduated at the Eindhoven University of Technology with a degree in Physics (M.Sc.).

Neil Crandell is a Senior Consultant with KEMA with over 25 years of professional engineering experience in power system studies and planning. He has an extensive background in power systems analysis including load flow, short circuit, transient stability, voltage stability, transfer capability, reactive power planning, reliability, operations planning and operating guides, switching transients, protection coordination, feeder analysis, and economic evaluation. He has made countless recommendations for T&D system improvement projects, upgrades, substation equipment specification, conceptual designs and equipment ratings. He has performed area coordinator responsibilities for system studies and served on numerous reliability council working committees and energy advisory committees. Mr. Crandell also has experience in underground systems, including transmission and distribution design, ampacity ratings for cables sharing a common duct bank, and underground secondary network studies, planning, and design. Mr. Crandell received his degree in Electrical Engineering from Ohio University and has held professional engineering licenses in the states of Louisiana, Maryland, and Florida.

Elizabeth Hicks, Senior Principal Consultant, has extensive experience in energy efficiency, program planning, load response, benefit-cost analysis, marketing and market research, and program evaluation. She will serve as the Principal in Charge for this project. Examples of her recent assignments at KEMA include a scoping study of CO2 offsets for a large generator; a study of best practices in energy efficiency programs for the US Environmental Protection Agency; energy-efficiency program review and program development for Sustainable Ireland; an organizational review of the Energy Services Department of Snohomish PUD; development of technical potential and program development for the Electric Commission of New Zealand; development of an all fuels energy plan for Nova Scotia; supporting the distributed generation policy collaborative in Massachusetts; a market assessment of the wind industry in the US, facilitating the Governor's Wind Energy Regulatory task force and performing business process re-engineering for the Energy Efficiency Department of Bonneville Power Administration.

Prior to joining KEMA in 2002, Ms. Hicks has held management positions with the National Grid USA (formerly New England Power Service Company) for 16 years. As the Director of Market Research and Planning, Product Development Department, Ms. Hicks was responsible for

conducting customer satisfaction studies and developing new products and services including load response. As the Director of Evaluation and Research for the Retail Services Department, she was involved in all aspects of evaluation, benefit-cost analysis, energy efficiency and load response program planning, program screening, regulatory support, and policy issues. She was also the U.S. lead on an effort to develop a sustainable development strategy for National Grid.

Ms. Hicks has a BA in Economics and Mathematics from the College of William and Mary and a MS in Resource Systems and Policy Design from the Thayer school of Engineering at Dartmouth College.

Kristina Kelly is an Energy Analyst with KEMA working from the Burlington office. Ms. Kelly has knowledge of the economics of energy, climate change, and other environmental issues. She also has experience in econometrics and energy price forecasting. Before coming to KEMA, Ms. Kelly worked at LaCapra Associates where she was responsible for analyzing wholesale energy markets in three northeast regions, forecasting client energy bills, and researching potential energy market changes. She has also authored papers on Australia's climate change policy and an econometric analysis of the relationship between China's fuel mix and carbon intensity. Ms. Kelly graduated from Boston University in May 2008 with a B.A. and M.A. in Economics.

Douglas Kneale is a Senior Consultant with KEMA, and specializes in renewable energy development, energy efficiency evaluations and biomass utilization. He is currently evaluating renewable energy programs in New Jersey, and conducting an energy efficiency assessment in Florida. In addition, he has recently provided feasibility studies for wind energy and photovoltaic installations, and marketing studies for power plant co-firing of wood pellets.

Mr. Kneale has over twenty years of experience in data collection, analysis and reporting for environmental surveys, equipment testing, facility siting and R&D applications. He has experience in wind turbine studies, PV installation and other renewable energy projects, as well as many years of experience in the siting, construction and operation of facilities. Mr. Kneale has a proven ability to design and engineer environmental systems and equipment and has extensive project management and consulting in the US and overseas. He is a contributing author to over 20 technical studies and project reports. Mr. Kneale holds a B.S. degree in Mathematics and Biochemistry, and an M.S in Agricultural Engineering.

Dr. David Lubkeman is a principal consultant at KEMA with over 25 years experience in the areas of distribution systems analysis and automation. He is an active participant in power

industry technical development activities, resulting in over 40 publications and 9 patents. He is also a registered Professional Engineer in the state of South Carolina.

Dr. Lubkeman's focus at KEMA is on distribution system modeling, reliability, analytics and automation. Past project tasks have included modeling the impact of distributed generation/storage devices on electric distribution grids, characterizing the performance of a large-scale battery storage system and providing expertise on Smart Grid applications for medium-voltage distribution systems.

Prior to joining KEMA, Dr. Lubkeman was with ABB for eight years where he was involved in the deployment of systems solutions for utility distribution networks, feeder automation product management and supporting utility asset management activities. Past projects at ABB have also included configuration tools for feeder automation devices, large storm damage assessment for distribution outage management, distribution contingency analysis, asset failure rate prediction, distribution utility performance analysis and transmission/distribution system fault location.

Dr. Lubkeman was also an associate professor at Clemson University for ten years and an assistant professor at North Carolina State University for six years. Project topics while in academia included industrial power quality, distribution circuit state estimation, distribution fault location, feeder reconfiguration and expert system diagnostic applications. Courses taught while at the university include Introduction to Power Systems, Power Electronics, Electric Machinery, Power System Stability and Control, Power System Operation and Control, Electric Power Distribution Systems, Power System Transients, and Computational Methods for Power Systems Analysis. He also taught a power systems analysis review designed to prepare engineers for the Professional Engineering (PE) Exam, was a lecturer on power system operations at the Modern Power Systems Analysis short-course held at Auburn, and was an instructor at the North Carolina Electric Meter School, covering basics of electric power circuits and revenue metering.

Dr. Lubkeman holds a Ph.D. in electrical engineering from Purdue University with an emphasis in power systems engineering. He also has an MS and BS in electrical engineering, also from Purdue. He is a member of IEEE and CIGRE.

Peter McPhee, Senior Engineer. Peter's primary role at KEMA is in the design and analysis of the technical aspects of renewable energy systems and green infrastructure. Recently, he has analyzed the feasibility of community wind projects in aspects ranging from wind resource

analysis and energy simulations to visual simulations and economic modeling. He is currently involved in planning a multi-turbine wind project south of Boston as well as supporting ongoing community wind projects throughout Massachusetts. His current interests in renewable energy include wind farm due diligence, wind power load-flow integration, wind project design and feasibility, and off-shore wind.

Mr. McPhee has also been involved in the energy efficiency/Demand-Side Management (DSM) field. Mr. McPhee has worked in providing data collection and analysis of energy efficiency practices and developed quantitative efficiency goals, best practice recommendations, and estimates of long-term expected DSM reductions. He has been involved in a variety of efficiency work, from the evaluation of state efficiency programs to quantitative potential studies for utilities. Prior to joining KEMA, he played a pivotal role in the development of a carbon neutral policy for the entire Johns Hopkins university system.

Peter McPhee is the coordinator for KEMA's Wind Energy Practice Area, which seeks to develop and expand on the scope of wind energy projects with which KEMA is involved. Mr. McPhee holds a B.S. in Mechanical Engineering from the University of Massachusetts Amherst and an M.S. in Mechanical Engineering from the Johns Hopkins University.

Colin Rickert, Consultant, holds an M.S. in Computer Science from the University of Vermont, an M.S.E. in Software Engineering from Seattle University and a B.A. in Biochemistry from Clark University. He has diverse professional experience in software development/testing, wind resource analysis, wind turbine siting/optimization, wind farm production modeling and authoring technical reports. Prior to joining KEMA, Mr. Rickert worked at EAPC Wind Energy Services in Norwich, Vermont as a project analyst working on a wide range of wind energy related projects including community, onshore, offshore and nearshore wind feasibility studies. Prior to working at EAPC, he worked for Intelligent Results and Bocada Software in Seattle Washington as a Software Research Engineer and Software Test Engineer respectively where he worked on modeling, verification and testing of advanced data mining applications. His research experience is also in the area of data mining and the use of genetic algorithms and neural networks for classification, forecasting and optimization. While in graduate school Mr. Rickert co-authored a paper titled "Feature Selection and Classification in Noisy Epistatic Problems using a Hybrid Evolutionary Approach" which he presented in the 2007 Genetic and Evolutionary Computation Conference (GECCO) in London UK as a poster paper (published in the conference journal).

Anne-Marie Taris has 7 years of experience in wind energy. After graduating she joined KEMA at the wind energy department. She gained broad experience in feasibility studies, legal issues, permits, wind resourcements and valuation of (future) wind farms. Ms Taris is as a project leader involved in the whole traject of wind energy starting feasibility studies to building permits and tendering. Thanks to her posting for several years at energy offices in the Netherlands she has good insight in all wind energy related issues.

For several project developers (Dutch energy companies, wind farm owners) she carried out due diligence studies of their wind farm portfolio. Wind farms were judged on their performances, technical state and operational and capital expenditures.

Ms Taris has been responsible for the Wbr-license application for the offshore wind farm Tromp Binnen of RWE.

4. References

References for KEMA:

Consulting Services for MTC's Community Wind Collaborative

Ms. Martha Broad

Massachusetts Renewable Energy Trust

Telephone: 508-870-0312

Email: Broad@masstech.org

Consulting Services for Community Wind Project in the Town of Scituate

Town of Scituate Town Hall

600 Chief Justice Cushing Way

Scituate, MA 02066

Attn: Bill Limbacher, Renewable Energy Committee

Email: wlimbo@verizon.net

Reference for Ecology & Environment:

Sandy Sayyeau

VP Environmental & Regulatory Affairs

Noble Environmental Power National Operations Center

(518) 420-8485, Office

sayyeaus@noblepower.com

5. Scope of Work

KEMA agrees with the strategy proposed in the RFP to conduct the study in two stages.

5.1 Stage 1 – Preliminary Analysis of Sites

The purpose of Stage 1 will be to screen potential sites through a “fatal flaw” analysis and identify a set of sites for more detailed analysis in Stage 2. In addition, the KEMA Team would be available to attend meeting and respond to questions on regulatory and legal issues to be addressed on a separate track by Roger Williams University Law School Fellows and the EBEC legal consultant.

As KEMA understands the RFP, the Consortium has done some preliminary work in identifying initial sites to target for analysis. Our initial approach would include meeting with the Consortium to review those locations, as well as clarify the goals of the Consortium for the study. In addition to planning the study with the Consortium, we plan to utilize the Consortium in the data gathering effort.

In Stage 1, KEMA will apply high-level filters to evaluate sites for “fatal flaws” that would preclude wind turbine development. Such filters would include:

- Insufficient wind resources – available wind maps indicate primarily marginal to fair wind resources for land-based turbines in Rhode Island. Based on our work on Community Wind projects in Massachusetts, KEMA understands that economically viable wind projects can be developed in these conditions, depending on energy prices and ownership structures, but would use “marginal” wind resources as a minimum preliminary filter for identifying sites. With the assistance of the Consortium, KEMA will identify and evaluate available wind data in the Consortium towns. More complete wind resource evaluation, including detailed evaluations of the uncertainties in wind resource estimates, would be conducted in Stage 2.
- Insufficient set backs from property lines, residences, buildings, flightpaths, or other sensitive receptors. In Stage 1 we plan to use conservative “rules of thumb” for acoustic and safety setbacks. We have budgeted for up to three site visits to “field check” our preliminary desktop review of physical constraints.

- Available access pathways for delivery and construction of turbines
- Infrastructure restrictions, including proximity, capacity, and difficulties with interconnection to National Grid's transmission or distribution system
- Community issues. Successful wind projects are embraced by the community, rather than forced on a community. Potential interference with recreation areas or scenic viewsheds must certainly be considered. In Stage 1, KEMA would not plan to develop photosimulations at all of the considered sites, but would potentially develop them for the most promising sites. We would solicit input from the Consortium on important landmarks or points from which to take pictures for the photosimulations.
- Permitting complexity. Successful permitting of wind projects is dependent on many factors and it is difficult to describe definitive filters in advance of determining potential size and locations, but as part of Stage 1, KEMA and Ecology & Environment will score identified sites against each other for their presumed complexity in permitting. This would be used in a final determination of the most promising sites. In Appendix B, Ecology & Environment has described their approach in greater detail. In addition, the KEMA team would work with the Consortium to gather details on existing or planned wind energy bylaws in the Consortium towns.

Deliverables for Stage 1 would be a memo describing the sites reviewed, the findings, and the recommendations of sites for further study. In addition, the Stage 1 deliverable would make preliminary estimates of the number of turbines that could be located on the identified sites, the energy production, and the percentage of municipal load that could be serviced through wind energy at those locations. KEMA would work with the Consortium to gather data on existing municipal energy use for these calculations.

5.2 Stage 2

Stage 2 will include a detailed analysis of the most promising sites identified in Stage 1. Budgetary limitations will likely determine the number of sites targeted for further analysis. We note that the project timeline suggested in the RFP would not be realistic if meteorological towers had to be erected and additional data collected to support the detailed wind resource analysis in Stage 2. Typically at least 1 year of met tower data is required to support a comprehensive feasibility study.

Stage 2 would kick off with a work session, organized by KEMA, to review the findings of Stage 1 and agree on the sites to be evaluated during Stage 2.

In Stage 2, KEMA will analyze the chosen sites in a greater level of detail to prepare feasibility studies, which will become a tool and reference sufficient to allow the Consortium to move on to future project stages, including engaging technical consultants for design and construction. As specified in the RFP, that analysis will include:

- Wind resources
- Financial Modeling
- Regulatory Environment
- Physical Construction, and
- Community Issues

Additional details are provided below.

Wind Resources

KEMA will conduct further analysis of wind resources using available MET tower data, if any exists, or will recommend to the Consortium that a met tower or towers be installed, and proposed locations.

KEMA utilizes Wasp, Windfarmer, and Windfarm, leading software programs for the analysis of wind data. Our analysis will focus not only on determining average wind speeds and potential energy production, but on uncertainty analysis to bound the analysis for the greater understanding of the Consortium. KEMA utilizes a comprehensive methodology for uncertainty analysis that takes into consideration a number of possible sources of error that can arise during a wind feasibility study. These sources of error are then tallied and entered into a Monte Carlo simulation that creates a distribution of possible net annual energy outcomes. The 90th percentile (or P90) of this distribution is where annual production will be exceeded 90% of the time and represents a very conservative estimate for wind power production. This value is then fed into our financial models (along with the 50th percentile or P50 mark). The result is that the client can make a much more objective decision to move forward based on the risk level associated with the project. Typically if modeled cash flows from a project are “in the black” even at the P90 level then the project economic risk is relatively minor.

Financial Modeling

KEMA will use the economic model it has developed with the MTC for developing pro forma financial projections including estimated revenues and expenses under different ownership scenarios, including nonprofit, municipal, private cooperative or combinations of those. KEMA will work with the Consortium, potential turbine host properties, and/or utility or ISO resources to assess avoided costs.

KEMA is currently working with National Grid and the Rhode Island Energy Efficiency Resource Management Council to conduct a study of energy efficiency opportunities in Rhode Island. In that study, we are intimately involved in assessing energy use and demand throughout Rhode Island, and will leverage resources from that study that will support the economic analysis of potential wind projects in the East Bay area.

Regulatory Environment

Ecology & Environment has described their approach to this section in Appendix B. KEMA will be responsible for modeling shadow flicker or electrical interference at the proposed turbine sites. KEMA and Ecology & Environment will review the regulatory environment of each site with the Consortium and recommend whether further studies, including avian and bat impact assessment, or acoustic modeling to certain adjacent properties or receptors, is necessary. We have estimated the costs for those types of studies in our Section 6, the budget.

In summary, this analysis will serve to develop a permitting roadmap that the Consortium or their future subcontractors can use to guide project development.

Physical Construction

KEMA will review available geological maps and potentially drilling logs conducted at or near the proposed turbine sites to assess any difficulties in construction. It is our opinion that additional borings or subsurface investigations would not be necessary until the technical design stages of the project, and we would not plan to budget for them in Stage 2.

In addition, through its ongoing work with MTC and other wind projects, KEMA continually monitors the market for turbines, and will evaluate the availability of appropriate turbines for the proposed sites.

Also, in Stage 2, KEMA will review interconnection guidelines, estimate requirements and costs, at each of the proposed sites. Our existing relationships with National Grid will facilitate that study.

Community Issues

During Stage 2, additional photosimulations will be developed for the proposed sites, and KEMA will assist East Bay to develop a public information plan and schedule, and to create effective communication tools with which to conduct public stakeholder meetings. KEMA will be available to participate in those meetings as needed.

6. Certificate of Insurance

| ACORD CERTIFICATE OF LIABILITY INSURANCE | | | | | | DATE (MM/DD/YY) 10/31/2008 | |
|---|------|--|-----------------------|--|-----------------------------------|--|---------------|
| PRODUCER | | Serial # 100617 | | THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. | | | |
| CHARTER INSURANCE AND CONSULTING, INC. P O BOX 421159 ATLANTA, GA 30342 404-256-7900 404-256-9257 FAX | | | | INSURERS AFFORDING COVERAGE | | NAIC# | |
| INSURED | | | | INSURER A: HARTFORD INSURANCE GROUP | | A + | |
| KEMA INCORPORATED | | | | INSURER B: NATIONAL UNION FIRE INSURANCE | | A + | |
| ONE BURLINGTON BUSINESS CENTER | | | | INSURER C: WESTCHESTER FIRE INS. CO. (ACE) | | A + | |
| 67 SOUTH BEDFORD STREET | | | | INSURER D: PRAETORIAN INSURANCE CO. | | A - | |
| SUITE 201 EAST | | | | INSURER E: | | | |
| BURLINGTON, MA 01803 | | | | | | | |
| COVERAGES | | | | | | | |
| THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS. | | | | | | | |
| INS LTR | PROD | TYPE OF INSURANCE | POLICY NUMBER | POLICY EFFECTIVE DATE (MM/DD/YY) | POLICY EXPIRATION DATE (MM/DD/YY) | LIMITS | |
| A | | GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input checked="" type="checkbox"/> OCCUR GEN'L AGGREGATE LIMIT APPLIES PER POLICY <input type="checkbox"/> PRO <input type="checkbox"/> SERV <input type="checkbox"/> LOC | 20 UUN ND9695 | 10/31/08 | 10/31/09 | EACH OCCURRENCE | \$ 1,000,000 |
| | | | | | | DAMAGE TO RENTED PREMISES (EA OCCURRENCE) | \$ 300,000 |
| | | | | | | MED EXP (Any one person) | \$ 10,000 |
| | | | | | | PERSONAL & ADV INJURY | \$ 1,000,000 |
| | | | | | | GENERAL AGGREGATE | \$ 2,000,000 |
| | | | | | | PRODUCTS - COMP/OP AGG | \$ 1,000,000 |
| | | | | | | DEDUCTIBLE | NIL |
| A | | AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO ALL OWNED AUTOS SCHEDULED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input checked="" type="checkbox"/> NON-OWNED AUTOS | 20 UUN ND9695 | 10/31/08 | 10/31/09 | COMBINED SINGLE LIMIT (EA accident) | \$ 1,000,000 |
| | | | | | | BODILY INJURY (Per person) | \$ |
| | | | | | | BODILY INJURY (Per accident) | \$ |
| | | | | | | PROPERTY DAMAGE (Per accident) | \$ |
| | | CARAGE LIABILITY <input type="checkbox"/> ANY AUTO | | | | AUTO ONLY - EA ACCIDENT | \$ |
| | | | | | | OTHER THAN AUTO ONLY: EA ACC AGG | \$ |
| B | | EXCESS/UMBRELLA LIABILITY <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE DEDUCTIBLE \$ RETENTION \$ | BE 3313170 | 10/31/08 | 10/31/09 | EACH OCCURRENCE | \$ 10,000,000 |
| | | | | | | AGGREGATE | \$ 10,000,000 |
| | | | | | | | \$ |
| | | | | | | | \$ |
| | | | | | | | \$ |
| A | | WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? If yes, describe under SPECIAL PROVISIONS below | 20 WB GB7691 | 10/31/08 | 10/31/09 | <input checked="" type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTHER | |
| D | | | P001101-0035-648 (CA) | 3/1/08 | 3/1/09 | EL EACH ACCIDENT | \$ 1,000,000 |
| | | | | | | EL DISEASE - EA EMPLOYEE | \$ 1,000,000 |
| | | | | | | EL DISEASE - POLICY LIMIT | \$ 1,000,000 |
| A | | OTHER | 20 UUN ND9695 | 10/31/08 | 10/31/09 | \$36,000,000 LIMIT PROPERTY/PLANT & EQUIPMENT | |
| C | | PROFESSIONAL LIABILITY | EON G21645667 007 | 10/31/08 | 10/31/09 | \$5,000,000 PER OCC/\$5M AGG | |
| DESCRIPTION OF OPERATIONS/LOCATIONS/VEHICLES/EXCLUSIONS ADDED BY ENDORSEMENT/SPECIAL PROVISIONS \$50,000 RETENTION ON PROFESSIONAL LIABILITY \$5,000 DEDUCTIBLE ON BUSINESS PROPERTY/CONTENTS | | | | | | | |
| CERTIFICATE HOLDER | | | | CANCELLATION | | | |
| MASTER CERTIFICATE 2008-09 | | | | SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES. AUTHORIZED REPRESENTATIVE | | | |

ACORD 25 (2001/08)

© ACORD CORPORATION 1988

Appendix A – Resumes



Appendices

Andrew H. Brydges

| | |
|-----------------------------|---|
| Profession: | Project Manager, Markets and Policies Practice Area |
| Years of Experience: | 14 |
| Education: | BA/1992/Geology/Carleton College |
| Years with KEMA: | 7 |

Key Qualifications:

Andrew Brydges is a Project Manager at KEMA and has fourteen years of experience in the energy and environmental sector working with public and private clients on a variety of strategic management consulting projects.

Mr. Brydges specializes in helping clients to develop communication tools to educate project stakeholders on complex technical, legal, and political issues. Mr. Brydges designs, delivers, and manages outreach and education programs for a variety of clients providing technical assistance to stakeholders on issues of energy efficiency and green building, including the Massachusetts Technology Collaborative and Southern California Edison.

In the field of energy efficiency, Mr. Brydges also assists clients to evaluate energy efficiency program and identify opportunities and viable strategies for increasing the adoption of energy efficient measures in the residential, commercial, and industrial sectors.

At KEMA, Mr. Brydges previously served as Executive Director of the North East Solid Waste Committee, working with municipal governments to develop and negotiate creative solutions to issues in solid waste management. Mr. Brydges represented NESWC on the Massachusetts Department of Environmental Protection's Solid Waste Advisory Committee, where he actively works with regulators and industry stakeholders on policy issues including waste minimization and recycling of construction and demolition debris. Prior to his work at KEMA and NESWC, he worked closely with the Massachusetts state transportation agencies to implement environmental compliance assessments and hazardous waste cleanups at hundreds of maintenance depots and stations, while also designing and conducting extensive training and communication programs and facilitating the successful implementation of environmental management systems.

Mr. Brydges earned his Bachelor of Science degree, with distinction, at Carleton College in Northfield, Minnesota.

Selected Professional Experience:

- **NYSERDA:** With the KEMA project team, implemented the Energy \$mart Loan Fund on behalf of NYSERDA in New York State. Communicated with and supported lending institutions in western New York and New York City to facilitate and develop participation in the Loan Fund.
- **Massachusetts Technology Collaborative:** Project manager for Education and Outreach portion of MTC's new Green Building Support Services initiative, which will support MTC's Green Schools, Green Affordable Housing, and Large On-Site Renewables Initiatives by providing green building education and support to municipal decision makers, project stakeholders, and design teams.

- **Nova Scotia Department of Energy:** Project manager for a study providing a review and assessment of residential, commercial, and industrial energy efficiency market potential based on modeling with KEMA's DSM Assyst program.
- **Southern California Edison Sustainable Communities Program:** Project Manager for implementation of the SCE Sustainable Communities Program, an incentive program providing design assistance and energy modeling to large, mixed-use or multi-building developments committing to aggressive energy efficiency goals or green building certification.
- **Sustainable Ireland:** With the KEMA project team, providing a review and assessment of residential, commercial, and industrial energy efficiency market potential using KEMA's DSM Assyst program.
- **Town of Arlington, Massachusetts:** Developed written guidelines for the purchase of fuel-efficient vehicles for the Town of Arlington under a Municipal Climate Change grant from the Massachusetts Department of Environmental Protection for member communities of the International Council for Local Environmental Initiatives. Analyzed fleet use, vehicle purchases, and maintenance procedures to determine best practices for maximizing the fuel efficiency.
- **United States Environmental Protection Agency:** Analyzed and summarized best practices in energy efficiency programs in the United States. Evaluating program data from individual states and utilities and comparing program expenditures with avoided energy costs as well as non-energy-related benefits.
- **Northeast Energy Efficiency Partnership (NEEP):** Assessed the recent experiences and views on the packaged commercial HVAC market and energy efficiency programs in the Northeast of distributors of heating, ventilation, and air conditioning (HVAC) equipment. Using data to provide input into the design of future energy efficiency programs.
- **North East Solid Waste Committee (NESWC):** Served as Executive Director managing the ongoing operations of the North East Solid Waste Committee, developing strategy for and coordinating the interactions between twenty-three Massachusetts towns and a waste-to-energy facility in North Andover, Massachusetts. Communicated with and educate public stakeholders on a variety of legal, operational, and political issues affecting the communities.
- **Confidential Client:** Primary analyst for a due diligence assessment of the regional solid waste marketplace and forecast of regional solid waste issues and pricing in relation to a proposed purchase of several waste to energy facilities.
- **New England Biosolids Association/Trade association for biosolids industry:** Developed, co-authored, and edited the Annual Report for the New England Biosolids Recycling Association, a first-of-its-kind report for use by the industry and as an education tool for legislators and community groups.
- **Connecticut and Rhode Island Renewable Energy Funds:** Conducted primary research to assess perceptions of, interest in, and experiences with green power and used information to develop marketing tools aimed at businesses in Connecticut and Rhode Island for the purchase of renewable energy and distributed generation.
- **EV Worldwide/Manufacturer of Electric Buses and Vans:** Conducted industry research and developed financial models and marketing tools to support a business plan used to secure funding for start-up operations.

- **Auto Emissions Services Company:** Revamped marketing tools and developed an innovative proposal format for an international operator of vehicle emissions testing programs undergoing internal operational and cultural changes.
- **Electronics Manufacturer:** Conducted industry analysis and developed financial models to evaluate product takeback programs and an innovative recycling technology for printed circuit boards for a major international electronics manufacturer.
- **Business for Social Responsibility/Green Power Market Development Group:** Researched strategies for addressing the green power certificate market for an influential group of large businesses exploring options to purchase green power.
- **MassHighway/Massachusetts Bay Transportation Agency:** Developed and implemented effective environmental management systems for the Massachusetts state transportation authorities, including writing operational procedure manuals and designing and conducting two-way education programs to communicate the goals and expectations of management and enhance employee input to the process.

Professional Experience:

KEMA Services, Inc., Burlington, Massachusetts: 2002 to Present

Project Manager

- Assist public and private clients in designing innovative and effective business solutions in the energy efficiency and sustainable development. Design, deliver, and manage outreach and education programs for clients providing technical assistance to stakeholders on issues of energy efficiency and green building. Evaluate energy efficiency programs and identify opportunities and viable strategies for increasing the adoption of energy efficient measures in the residential, commercial, and industrial sectors.

Executive Director – North East Solid Waste Committee

- Manage the ongoing operations of the North East Solid Waste Committee. Develop strategy for and coordinate the interactions between twenty-three Massachusetts towns and a waste-to-energy facility in North Andover, Massachusetts; interpret a variety of legal, operational, and political issues affecting the communities.

Rizzo Associates, Inc., Natick, Massachusetts: 1993 to 1998

Project Geologist

- Managed multi-site environmental assessment and remediation projects for public and private clients. Developed environmental management systems and designed and conducted training programs to facilitate the successful implementation of organization change.

MAECORP, Inc., Chicago, Illinois: 1992 to 1993

Geologist

- Conducted subsurface environmental investigations for property transactions nationwide. Provided technical and regulatory guidance to private sector clients.

Languages:

| | <i>Speaking</i> | <i>Reading</i> | <i>Writing</i> |
|----------|------------------------|-----------------------|-----------------------|
| English: | Excellent | Excellent | Excellent |

Johannes W. Cleijne

| | |
|-----------------------------|---|
| Profession: | Senior Consultant KEMA Power Generation & Sustainables |
| Years of Experience: | 19 |
| Education: | M.Sc. Physics/1985/University of Technology, Eindhoven, the Netherlands Science/1978/theneum B/secondary modern school |
| Years with KEMA: | 8 |

Key Qualifications:

Mr. Cleijne has worked in the field of renewable energies since 1985. He has gained extensive knowledge and experience in the field of:

- Wind potential studies and statistical analysis of wind data
- Wind farm development
- Short term wind energy forecasting
- Economics of renewable energies
- Monitoring development of renewable energy
- Renewable energy certificates.

Professional Experience:

KEMA, Arnhem, The Netherlands: 1998 to Present

Senior Consultant

- Strategic studies on the development of Renewable Energies
 - Ministry of Housing, Spatial Planning and the Environment
 - ElGreen: feasibility of a green electricity market in Europe (EU)
 - GreenX: Dynamic model of renewable. Energy development in the EU
 - Forres 2020: Analysis of renewable energy evolution up to 2020 (EU)
 - Advice on subsidy levels for renewable energy (Ministry of Economic Affairs)
- Wind Energy
 - Consultancy on the development of an offshore wind farm in the Netherlands
 - Short term wind energy forecasting
 - Handbook on risk zoning for wind turbines
 - Wind potential in European waters

- Assessment of offshore wind and wave climate
- Economics and Risks of offshore wind energy
- Large scale integration of offshore wind farms in the Dutch Grid (Connect 6000)
- Development of a research and evaluation program for 100 MW offshore wind farm
- Advisory board for Delft University Wind Energy Institute
- Wind resource map of the Netherlands
- Due Diligence of two large onshore wind farms in the UK
- Monitoring of Renewable Energies
 - Wind Monitor
 - Euwinet: European Wind Energy Monitor
 - Renewable Energy Monitor Netherlands
- Renewable Energy Certificates
 - Development of RECS-system, including issuing and registration software
 - Consultancy on RECS-system in the USA

TNO MEP, Apeldoorn: 1990 to 1998

Research Engineer, Wind Energy

- Wind farm wake effects
 - Literature data base on wind turbine wakes and wake effects, Edition November 1990
 - Results of Sexbierum Wind Farm; double wake measurement, 1992
 - Results of Sexbierum Wind Farm; single wake measurement, 1993
 - Full scale measurements at the Dutch experimental wind farm at Sexbierum
 - Wake wind data analysis. Measurements from the Dutch experimental wind farm at Sexbierum, 1993
 - Results of Sexbierum Wind Farm; double wake measurements at 1,5 D, 2,5 D and 4 D, 1993
 - Wake and wind farm modeling Part A: Wind farm modeling, 1993
- Wind Potential
 - Description of the North Sea Wind climate for offshore wind energy applications, 1991
 - Local wind resource at Dutch experimental wind farm, 1991
 - Assessment of correlation method Ecotecnia, 1992
 - Dutch Handbook for wind turbine power output predictions, 2nd edition, 1992
 - Power output prediction of a 250 MW wind farm in the IJsselmeer, 1990
- Wind loads
 - Inventory of methods of stochastic wind field simulations, 1990

- Extreme Direction Change Model sub-committee proposal for IEC TC 88 Working Group 7, 1996
- Extreme Wind Conditions for Wind Turbine Design, 1996

Wind Energy Training

- Wind potential module, International course on wind energy at ECN, The Netherlands
- Dispersion of air pollution
 - Computational Fluid Dynamics: influence of road geometry on the concentration of air pollutants, 1994
 - Wind tunnel studies of cooling tower dispersion, 1995
 - Natural ventilation of Floating Production Storage and Offtake Vessel (FPSO) "Anasuria", 1996
 - Evaluation of Air Quality in the Amsterdam Airport Schiphol Region, 1997.

Technical University, Faculty of Physics, Eindhoven, the Netherlands in the Wind Energy Group for the program of Consultancy Services Wind Energy for Developing Countries (CWD): 1987 to 1990

Researcher

- Research on piston pumps
- Guidance of students
- Transfer of knowledge
- Studies of wind measuring equipment
- Wind tunnel measurements of full scale wind pump in China
- Dynamic behavior of hand pumps with PVC risers
- Identification mission on wind potential in Pakistan under contract of the Dutch ministry of Development Co-operation

Neil Crandell, P.E.

| | |
|-----------------------------|---|
| Profession: | Professional Engineer |
| Years of Experience: | 25 |
| Education: | B.S.E.E./1978/Ohio University Associate E.E./1975/Columbus Technical Institute |
| Years with KEMA: | < 1 |

Key Qualifications:

Neil Crandell has over 25 years of professional experience in power system planning and analysis, working at IOUs, Municipal Electric systems, RTOs, and in consulting. He has performed transmission studies of all types, including loadflow, short-circuit, transient and dynamic stability, voltage stability, transfer capability, system impact, facilities, and reliability studies. He also has experience in economic analyses, protection coordination, and design of underground transmission and distribution networks, along with over 8 years of supervisory experience.

Power Systems software Experience:

- PSS/E (loadflow, short-circuit, transient stability)
- MUST (transfer capability)
- VSAT (voltage stability)
- EMTP (transient switching analysis)
- Electrocon (loadflow, short-circuit, transient stability)
- WSCC (loadflow, transient stability)
- ABB (loadflow, short-circuit and distribution feeder analysis) – formerly GE products
- Scott & Scott (distribution feeder analysis)
- VHARM (harmonics analysis)
- AutoCAD (computer drafting)

Professional Experience:

KEMA, Raleigh, North Carolina: May 2008 to Present

Professional Engineer

American Transmission Co., Madison, Wisconsin: June 2001 to November 2003

Senior Transmission Service Engineer - System Impact Studies, Facilities Studies, Operations Support, Operating Guides

- Arpin Area Study (loadflow study of the Minnesota-Wisconsin transmission interface involving several control areas and two separate Regional Reliability Councils. Transfer Capability and Operating Security Limits were set for 2002 and 2003).

- Minnesota/Wisconsin/Iowa Transfer Capability Committee working group.
- Oak Creek System Impact and Facilities Studies (loadflow studies of 1650 MW of proposed coal-fired generation at Oak Creek generating station).
- Port Washington System Impact and Facilities Studies (loadflow studies of 1200 MW of proposed gas-fired generation at Port Washington generating station).

Gainesville Regional Utilities, Gainesville, Florida: January 1997 to July 1999

Strategic Planning Engineer - T & D Planning Studies, System Improvement Projects, Emergency Operating Guides, Underground Cable Ratings, Strategic Business Plan

- Liaison to the Gainesville Energy Advisory Committee.
- FRCC Transfer Capability Committee working group.
- FRCC Transmission Committee working group.
- Biomass Study (feasibility study of utilizing biomass as a renewable energy supply, capital costs, O&M, fuel handling, adequacy of supplies and environmental effects).

American Electric Power Co., South Bend, Indiana: September 1996 to January 1997

Underground Network Engineer - Underground Distribution Network System Review, Improvement Projects

- Field inspections (manholes and underground vaults).
- Improvement projects (transformer and network protectors, system grounding, splices, primary and secondary cables, secondary crabs, and cost estimates).

Massachusetts Electric Company, Malden, Massachusetts: October 1994 to April 1995

Senior Operations Engineer - Operations Support, Improvement Projects, Underground Networks, Outage Restoration

- Loadflow, Distribution Feeder Analysis.

R.W. Beck, Orlando, Florida: January 1991 to October 1993

Principal Engineer and Project Manager – Power System Studies, Reviews, Improvement Projects, Underground Design, and Supervision

- Loadflow, short-circuit studies.
- Distribution Feeder Analysis.
- Protection Coordination Studies.
- Underground distribution design, Mt. Dora, FL.
- Combustion Turbine Interconnection, Rocky Mount, NC (two 80 MW CTs).
- System Planning Study, Key West, FL (loadflow, short-circuit, feeder analysis, protection coordination, generation operating limits, load-shedding, load management, and cost estimates).

Black & Veatch, Overland Park, Kansas: July 1988 to January 1991

Project Engineer & Studies Section Leader - Power system studies and supervision

- Loadflow, short-circuit, transient stability, switching studies.

- Reliability analysis.
- Transmission Needs Assessment, New South Wales, Australia (study of the need, environmental impact, and cost of transmission additions in New South Wales).
- Transmission Planning Study, Kissimmee, Florida (load flow study of generation expansion alternatives).
- Insulation Coordination and Switching Surge Analysis, Hawaiian Electric Co (EMTP study of switching and lightning surges for the proposed airport substation).
- T & D Planning Study, Hastings, Nebraska (load flow, distribution feeder analysis, system retirements and voltage conversions, cost estimates, capital budget, with presentation of final report to the utility board).
- System Planning Study, Hughesville, Maryland (load flow, short-circuit, generating site feasibility, cost estimates, and budget forecast).
- T & D System Review Study, Kansas City, MO (system review of KCP&L Co's construction standards, overhead conductor and substation equipment selection, transformer evaluation practices, planning methodology, construction and maintenance practices, system reliability analysis, with presentation to the board).
- System Service Review, Highland, IL (review of proposed service alternatives to the city and construction cost estimates).
- System Stability Study, East Kalimantan, Indonesia (transient stability study of proposed generation alternatives).

Central Louisiana Electric Co., Pineville, Louisiana: July 1984 to July 1988

Supervisor, Transmission Planning - Transmission Expansion Planning, Capital Budget, Operations Studies, and Supervision

- Loadflow, short-circuit, transient stability, switching studies.

HARZA Engineering, Chicago, Illinois: August 1983 to June 1984

Electrical Engineer III, Electric-Pumped Storage - Control Systems Design, Protective Device Coordination, UPS and PCAMS Interface

- Bath County Pumped Storage Project.

Public Service Co of New Mexico, Albuquerque, New Mexico: August 1980 to August 1983

Transmission Planning Engineer - Transmission Planning Studies, Loadflow, Transient Stability, Statistical Reliability

- WSCC Area Studies Coordinator for Arizona/Nevada/New Mexico.
- Palo Verde transmission requirements task force.
- Southwest Area Transmission Coordinating Committee (study of area transmission reliability performance, development of indices and reliability database).

Columbus Southern Power Co., Columbus, Ohio: August 1978 to August 1980

T & D Planning Engineer - Transmission and Distribution Planning Studies

- Loadflow, short-circuit, distribution feeder analysis, area projects & planning.

Languages:

| | <i>Speaking</i> | <i>Reading</i> | <i>Writing</i> |
|----------|------------------------|-----------------------|-----------------------|
| English: | Excellent | Excellent | Excellent |

Professional Affiliations:

Member of Eta Kappa Nu
National Honor Society for Electrical Engineers

Specialized Education:

Improving Reliability of Large Interconnected Systems, Power Technologies Inc, 2002
Underground Cable Systems, Power Technologies Incorporated, 1998
Power Cable Seminar, Pirelli Cable Systems, 1998
Advanced Power Systems Analysis, Power Technologies Inc, 1997
EGEAS Production Costing, Stone & Webster, 1997
Low Voltage Secondary Networks, Power Technologies Inc, 1994
Utility Applications Relay School, Asea Brown Boveri, 1991
Managing Interpersonal Relationships, Wilson Learning, 1990
Effective Delegation, American Management Associates, 1987
Effective Writing, Twain Associates, 1985
Engineering Economics, Commonwealth Edison, 1985
Power System Stability, GE, 1982
Substation Application Engineering, CPA, 1980
HVDC Transmission Systems, GE, 1980
Technical Writing, Xavier University, 1980
Power System Planning Economics, Center for Professional Advancement, 1979

Elizabeth Hicks

| | |
|-----------------------------|---|
| Profession: | Senior Principal Consultant |
| Years of Experience: | 25+ |
| Education: | M.S./1981/Resource Systems and Policy Design/Thayer School of Engineering, Dartmouth College B.A./1978/Economics and Mathematics/The College of William and Mary |
| Years with KEMA: | 5 |

Key Qualifications:

Liz Hicks has over 20 years of experience in consulting related to energy efficiency, renewable energy sources, utility marketing, and customer energy choices. She provides strategic advice to a wide variety of clients, including utility and government clients implementing and evaluating energy efficiency and renewable programs, and renewable energy industry market participants seeking customers in restructured energy markets. Key areas of expertise include: energy efficiency planning, cost effectiveness analysis, energy efficiency evaluation, market research, load response programs, policy analysis, renewable energy, regulatory analysis and expert testimony.

Selected Professional Experience:

- Scoping study of Carbon Offsets options in Massachusetts for a confidential client
- Developing a comprehensive all fuels energy plan for Nova Scotia
- Developing a demand side management program portfolio for Sustainable Ireland
- Supporting the Massachusetts DG Policy Collaborative and pilots to use energy efficiency, load response and renewable energy to defer electric distribution upgrades
- Development of program designs and budget for a 5 year energy efficiency and load management plan for City Public Service.
- Facilitation of the Governor's Wind Energy Policy Collaborative in Vermont
- Management of the energy efficiency collaborative in Massachusetts

Professional Experience:

KEMA, Inc., Burlington, Massachusetts, 2002 to Present

Senior Principal Consultant

- Responsibilities include business development, staff management, project management, and co-management of the Sustainable Market Strategies practice in Burlington, Ma. The major focus is on consulting related to: renewable energy sources, energy efficiency, policy analysis, regulatory support, utility marketing, climate change and customer energy choices. Clients include utilities; retail marketers; state and federal government agencies; international government agencies and private companies.

National Grid USA, Northborough, Massachusetts: 2000 to 2002

Director of Market Research and Planning, Product Development Department

- Led a small group founded to start channel marketing efforts with vendors. Developed marketing relationships/programs with several e-commerce partners and a major cable/broadband/telephone provider. Conducted customer satisfaction studies. Implemented a residential premium service product, which included electrical services and payment by credit cards. Responsible for market testing of new products, market share projections, and development of business plans. Obtained regulatory approval and implemented Enhanced Metering and Energy Data Services. On special assignment to work on a Company-wide team to develop a Sustainable Development Strategy.

New England Power Service Company (NEPSCo), Westborough, Massachusetts: 1986 to 2000

Director of Evaluation and Research, Retail Services Department (1997 to 2000)

- Responsible for new product and services development, market planning, market research, cost benefit analysis, renewable energy research, and energy efficiency evaluation functions for the Retail Services Department. Specific special projects include: developing a strategy for new revenue for the NEES Distribution Companies, oversight of business process redesign, strategic market research, customer satisfaction studies, assessing the role of energy efficiency services after industry restructuring, profitability analysis of new products and services, using distributed generation to avoid system upgrades, development of a PV pilot, customer education on restructuring, electronic commerce products, evaluating DSM market spillover and representing the Company on state and regional policy forums on energy efficiency and renewable energy.

Director of Evaluation and Planning, Director of Demand Planning, Director of DSM Regulatory Support (1990 to 1997)

- Responsibilities included administration of all functions of the demand planning department, load forecasting, oversight of the planning and design of DSM (energy efficiency) programs, evaluation of all DSM programs, and research and development in the DSM area; providing expert testimony on DSM planning and evaluation; participation in collaborative planning processes; renewable energy research and plots; selected market research projects on electric sector restructuring; use of energy efficiency for environmental credits.

Manager of Conservation and Load Management Planning and Evaluation (1989 to 1990)

- Coordinated all activities in the areas of DSM planning, R&D, market research, and evaluation. Managed many projects including: market research on customer needs, pilot programs, incorporating environmental externalities into the least cost planning process, several process evaluations, and impact studies.

Supervisor of Conservation and Load Management Evaluation (1987 to 1989)

- Established the NEPSCo Conservation and Load Management Program Evaluation Group. Participated in the development of early NEPSCo DSM programs. Managed numerous process and impact evaluations. Survey design and development.

Senior Analyst, Load Forecasting Group (1986 to 1987)

- Produced Commercial sector forecast. Implemented COMMEND – PC. Managed projects including: development of baseline commercial sector data, development of a peak forecasting model, and evaluation of a pilot conservation program.

Applied Management Sciences, Silver Spring, Maryland: 1985 to 1986

Staff Associate

- Responsible for market research, policy analysis and computer modeling for both private and public clients. Specific projects include: development of computer model to forecast world long-term natural gas supply, development of enhancements to a world oil model, development of a 5 year plan to update the load research program of an electric utility, and analysis of reporting and sampling error in oil import data.

Ernst and Whinney, Washington, DC: 1981 to 1985

Supervisor (1983 to 1985)

Senior Analyst (1981 to 1983)

- Responsibilities included computer modeling, data base development and implementation, forecasting, market research, and litigation support for domestic and international utility, legal and government clients.

TRW Energy Engineering Division, McLean, Virginia: 1980 to 1981

Analyst

- Performed analysis including: development of logit model to forecast market share of conservation and fuel switching in the industrial sector, energy I/O analysis of enhanced oil recovery and oil shale, and development of data requirement analysis.

Resource Policy Center, Thayer School of Engineering, Dartmouth College, Hanover, New Hampshire: 1978 to 1980

Research Assistant

- Developed a market penetration model of small scale hydro in New England. Analyzed regional economic and social impacts of a 50 MW wood-fired power plant.

Languages:

| | <i>Speaking</i> | <i>Reading</i> | <i>Writing</i> |
|----------|------------------------|-----------------------|-----------------------|
| English: | Excellent | Excellent | Excellent |

Professional Affiliations:

Board of Directors, Northeast Energy Efficiency Partnerships, 1997–2000

Board of Directors, American Council for an Energy Efficient Economy, Washington, D.C., 1996–present

Board of Directors, E-Source, Boulder, Colorado, 1991–1998

Board of Directors, AESP, Boca Raton, Florida 1995- present

Organizing Committee, International Energy Conservation Conference, 1991–2001

Panel Leader, American Council for an Energy Efficient Economy Summer Study, 1990, 1992, 1994, 1996

Recipient of a National Science Foundation Energy Fellowship, Thayer School of Engineering

Expert Testimony:

Testimony in the areas of DSM program design, program administration, planning, evaluation, and cost-effectiveness for the following:

- Massachusetts Department of Public Utilities
- Rhode Island Public Utilities Commission
- New Hampshire Public Utilities Commission
- California Public Utilities Commission

Kristina Kelly

| | |
|-----------------------------|--|
| Profession: | Senior Energy Analyst |
| Years of Experience: | 4 |
| Education: | Bachelor of Arts/May 2008/Economics/Boston University, Boston, MA Master of Arts/May 2008/Economics/Boston University, Boston, MA |
| Years with KEMA: | 1 |

Key Qualifications:

Kristina Kelly, a Senior Energy Analyst in KEMA's Sustainable Market Strategies team, has been working at KEMA since June 2008. While at KEMA, Ms. Kelly has been involved in many facets of energy efficiency potential studies. She has experience in survey instrument design for data collection, the research and design phase of potential studies, and modeling energy efficiency programs. She came to KEMA with a knowledge of the economics of energy, climate change, and other environmental issues. She also has experience in econometrics and energy price forecasting. Before starting at KEMA, Ms. Kelly worked at LaCapra Associates where she was responsible for analyzing wholesale energy markets in three northeast regions, forecasting client energy bills, and researching potential energy market changes.

Ms. Kelly graduated from Boston University in May 2008 with a B.A. and M.A. in Economics. While at Boston University she took courses on economic theory, statistics, econometrics, economic development and energy and environmental economics. She authored papers on Australia's climate change policy and an econometric analysis of China's carbon intensity and fuel mix.

Selected Professional Experience:

- **United Illuminating and Connecticut Light and Power, Energy Efficiency Potential Study:** Analyst for a study providing a review and assessment of residential, commercial, and industrial energy efficiency market potential based on modeling with KEMA's DSM Assyst program. Focused heavily on the residential sector, calibrated baseline to historical data, and estimated demand and load savings from technical through to achievable potential.
- **National Grid of Rhode Island, Energy Efficiency Potential Study:** Designed survey instruments to collect end use and measure saturation data in the residential, commercial, and industrial sectors that will directly populate KEMA's DSM Assyst program to create factual baseline estimates. Responsible for evaluating Rhode Island's energy efficiency potential. Also dissecting the DSM Assyst model in order to document the interactions of inputs in the KEMA's model.
- **Xcel Energy of Colorado, Energy Efficiency Potential Study:** Assisting in the design of survey instruments that will gather data on residential customers awareness and attitudes towards energy efficiency products and commercial end use saturations. Is currently responsible for running KEMA's Demand Response Model to determine Xcel's demand shifting and reduction possibilities.

- **Energy Price Forecasting, Amtrak:** Assisted with the forecasting of energy bills and the creation of annual financial budgets based on regional electricity tariffs and the company's historical electricity use. Examined the company's energy consumption patterns and performed an econometric analysis of the variables affecting these trends.
- **Wholesale Market Analysis:** Performed monthly analyses of various wholesale market statistics such as day ahead and realtime LMPs, Henry Hub and regional natural gas prices, and oil prices. Developed a forward contract vs. spot price comparison, and forecasted LMPs based on average market heat rates and NYMEX natural gas futures. Designed statistical reports with this information for client and employee use.

Professional Experience:

KEMA, Burlington, Massachusetts: June 2008 to Present

Senior Energy Analyst

- Evaluate and design energy efficiency and demand response programs using Excel-based models for public and private clients.
- Analyze the financial viability of renewable projects using an Excel-based model.

La Capra Associates, Boston, Massachusetts: May 2005 to June 2008

Intern

- Assisted with forecasting client energy bills and annual budgets, researched regional energy market structure, tariffs, and changes, analyzed the wholesale energy market for three northeast regions and created monthly wholesale market statistical reports for clients and colleagues.

Emerson and Hughes, Sydney, Australia: Fall 2006

Market Research Intern

- Performed preliminary research for company consumer behavior surveys, researched and reported on the structure of American markets. Assisted in recreating the company objectives and client interface portion of the company's website.

Languages:

| | <i>Speaking</i> | <i>Reading</i> | <i>Writing</i> |
|----------|------------------------|-----------------------|-----------------------|
| English: | Excellent | Excellent | Excellent |

Skills:

STATA
 RATS
 Forecast Pro
 Microsoft Excel
 Microsoft Access
 Adobe Writer
 Microsoft Word

Douglas C. Kneale

| | |
|-----------------------------|--|
| Profession: | Senior Consultant |
| Years of Experience: | 20 |
| Education: | <p>Master of Science/Agricultural Engineering/University of Hawaii, Honolulu, Hawaii</p> <p>Bachelor of Arts/Mathematics and Biochemistry/Bowdoin College, Brunswick, Maine</p> <p>Environmental Technology Certificates in Environmental Site Assessment, Geographical Information Systems, and Coastal Zone Management</p> <p>Battelle training seminars for project management, interpersonal communication, and meeting organization</p> |
| Years with KEMA: | 1½ |

Key Qualifications:

Douglas Kneale has over twenty years of experience in data collection, analysis and reporting for environmental surveys, equipment testing, facility siting and R&D applications. He has experience in wind turbine studies, PV installation and other renewable energy projects, as well as many years of experience in the siting, construction and operation of facilities. Mr. Kneale has a proven ability to design and engineer environmental systems and equipment and has extensive project management and consulting in the US and overseas. He is a contributing author to over 20 technical studies and project reports.

Professional Experience

KEMA, Burlington, Massachusetts: 2007 to Present

Renewable Energy and Energy Efficiency

- **New Jersey Clean Energy Program – Clean Energy Impact Evaluation:** Managing the renewable energy component of a project which is evaluating the resource savings protocols for measuring electrical energy and capacity. Key aspects of the study are to collect data from telephone surveys to verify accuracy and completeness of the database, and the net impacts of the program. On-site surveys will assess the operational integrity and actual production of the photovoltaic systems. Direct input into the design, management, reporting, data collection and analysis for the project.
- **Florida Commercial End Use and Efficiency Potential Study:** Team member on project whose goal is to identify electrical equipment usage and potential energy efficiency measures for commercial buildings. As a field surveyor inventoried facilities, equipment schedules and energy loads for systems such as lighting, HVAC, motors and pumps, service water heaters, and refrigeration. Also conducted quality control inspections of completed surveys and trained new surveyors.

- **Wisconsin Focus on Energy Statewide Evaluation – Renewable Energy Program:** Evaluation of program production estimates and methodology for various renewable energy projects including solar electric, wind, biogas, biomass and solar thermal technologies. Also developed protocols for the calculation of energy savings from state wide renewable energy installations.
- **Massachusetts Technology Collaborative (MTC) Community Wind – Technical Consultant:** Consultant providing communities with project feasibility, planning, and development support for wind turbine projects including detailed environmental, technical, and economic studies in support of permitting and approval processes. Work includes field site surveys and turbine specification, wind energy calculations, noise and visual impact modeling.
- **Massachusetts Department of Capital Asset Management:** Renewable energy consultant to a team providing feasibility studies for 10 PV systems and a wind facility at educational and correctional institutes in Massachusetts. Site visits evaluated solar resource and placement of PV panels. Studies resulted in design schematics, electrical production estimates and system costs.
- **Renewable Energy Analysis for a California Development Project:** Comprehensive assessment of the renewable energy strategies available to meet energy neutrality goals. Team participant providing wind and solar resource assessments, and a technical and economic feasibility study. Approaches considered include small and large scale turbines, building integrated systems, and off shore wind.
- **Barclay Capital European Wood Pellet Market Study:** Team member providing an analysis of the European wood pellet market for co-firing in coal fired power plants. Assessments provided for pellet market drivers, suppliers and purchasers, pricing, technology and logistics.

Other Project Experience:

- Engineer and Project Manager, 1988-2007, DCK Environmental Services
- Project Engineer, 2006-07, Cotuit Solar, Inc.
- Operations Manager and Remediation Supervisor, 2002-03, Woods Hole Group, Inc.
- Project Manager and Engineer, 1998-2002, KV Associates, Inc.
- Project Engineer, 1996, Sloane, Cook & King PTY. LTD.
- Facilities Inspection Specialist, 1994-95, Eduplus Management Group, Inc.
- Project Manager and Engineer, 1993-94, Aquatic Farms, Inc.
- Scientific Project Manager, 1991-92, James Dobbin Associates, Inc.
- Environmental Scientist, 1990, Harza Engineering, Inc.

Renewable Energy:

- Site evaluation, feasibility and design studies for PV and wind energy facilities.
- Experience designing and installing PV, solar thermal and wind turbine systems.
- Design of spreadsheets and models to determine site viability, capacity, equipment, and cost.
- Evaluation of Renewable Energy Programs in New Jersey and Wisconsin.
- Provide input for public hearings and zoning board reviews.
- Design cost effective and innovative approaches to retrofits of existing solar heating systems.

- Participate in wind power, photovoltaic, solar hot water, passive solar, green construction and permaculture workshops/certificate courses.

Project Management:

- Extensive experience managing projects and consulting in the US and developing countries.
- Proven ability to prepare and implement work plans and budgets, develop methodology and procedures, analyze and interpret data, prepare oral and written reports, and hire and evaluate personnel.
- Managed in-country operations of a \$1.6M coastal erosion study for the Sultanate of Oman. Coordinated an interdisciplinary team of engineers, geomorphologists, lawyers and coastal planners. Met with Oman ministry and funding agency representatives; personally briefed the Minister of Environment.
- Prepared plans, costs, budget and bid documents for \$0.5M dredging project; subsequently managed operations.
- Managed a project to intensify aquaculture in India; identified more than 2000 acres of land for shrimp culture of which 170 acres was farmed for a profitable production of 75 tons in the first year. Met with Indian government officials at all levels, and recognized for achievement by the Chief Minister of Kerela.

Engineering:

- Designed and supervised construction of a 30,000 lb barge with 2000 gpm pumping system for a prototype dredging system. Ensured barge pumps, manifolds, pipelines, buoyancy system, spuds and hydraulics operated in concert. Careful attention to detail ensured that the barge was operational at start up, with no shake down time; and continued to operate for the duration of the project, with no days lost due to mechanical failure.
- Designed and fabricated proprietary systems to treat groundwater with ozone. Careful consideration of materials and operating parameters insured that even prototype equipment operated efficiently when introduced into the field, all without mishap or down time.
- Oversaw testing of various materials handling technologies and operations associated with the treatment of excavated oiled beach sands in Saudi Arabia. Quickly learned appropriate new application and techniques in the field, and successfully completed all tasks.

Data Collection and Analysis:

- Over ten years experience in data collection, analysis and reporting for environmental surveys, equipment testing, facility siting and R&D applications.
- Analyzed survey data for the placement of intake pipelines for five marine laboratories in Indonesia. Developed Excel spreadsheets for the analysis of data for pipeline sizing and configuration.
- Collected quantitative and qualitative data for environmental assessments of Indonesian dam irrigation projects. Analyzed initial reports and conducted personal field observations; uncovered a misallocation of water resources, previously unnoticed by hydraulic engineers, which significantly impacted project viability.

- Designed and fabricated a centrifugal sand sprayer to distribute dredge spoils, then successfully developed a model using CAD to predict spray pattern and move equipment for maximum sand distribution.
- Training in CAD, geographical information systems, cartography and database management.

Languages:

| | <i>Speaking</i> | <i>Reading</i> | <i>Writing</i> |
|-------------|------------------------|-----------------------|-----------------------|
| English: | Excellent | Excellent | Excellent |
| Indonesian: | Good | --- | --- |
| German: | Fair | Fair | --- |
| Arabic: | Fair | --- | --- |

Professional Training:

AUTOCAD, Cartography, GIS, GPS, Arcview, Cartalink

Hazardous Waste Management, Database management, Site Evaluation

Wind Power Design, Solar Hot Water, Green Construction, Permaculture Design

Project Management, Interpersonal Communication and Meeting Organization

OSHA HAZWOPER 40 hour certificate, Advanced Certified PADI Scuba Diver

Professional Publications:

Mr. Kneale is author of over 20 publications, technical reports and project reports, and conference presentations. He frequently prepares and presents proposals, reports and budgets to the clients, government officials and funding agencies, including the Minister of Environment for the Sultanate of Oman.

David L. Lubkeman, Ph.D.

| | |
|-----------------------------|---|
| Profession: | Principal Consultant |
| Years of Experience: | 25 |
| Education: | Ph.D./1983/Electrical Engineering/Purdue University M.S.E.E./1980/Purdue University B.S.E.E./1979/Purdue University |
| Years with KEMA: | 1 |

Key Qualifications:

- Over 25 years experience in electric power systems engineering.
- 8 years of R&D project management experience within ABB.
- While at university faculty, initiated and managed a wide variety of research projects directly with electric utilities and industry.
- Broad background in various aspects of electric power distribution systems operations and analysis, with emphasis on distribution automation.
- Active participant in power engineering technical activities, resulting in over 40 publications in power systems.
- Proficient in software programming languages and techniques required to develop applications for distribution analysis.

Selected Professional Experience:

- **Consulting Studies:** Dr. Lubkeman's focus at KEMA has been on performing consulting studies related to distribution system modeling, reliability, analytics and automation. Past projects while at KEMA have included modeling the impact of distributed generation/storage devices on electric distribution grids, characterizing the performance of a large-scale battery storage system, providing expertise on smart grid applications for medium-voltage distribution systems, and performing reliability studies for distribution automation upgrades.
- **Product Development:** While at ABB, Dr. Lubkeman had served as team leader and project manager on a number of projects in the corporate development center. His primary focus had been on the development of tools for evaluating and implementing systems solutions for utility distribution networks and supporting utility asset management activities. Most recent projects have included developing architecture for advanced feeder automation and developing asset management embedded modules for substation automation. Past projects at ABB have also included configuration tools for feeder automation devices, large storm damage assessment for distribution outage management, distribution contingency analysis, asset failure rate prediction, distribution utility performance analysis, and transmission/distribution system fault location.
- **Technology Development:** Before joining ABB, Dr. Lubkeman was an associate professor at Clemson University and was involved in a number of R&D projects with electric utilities. During

this time, he conducted an R&D project with Empire State Electric Energy Research Corporation (ESEERCO) on a prototype electric power distribution system state estimator. Dr. Lubkeman was also involved in an R&D project with Duke Power Company for developing a fault location system for electric power distribution systems. A second project area with Duke Power pertained to evaluating and modeling the impact of voltage power quality on industrial manufacturing. Before joining Clemson University, Dr. Lubkeman was an assistant professor at North Carolina State University. During this time, he pursued a number of research projects involving applications of artificial intelligence to power system problems. Projects included the application of neural networks to distribution fault diagnosis and the use of a rule-based system for feeder reconfiguration.

- **Technical Training:** Dr. Lubkeman has taught a number of undergraduate and graduate level courses including: Introduction to Power Systems, Power Electronics, Electric Machinery, Power System Stability and Control, Power System Operation and Control, Electric Power Distribution Systems, Power System Transients, and Computational Methods for Power Systems Analysis. He also taught a power systems analysis review designed to prepare engineers for the Professional Engineering (PE) Exam, was a lecturer on power system operations at the Modern Power Systems Analysis short-course held at Auburn, and was an instructor at the North Carolina Electric Meter School, covering basics of electric power circuits and revenue metering.

Professional Experience:

KEMA, Raleigh, North Carolina: December 2007 to Present

Principal Consultant

Dr. Lubkeman's focus at KEMA is on distribution system modeling, reliability, analytics and automation. Past project tasks have included modeling the impact of distributed generation/storage devices on electric distribution grids, characterizing the performance of a large-scale battery storage system and providing expertise on Smart Grid applications for medium-voltage distribution systems.

Specific Project Experience:

- **AES Corporation – Battery Energy Storage Testing:** Developed a test plan and wrote test report for a 1 MW Battery Energy Storage System based on lithium-ion battery technology. Test plan was used to verify proper operation and performance characteristics of a prototype unit situated at a utility substation. Final report included content regarding compliance to utility interconnection standards, unit energy storage capacity and rating, unit efficiency characteristics and ability to carry out frequency regulation applications.
- **Hawaiian Electric Company – Lanai PV Station Interconnection Study:** Analyzed the impact of adding a large-scale photovoltaic station to an island medium-voltage electric grid. Study provided interconnection requirements for the PV Station including disturbance ride-through and ramp rate response restrictions. Modeling consisted of both steady-state and dynamic analysis.
- **The United Illuminating Company – Distribution System Vegetation Management Review:** Benchmarked UI's vegetation management program against industry standard practices.

Asea Brown Boveri (ABB) Lake Mary, FL: January 2007 to December 2007

Product Manager

- Responsible for management of feeder automation product portfolio. This includes monitoring of customer needs and competitors, monitoring of product line performance, development of market requirements, business plans and payback calculations. Support product promotion,

marketing material creation and development of sales tools. Owner of product life cycle and IP-related issues.

Asea Brown Boveri (ABB), Raleigh, NC: July 1999 to December 2007

Senior Principal Scientist

- Directed internal R&D projects to support ABB business unit needs. Developed prototypes for new hardware and software products. Participated in field pilots with customers. Project topics included: distribution automation, predictive equipment maintenance monitoring, utility transmission and distribution asset management performance benchmarking, storm outage crew planning, distribution system reliability analysis, industrial power quality. Lead R&D consultant for distribution automation and reliability. Corporate research university relations contact for US power system programs.

Specific Project Experience:

- Interface to North American Power Systems Engineering faculty. Responsible for organizing summer intern program and coordinating university research contracts.
- Worked with Distribution Automation business in developing new architecture for Advanced Feeder Automation based on peer-to-peer network communications.
- Developed pilot prototypes for new substation automation applications related to providing cost-effective asset management of substations and feeder components.
- Lead project team in development of advanced feeder automation configuration tool for setting relays.
- Developed prototype of large storm outage planning program that can be used as an add-on to ABB's CADOPS outage management system.
- Lead project team in development of models for estimating the failure rates of distribution components based on condition assessment.
- Developed and taught one week short course on Electric Distribution Power Quality at CFE in Mexico
- Developed new transmission and distribution contingency analysis engine used in Performance Advantage for Distribution (PAD) tool by distribution systems consulting group for grid reliability analysis.
- Lead project team in development of Utility Performance Analysis tools used for benchmarking operation & maintenance performance. Tool rolled out globally by distribution systems group and used in various utility studies.

Clemson University, Clemson, SC: August 1989 to July 1999

Electrical and Computer Engineering Department Associate Professor

- Taught classes in power systems analysis, supervised graduate students and conducted R&D projects with electric utilities. Topics of projects included: distribution circuit measurement estimation, distribution circuit fault location for crew direction, industrial power quality modeling, and new techniques for electric circuit disturbance classification. Served as department graduate

program coordinator, which included admissions and program promotions. Taught professional engineering review courses on basic power systems analysis.

Specific Project Experience:

- Lead an R&D project with Empire State Electric Energy Research Corporation (ESEERCO) on a prototype electric power distribution system state estimator.
- Supervised an R&D project with Duke Power Company for developing a fault location system for electric power distribution systems.
- Supervised National Science Foundation project on use of artificial intelligence techniques for classifying disturbances on electric power distribution systems.
- Working as a consultant, programmed and delivered an electric power distribution power flow and short-circuit package for use in a commercial environment for a large US utility.
- Developed data acquisition system for studying the impact of harmonic voltages and currents on revenue meter accuracy for a large US utility.
- Worked with large US utility on several projects pertaining to impact of voltage power quality on industrial manufacturing.
- Courses developed and taught include: ECE 360 Introduction to Power Engineering, ECE 807 Computer Methods in Power Systems, ECE 817 Power System Transients, ECE 416/616, Electric Power Distribution System Engineering, ECE 816 Electric Power Distribution System Engineering.
- Instructor for Modern Power Systems Analysis short course sponsored by Southeastern Electric Exchange at Auburn University, 1988-1996.
- Instructor for Clemson Continuing Engineering Education PE Review Program on Power Systems Analysis, 1992-1999.

North Carolina State University, Raleigh, NC: August 1983 to July 1989

Electrical and Computer Engineering Department Assistant Professor

- Taught classes in power systems analysis, supervised graduate students and conducted R&D projects with electric utilities. Topics of projects included: distribution circuit reconfiguration for performance improvement, placement and control of capacitors on distribution circuits, detection of high-impedance faults, application of artificial intelligence techniques for distribution circuit monitoring. Taught review courses at local electric meter school.

Specific Project Experience:

- Supervised utility-sponsored project on use of heuristic techniques for reconfiguring distribution feeders to eliminate overloads and reduce losses.
- Supervised utility-sponsored project on first application of neural network-based classification to high impedance faults on electric power distribution circuits.
- Courses developed and taught include: ECE 305 Electric Power Systems, ECE 632 Power System Stability and Control, ECE 457 Semiconductor Power Conversion, ECE 454 Electric Machinery, ECE 550 Power System Operation and Control, ECE 633 Computer Analysis of Large-Scale Power Systems.

- Instructor for North Carolina Electric Meter School, Basics of Electric Power Circuits and Revenue Metering, 1986 -1989.

Languages:

| | <i>Speaking</i> | <i>Reading</i> | <i>Writing</i> |
|----------|------------------------|-----------------------|-----------------------|
| English: | Excellent | Excellent | Excellent |

Professional Affiliations:

- Registered Professional Engineer in State of South Carolina
- Senior Member of IEEE
- Member of Power Engineering Society
- Paper Reviewer for Power Engineering Society
- Proposal Reviewer for National Science Foundation
- CIGRE Member

Professional Journals:

1. D.L. Lubkeman, G.T. Heydt, "Transient Stability Enhancement in Multimachine Power Systems Using Braking Resistors, Electric Machines and Power Systems, Vol. 9, No. 1, Jan-Feb 1984, pp.1-12.
2. D.L. Lubkeman, G.T. Heydt, "The Application of Dynamic Programming in a Supplementary Control for Transient Stability Enhancement of Multimachine Power Systems", IEEE Transactions on Power Apparatus and Systems, Vol. PAS-104, No. 9, Sept. 1985, pp. 2342-2348.
3. T. Taylor, D. Lubkeman, "Applications of Knowledge-Based Programming to Power Engineering Problems, IEEE Transactions on Power Systems, February 1989, Vol. 4, No. 1, pp. 345-352.
4. Tim Taylor and David Lubkeman, "Implementation of Heuristic Search Strategies for Distribution Feeder Reconfiguration, IEEE Transactions on Power Delivery, Vol. 5, No. 1, January 1990, pp. 239-246.
5. Sonja Ebron, David Lubkeman and Mark White, "Neural Net Processing Approach to the Detection of High Impedance Faults, IEEE Transactions on Power Delivery, Vol. 5, No. 2, April 1990, pp. 905-914.
6. Ivan Matulic and David Lubkeman, "A Decision Support Approach for Considering Reliability Criteria in the Protective Coordination of Distribution Feeders," Electric Power Systems Research, 19 (1990), pp. 47-56, Elsevier Science Publishing.
7. Uzma Siddiqi, David Lubkeman, "An Automated Strategy for the Processing and Analysis of Distribution Automation Data, IEEE Transactions on Power Delivery, Vol. 6, No. 3, July 1991, pp. 1216-1223.

8. David L. Lubkeman, Edward R. Collins, "Hypermedia-Based Courseware Development for Power Engineering Education," IEEE Transactions on Power Systems, Vol. 6, No. 3, August 1991, pp. 1259-1265.
9. Adly A. Girgis, Christopher M. Fallon, David L. Lubkeman, "A Fault Location Technique for Rural Distribution Feeders," IEEE Transactions on Industry Applications, November/December 1993, Vol. 29, No. 6, pp. 1170-1175.
10. Atish K. Ghosh, David L. Lubkeman, "The Classification of Power System Disturbance Waveforms Using a Neural Network Approach," IEEE Transactions on Power Delivery, Vol. 10, No. 1, January 1995, pp. 109-115.
11. Jun Zhu, David L. Lubkeman, Adly A. Girgis, "Automated Fault Location and Diagnosis on Electric Power Distribution Feeders," IEEE Transactions on Power Delivery, Vol. 12, No. 2, April 1997, pp. 801 -808.
12. Atish K. Ghosh, David L. Lubkeman, Matthew J. Downey, Robert H. Jones, "Distribution Circuit State Estimation using a Probabilistic Approach," IEEE Transactions on Power Systems, Vol. 12, No. 1, February 1997, pp. 45-51.
13. Atish K. Ghosh, David L. Lubkeman, Robert H. Jones, "Load Modeling for Distribution Circuit State Estimation," IEEE Transactions on Power Delivery, Vol. 12, No. 2, April 1997, pp. 999-1005.
14. Jun Zhu, David L. Lubkeman, "Object-Oriented Development of Software Systems for Power System Simulations," IEEE Transactions on Power Systems, Vol. 12, No. 2, May 1997, pp. 1002-1007.
15. Lubkeman, D.L.; Jianzhong Zhang; Ghosh, A.K.; Jones, R.H.; "Field results for a distribution circuit state estimator implementation," IEEE Transactions on Power Delivery, Volume 15, Issue 1, Jan. 2000, Page(s):399 – 406.
16. Baldwin, T.; Renovich, F., Jr.; Saunders, L.F.; Lubkeman, D.; "Fault locating in ungrounded and high-resistance grounded systems," IEEE Transactions on Industry Applications, Volume 37, Issue 4, July-Aug. 2001, Page(s):1152 – 1159.
17. Pahwa, A.; Xiaoming Feng; Lubkeman, D.; "Performance evaluation of electric distribution utilities based on data envelopment analysis," IEEE Transactions on Power Systems, Volume 18, Issue 1, Feb. 2003, Page(s):400 – 405.
18. Baran, M.E.; Jinsang Kim; Hart, D.G.; Lubkeman, D.; Lampley, G.C.; Newell, W.F.; "Voltage variation analysis for site-level PQ assessment," IEEE Transactions on Power Delivery, Volume 19, Issue 4, Oct. 2004, Page(s):1 956 – 1961.

Conferences:

1. D. Lubkeman, G. Wickramasekara, "A Knowledge-Based Expert System Approach for the Analysis of Distribution Feeder Harmonics," 1987 Industrial and Commercial Power Systems Technical Conference Record, pp. 64-71.

2. M.G. Wickramasekara and David Lubkeman, "Application of Sensitivity Factors for the Harmonic Analysis of Distribution System Reconfiguration and Capacitor Problems," Proceedings of Third International Conference on Harmonics in Power Systems, pp. 141-148.
3. B.W. Coughlan, D.L. Lubkeman, John Sutton, "Improved Control of Capacitor Bank Switching to Minimize Distribution Systems Losses," The Proceedings of the Twenty-Second Annual North American Power Symposium, pp. 336-345.
4. David L. Lubkeman, Christopher Burnette, Adly A. Girgis, Elham B. Makram, Hoke Fortson, "Automated Testing of Solid-State Watthour Meters in the Presence of Harmonic Distortion," The Proceedings of the 5th International Conference on Harmonics in Power Systems, pp. 345-351.
5. D.L. Lubkeman, A. El-Abiad, "Overview of Automation of Power Distribution Systems," IEEE Southeastcon 1981 Proceedings, pp. 260-264, April 1981.
6. T. Taylor, T. Tapp, J. Wall, D. Lubkeman, "Applications of Knowledge-Based Expert Systems to Power Engineering," Proceedings of the Eighteenth Southeastern Symposium on System Theory, April 1986, pp. 2 - 6.
7. T. Taylor, J. Wall, D. Lubkeman, "Knowledge-Based Expert Systems for Power Engineering Problems," Proceedings of the IASTED International Symposium High Technology in the Power Industry, pp. 357-361.
8. G. Wickramasekara, D. Lubkeman, "A Rule-Based Heuristic Approach to the Analysis of Distribution Feeder Harmonics," Proceedings of the IASTED International Symposium High Technology in the Power Industry, pp. 292-295.
9. D. Lubkeman, G. Wickramasekara, "A Knowledge-Based Approach for Solving Distribution Feeder Harmonic Problems," Proceedings of the Nineteenth Southeastern Symposium on System Theory, March 1987, pp. 106-113.
10. D. Lubkeman, T. Massey, "A Knowledge-Based Expert System for the Diagnosis of Rotating Machine Problems," Proceedings of IEEE Southeastcon 87, Vol. 2 of 2, pp. 461 -466.
11. S. Civanlar, D. Lubkeman, T. Taylor, H. Yin, "A Switching Operation to Improve the Operation of Electric Distribution Systems", Proceedings of the American Power Conference, Vol. 49, 1987, pp. 475-482.
12. D. Lubkeman, R. Gyurcsik, M. White, "Integration of Artificial Intelligence Approaches into Electric Power Distribution Analysis, Monitoring and Control," High Technology in the Power Industry, pp. 193-1 97.
13. Uzma Siddiqi and David Lubkeman, "An Expert System Dispatchers Aid for Distribution Feeder Fault Diagnosis," Proceedings of the Twentieth Southeastern Symposium on System Theory, pp. 519-523.
14. Sonja Ebron, David Lubkeman and Mark White, "Neural Network Applications for Data Interpretation and Diagnostic Analysis," Proceedings of the 1989 American Power Conference, April 24-26, 1989, Chicago, IL.

15. V.C. Ramesh, David Lubkeman, Ivan Matulic, "Decision Support Applications for Electric Power Distribution Facility Design and Management," Second Symposium on Expert Systems Application to Power Systems Conference Proceedings, Seattle, Washington, July 17-20, 1989, pp. 303-309.
16. David .L. Lubkeman, Chris .O. Fallon, Adly .A. Girgis, "Unsupervised Learning Strategies for the Detection and Classification of Transient Phenomena on Electric Power Distribution Systems," Proceedings of the First International Forum on Applications of Neural Networks to Power Systems, 1991, pp. 107-111.
17. A.A. Girgis, D.L. Lubkeman, "Integration of Distributed Transient Measurement Technology into Power System, Control and Protection," Proceedings for Workshop on Real-Time Control and Operation of Electric Power Systems, Oak Ridge National Laboratory, 1991, pp. 149-159.
18. Adly A. Girgis, David L. Lubkeman, Danny E. Julian, Christopher Fallon, " Incorporating Mutual Coupling and Intermediate Loads into Fault Location Techniques using Digital Fault Recorder Data," Proceedings of Seventh Annual Conference for Fault & Disturbance Analysis, Texas A&M University, 1992.
19. D.L. Lubkeman, A. Ghosh, J. Zhu, "Object-Oriented Programming for Power Engineering Education," Proceedings of the Twenty-Fifth Southeastern Symposium on System Theory, 1993, pp. 69-73.
20. A.K. Ghosh, T.B. Dixon, D.L. Lubkeman, A.A. Girgis, "A PC-Based System to Assist Researchers in Electric Power Distribution Systems Analysis," Proceedings of the 13th IEEE Transmission and Distribution Conference, 1994, pp. 227-232.
21. David L. Lubkeman, Atish K. Ghosh, "Automated Classification and Analysis Strategies for Electric Power System Disturbance Waveforms," Proceedings of Second Annual Joint Conference on Information Sciences, 1995, pp. 440-443.
22. Lubkeman, D.; Julian, D.E., "Large scale storm outage management," IEEE Power Engineering Society General Meeting, 2004, 6-10 June 2004, Page(s):1 6 – 22, Vol.1.
23. Tsai, S.S.; Li Zhang; Phadke, A.G.; Yilu Liu; Ingram, M.R.; Bell, S.C.; Grant, I.S.; Bradshaw, D.T.; Lubkeman, D.; Tang, L.; "Study of global frequency dynamic behavior of large power systems," IEEE PES Power Systems Conference and Exposition 2004, 10-13 Oct. 2004, Page(s) :328 – 335, vol.1.
24. Jorgen Hasselstrom, David Lubkeman, Fangxing Li, John Wang, and Yuan Liao, "Web-based Asset Management Tools", Proceedings of DistribuTech Conference, February 2003.

Patents:

25. 6,760,670 Crossover fault classification for power lines with parallel circuits.
26. 6,741,943 Crossover fault classification for power lines with parallel circuits.
27. 6,738,719 Crossover fault classification for power lines with parallel circuits.
28. 6,721,670 Crossover fault classification for power lines with parallel circuits.

- 29. 6,466,031 Systems and methods for locating faults on a transmission line with multiple tapped loads.
- 30. 6,466,030 Systems and methods for locating faults on a transmission line with a single tapped load.
- 31. 6,988,092 Method for evaluation of energy utilities.
- 32. 7,010,437 Electric utility storm outage management.
- 33. 7,272,516 Failure rate adjustment for electric power network reliability analysis.

Peter McPhee

| | |
|-----------------------------|---|
| Profession: | Senior Engineer |
| Years of Experience: | 3 |
| Education: | M.S./2007/Mechanical Engineering/The Johns Hopkins University - "Mechanical Engineering Fellowship" B.S./2005/Mechanical Engineering/UMASS Amherst - "Best in Class" Award, 2005 |
| Years with KEMA: | 1.5 |

Key Qualifications:

Mr. McPhee's primary role at KEMA is in the design and analysis of the technical aspects of renewable energy systems and green infrastructure. Recently, he has analyzed the feasibility of community wind projects in aspects ranging from wind resource analysis and energy simulations to visual simulations and economic modeling. He is currently involved in planning a multi-turbine wind project south of Boston as well as supporting ongoing community wind projects throughout Massachusetts. His current interests in renewable energy include wind farm due diligence, wind power load-flow integration, wind project design and feasibility, and off-shore wind.

Mr. McPhee has also been involved in the energy efficiency/Demand-Side Management (DSM) field. Mr. McPhee has worked in providing data collection and analysis of energy efficiency practices and developed quantitative efficiency goals, best practice recommendations, and estimates of long-term expected DSM reductions. He has been involved in a variety of efficiency work, from the evaluation of state efficiency programs to quantitative potential studies for utilities. Prior to joining KEMA, he played a pivotal role in the development of a carbon neutral policy for the entire Johns Hopkins university system.

Peter McPhee is the coordinator for KEMA's Wind Energy Practice Area, which seeks to develop and expand on the scope of wind energy projects with which KEMA is involved. Mr. McPhee holds a B.S. in Mechanical Engineering from the University of Massachusetts Amherst and an M.S. in Mechanical Engineering from the Johns Hopkins University.

Selected Professional Experience:

Renewable Energy

- **City of Quincy Community Wind Project:** Feasibility Study. An analysis of the feasibility of a multi-turbine wind project at the Quarry Hills region of the city of Quincy was performed to analyze the potential for an up to 5 MW wind farm bordering the town golf course. The design and layout of the three turbine windfarm was completed for three utility-sized wind turbines. The study included a complete analysis of local wind resources and a determination of long-term resource prediction. Potential layouts of the wind farm over the entire area were investigated in respect to transportation, construction, and energy production potential. Suggestions and requirements for interconnection of the generators were provided and the potential for communications interference was analyzed in respect to possible windfarm layout. Digital

visualizations of possible site layouts were created for comparison. KEMA's predicted wind resources for the site were used to develop a long-term revenue prediction for the city in relation to multiple ownership options and for given levels of confidence.

- **Scituate Community Wind Project:** Wind Site Evaluation and Feasibility Study. A complete feasibility study for the wind turbine site on the Scituate, MA Waste Water Treatment Facility was conducted with regard to energy and economic output, construction requirements, and visual impacts. An analysis and evaluation of meteorological wind data collected from the site was performed and wind resources were correlated to long-term historical data. Wind resources were simulated on a local level using WindFarm software and different turbine sites and scenarios were evaluated for optimal economics. On-site evaluations of delivery and construction requirements were performed and visual renderings of the turbine site from surrounding locations were created. All potential fatal flaws of the turbine location were evaluated and reported to the Massachusetts Technology Collaborative.
- **UPC Brisbane, Ca:** Renewable Energy Potential Study. A suite of renewable energy and energy efficiency options was proposed and analyzed for a reclaimed industrial zone in Brisbane, CA. The study looked specifically into solar photovoltaics and wind energy options, including off-shore, small on-shore, and building integrated wind. The technical and economic potential of these renewable energy technologies were evaluated given the site specific climate.
- **Connecticut Clean Energy Fund:** Evaluation of Renewables Program. A full analysis of the Connecticut Clean Energy Fund's (CCEF) solar and fuel cell program was conducted, including analyses and confirmation of renewable energy system performance. The project also investigated customer and installer experiences with the CCEF. Photovoltaic and fuel cell systems were analyzed and output performance was predicted and compared to reported production.
- **Massachusetts Technology Collaborative:** Community Wind Projects Support. Technical support for multiple community wind sites was provided for on-going KEMA projects. Assistance ranged from reviewing permitting processes to evaluating potential interferences with communications towers or aircraft flight paths. Support was provided for WindFarm simulations regarding wind analyses and visual impacts for surrounding areas.
- **ELMAR Aruba Power Company:** Distributed Generation Interconnection Policy. A distributed generation (DG) interconnection policy for the Caribbean island of Aruba was developed for small generation sources such as wind and solar. The technical interconnection standards for a range of power production capacities were considered. Tariff and metering options were provided to ELMAR to suit the island's generation resources and to fit into the pricing structure presently on the island. Internal project organization and communication to the utility company was provided and additional information and background research was completed for the project.

Energy Efficiency

- **Vermont Department of Public Service: Evaluation of C&I Baseline Efficiency.** Conducted on-site commercial and industrial building efficiency audits to determine baseline efficiency throughout the state of Vermont. Duties included analysis of building envelope, inventory of electrical equipment, evaluation of window efficiency, and determination of building occupancy and usage patterns. Sampled data was collected into a standardized survey and used to extrapolate state-wide energy use and efficiency practices.
- **Wisconsin Focus on Energy: Evaluation of Commercial Efficiency Program.** Evaluated commercial efficiency projects for estimation of technical savings, confirmation of installed

efficiency measure, and evaluation of project effectiveness. Provided project analyses directly to state efficiency program with savings estimations and project overview.

- **Nova Scotia Department of Energy:** Long-Term Energy Plan. A comprehensive sustainable transportation plan was developed for the Canadian province of Nova Scotia. Energy-saving measures ranging from increased public transportation and fare subsidies to improved bike ways and modified parking tariffs were considered. Economic-based measures were simulated using EPA COMMUTE software and energy and cost impacts were collected within a larger energy plan that included residential and commercial energy efficiency measures as well as renewable energy options. The results of these scenarios over the coming decades were reported to Conserve Nova Scotia for consideration in future sustainable energy plans.
- **ISO New England:** Evaluation of Forward Capacity Market Proposals. Support for a KEMA evaluation team was provided for ISO New England's forward capacity market proposals. These proposals presented portfolios of efficiency and renewable generation resources for which the utility company took ownership. The team was responsible for evaluating claims of savings and providing corresponding reports to ISO New England for final evaluation. Weekly update reporting support and data/report submissions were provided and communications between the ISO and the KEMA team were monitored and overseen.
- **Johns Hopkins University:** Carbon Neutral Policy Development. Played a pivotal role in developing an institution-wide policy for carbon neutrality across the entire Johns Hopkins system. Proposed measures for on- and off-site renewable energy sources including solar, wind, and biomass. Provided options for expanding biofuel usage in university vehicles and promoting energy efficiency for building renovations and new construction. Acted as a liaison between facilities management, academic administrators, and university students to communicate technical details as well as future implications of the policy. Provided detailed media releases for policy developments and communicated ideas and concerns between the university and surrounding community.

Professional Experience:

KEMA, Burlington, Massachusetts: 2007 to Present

Senior Engineer

- Providing technical consulting on renewable energy and sustainable infrastructure, primarily focusing on projects within the Sustainable Market Strategies group. Quantitatively analyzing wind resources and wind turbine projects as well as modeling current and future energy scenarios for utility and state clients. Conducting in-depth analysis of energy efficiency and renewable energy efficacy under state- and industry-funded programs. Evaluating the performance of demand-side reduction portfolios of utility companies. Implementing on-site performance evaluations for residential photovoltaic installations as well as for institutional building efficiency retrofits.

Tissue Dynamics Laboratory, The Johns Hopkins University, Baltimore, Maryland: 2005 to 2007

Research Assistant

- Conducted original research in the investigation of brain injuries through the development and implementation of computational models to simulate traumatic impacts to the head. Correlated sets of injury data to develop engineering parameters for injury. Provided detailed analysis of computational outcomes and correlated data sets to medical case studies. Evaluated finite element model solutions with respect to medical data and prepared resulting analytical models to serve as predictors of traumatic brain injury.

Electro-Mechanical Systems Laboratory, UMASS Amherst, Amherst, Massachusetts: 2003

Research Assistant

- Developed real-time signal processing programs to monitor and analyze flawed roller bearings to determine defect location and amplitude from vibrational signals. Implemented processing routine into experimental test-bed for bearing monitoring. Collected and analyzed time-series data for method validation.

Languages:

| | <i>Speaking</i> | <i>Reading</i> | <i>Writing</i> |
|----------|------------------------|-----------------------|-----------------------|
| English: | Excellent | Excellent | Excellent |
| German: | Excellent | Excellent | Excellent |

Professional Affiliations:

Member, American Society of Mechanical Engineers, 2004 to Present

Member, Phi Kappa Phi Honor Society, 2004 to Present

Colin B. Rickert

| | |
|-----------------------------|--|
| Profession: | Consultant |
| Years of Experience: | 4 |
| Education: | M.S./2008/Computer Science/ University of Vermont, Burlington, VT M.S.E./2003/Software Engineering/ Seattle University, Seattle, WA B.A/1996/Biochemistry/ Clark University, Worcester, MA |
| Years with KEMA: | < 1 |

Key Qualifications:

Colin Rickert holds an M.S. in Computer Science from the University of Vermont, an M.S.E. in Software Engineering from Seattle University as well as a B.A. in Biochemistry from Clark University. He has diverse professional experience in software development/testing, wind resource analysis, wind turbine siting/optimization, wind farm production modeling and authoring technical reports. His research experience is in the area of data mining and the use of genetic algorithms and neural networks for classification, forecasting and optimization. While in graduate school he co-authored a paper titled "Feature Selection and Classification in Noisy Epistatic Problems using a Hybrid Evolutionary Approach" which he presented in the 2007 Genetic and Evolutionary Computation Conference (GECCO) in London UK as a poster paper (published in the conference journal).

Professional Experience:

KEMA, Burlington, Massachusetts: November 2008 to Present

Professional Focus

- Performing wind resource analysis for wind projects.
- Analyzing electrical grid loading from wind farms, investigating electrical grid load profiles from wind farms.
- Supporting energy efficiency potential analyses.
- Data mining, acquisition and processing
- Statistical programming.

EAPC Wind Energy Services, Norwich Vermont: December 2006 to September 2008

Project Analyst

- Focused on wind feasibility studies.
- Performed data processing, acquisition and quality control.
- Constructed wind resource maps and analyzed wind farm production, wake loss and turbulence using WindPRO and WASP.
- Programmed NRG data loggers (for met towers) and constructed a status report on a monthly basis.

- Authored technical reports.

Bocada Software, Seattle Washington: June 2005 to October 2005*Senior Test Engineer*

- Member of the quality assurance team. Developed manual and automated test suites for a backup server data mining application.
- Involved in the process of quality testing, bug tracking and build verification for the release of BackupReport version 4.0 (enterprise level software).

Intelligent Results, Seattle Washington: July 2004 to August 2005*Software Development Engineer*

- Member of the Intelligent Results research team. Proposed, designed and improved various techniques related to structured, textual and time-series data mining. Reviewed current material associated with these technologies and implemented them accordingly.
- Functioned as a liaison with quality assurance and was involved in various statistical analysis tasks aimed at increasing predictive model quality and verifying many advanced data mining software features.

Annuncio Software, Pleasanton California: 8/2000-1/2001*Hosting Applications Consultant*

- Designed an internal metrics reporting system using dynamic PL/SQL.
- Developed an antispam solution that involved cleaning up spam recipients.

Languages:

| | <i>Speaking</i> | <i>Reading</i> | <i>Writing</i> |
|----------|------------------------|-----------------------|-----------------------|
| English: | Excellent | Excellent | Excellent |
| German: | Basic | Basic | Basic |

Professional Affiliations:

ACM (Association of Computing Machinery) member as of July 2007.

Certifications:

Completed WindPRO training course, Boston Massachusetts (January 2007).

Awards:

- Nominated for the National Dean's List in 2007 for outstanding academic performance.
- Member Upsilon Pi Epsilon: Honors society in computing and information systems.

Skills:

- Applications: WindPRO, Microsoft Excel, Microsoft Word, Matlab, Oracle/SQL-Server, WASP
- Programming Languages: Java, LISP, R, Matlab, C++

- Operating Systems: Windows, Unix/Cygwin
- Scripting: Bash, grep, sed and (some) PERL

Professional Publications:

Dehaas D., Craig J., Rickert C., Haake P., Eppstein M., Stor K. (2008). "Feature selection and classification in noisy epistatic problems using a hybrid evolutionary approach"; Genetic and Evolutionary Computation Conference (journal), 2007

Family name: Taris, ing. [BSc]

First name(s) : Anne-Marie H.W.

Present function : Specialist Wind Energy

Date of Birth : June 29, 1978

Nationality : Dutch

| Education: | | Certificate |
|------------|---|-------------|
| | ▪ Secondary Modern School GCSE A'levels [Gymnasium] | 1996 |
| | ▪ College of Technology [HTS] Environmental Material Technology | 2001 |

| Languages: | Conversation | Reading | Writing |
|------------|--------------|---------|---------|
| ▪ English | good | good | good |
| ▪ German | fair | fair | fair |

Key qualifications

Ms Taris has 7 years of experience in wind energy. After graduating she joined KEMA at the wind energy department. She gained broad experience in feasibility studies, legal issues, permits, wind resourcements and valuation of (future) wind farms. Ms Taris is as a project leader involved in the whole traject of wind energy starting feasibility studies to building permits and tendering. Thanks to her posting for several years at energy offices in the Netherlands she has good insight in all wind energy related issues.

For several project developers (Dutch energy companies, wind farm owners) she carried out due diligence studies of their wind farm portfolio. Wind farms were judged on their performances, technical state and operational and capital expenditures.

Ms Taris has been responsible for the Wbr-license application for the offshore wind farm Tromp Binnen of RWE.

Experience

since 2001:

Consultant Wind Energy

- | | |
|-------|--|
| 2009: | <ul style="list-style-type: none">▪ Owner's and lender's engineer for wind farm Vader Piet on Aruba▪ risk analysis for future wind farm Hartelkanaal▪ due diligence for Scottish wind farms |
| 2008: | <ul style="list-style-type: none">▪ Wbr license application and EIA for an offshore wind farm of RWE▪ license application and SDE-application for wind farm Coevorden of the Ministry of Defence▪ due diligence of all renewable assets for a Dutch energy company▪ tender documents for 400 MW offshore wind farm of Essent▪ project engineer for wind farm Growind |
| 2007: | <ul style="list-style-type: none">▪ due diligence of several wind farms for energy company▪ tender enquiry document for wind farm Gouwe Park▪ due diligence of a large wind farm in the northern part of the Netherlands▪ due diligence of production assets for a Dutch energy company |
| 2006: | <ul style="list-style-type: none">▪ tender enquiry document and permits of wind farm Coevorden for Ministry of Defense▪ air quality studies for new industrial developments (Essent, RWE, NUON, Fibroned)▪ wind resource calculations for several wind farms in the province Flevoland▪ inventory study wind energy in Garland, USA▪ monitoring permits of bio-energy projects in the Netherlands▪ air quality study Zuidas for Rijkswaterstaat▪ programme of requirements wind farm Ommen |
| 2005: | <ul style="list-style-type: none">▪ wind map of the Netherlands at 100 m▪ air quality study for the municipality Apeldoorn▪ posting at the Energy-agency of Overijssel: providing support to the municipalities regarding the development of wind energy (since 2003) |

- evaluation of the wind energy policy of the province Noord-Brabant
 - air quality study Heinz
 - project manager wind energy for the municipalities of Ommen and Hardenberg
- 2004:
- study of the environmental and technical aspects of wind energy for several locations in 8 municipalities
 - posting at the municipality of Kampen regarding the development of wind energy
 - quick scan wind energy for 90 farmers in the eastern part of the Netherlands
 - project manager Quick scan wind energy Rivierenland
 - action plan wind energy for the north east of Overijssel
- 2003:
- quick scan wind energy for 30 farmers in the Netherlands
 - cast shadow research NUON
 - inventory of Railwind, possibilities for wind energy over rail tracks of the Betuweroute
 - possibilities of wind energy for RijksWaterstaat
- 2002:
- wind resource calculations for the Investor's Memorandum of wind farm Koegorspolder
 - course Sustainable Energy on a Local Level, author part 6: wind energy
 - project assistant at location research and detail study by order of the municipalities of Veghel and Bernheze
 - wind resource calculations Slufterdam-West for Siemens
 - project assistant at the development of the concept Railwind (wind turbines above railways) and consultation partner for ProRail
- 2001:
- inventory of Combimast (combination of wind turbine and power pylon) possibilities in the Netherlands
 - project assistant at several feasibility studies for concrete wind energy locations

- drawing up zoning plans of several wind parks (for example Axelse Vlakte, Moerdijk and Sloegebied)

Courses:

- WAsP calculations on wind supply (Risø), 2001
- Wind Turbine Techniques (DEWI), 2002
- Risk Analysis for wind turbines (NRG), 2002
- Drawing up proper zoning plans (Elsevier), 2003
- Energy Production warranties (DEWI), 2004
- Management for young engineers (TSM Business School), 2004
- Commercial skills (STEM), 2005
- ArcView (GEODAN), 2005
- Advice skills (Bureau Zuidema), 2005
- Basic Elements of Safety SCC (VCA), 2006
- English (Regina Coeli), 2006
- Marketing & Sales (KEMA), 2008
- Project Management (AMI), 2009
- Technology of offshore wind energy (TU Delft), 2009

Appendix B – Ecology and Environment Proposal



Appendices



ecology and environment, inc.

International Specialists in the Environment

56 Pine Street, Suite 3A
Providence, Rhode Island 02903
Tel. (401) 351-2472

August 27, 2009

Andy Brydges
Project Manager
KEMA, Inc.
67 South Bedford Street, Suite 201 East
Burlington, MA 01803

Re: Proposal for Environmental Consulting Services for East Bay Energy Consortium

Dear Mr. Brydges:

Ecology and Environment, Inc., (E & E) is pleased to submit to KEMA, Inc. (KEMA) this scope of work (SOW) [REDACTED] to support the East Bay Energy Consortium's evaluation of the feasibility of erecting a regional wind energy system within the East Bay of Rhode Island. This proposal includes a brief description of our scope of services as requested by KEMA and cost estimate to perform the work.

The *East Bay Energy Consortium Request for Proposal Evaluation of the Feasibility of Erecting a Regional Wind Energy System Within the East Bay of R.I* (RFP) is soliciting only cost proposals for Task 1, a Pre-Feasibility Study, at this time. We are including a preliminary scope of services for Task 2, a Detailed Feasibility Study, to respond to all the requested services of the RFP. These scopes of services are subject to change as more information regarding the project becomes available. Attendance at meetings and the preparation process of deliverables for Task 2 will be addressed in detail at a later date if the project goes forward.

SCOPE OF WORK

It is our understanding that the project will consist of two (2) tasks. The first task will involve the selection of multiple sites best suited for wind development in the East Bay Region or Aquidneck Island in which a Pre-Feasibility Study will be conducted. E & E assumes that sites located offshore will not be considered in this site selection process. E & E will perform the evaluation of environmental impacts and permitting requirements for Task 1 which will consist of:

- **Determine the potential level of involvement, if any, of federal and state agencies.**
E & E will identify the potential level of involvement from federal and state agencies based on numerous sites being considered for wind development. E & E assumes these sites will be selected by others and based on other factors such as availability of wind resource, land use compatibility and proximity to transmission lines.
- **Determine the potential presence of sensitive natural resources.** A desktop analysis will be conducted to identify the potential presence of sensitive natural resources within the East Bay Region that could potentially be impacted by a wind energy facility. The resources to be considered will be land based and include wetlands, streams, threatened and endangered species, birds, bats, rare or unique natural communities, and wildlife species of local importance. E & E will provide KEMA with a SHP file of these areas, if available from published data sources.

Per the requirements of the RFP E & E will prepare a letter report of the regulatory and environmental analysis described above. In addition, an E & E biologist will attend one (1) meeting via phone with the East Bay Energy Consortium (EBEC) to discuss the findings of the analysis.

Upon the completion of Task 1, it is our understanding that the EBEC will select a number of sites to be evaluated in fuller detail. Task 2 involves a detailed feasibility study of these sites which will include:

- **The determination of the potential presence of threatened and endangered (T&E) species and potential avian resources in the selected sites.** The avian analysis will involve an evaluation of potential avian usage of the site(s) based on its relation to coastal areas, major migration pathways, important bird areas and known nesting sites. This information will be collected using published data sources and used to give a preliminary risk analysis to avian species. In order to truly analyze the risk to avian species, we recommend field surveys to characterize the bird usage of the project sites. Avian surveys are beyond the scope of this task. T&E analysis will involve contacting state and federal agencies in writing to determine if T&E species are present in the area.
- **The performance of a site visit to field verify desktop study of sensitive resources.** A one-day site visit will be conducted by a single biologist to verify the accuracy of the published data sources used to determine potential locations of wetlands and aquatic resources in each of the selected sites in Task 2. The biologist will also verify land use and verify the potential location of wildlife (including avian, bat, and T&E species) habitat present at each of the sites. Other potential environmental constraints will also be identified during this site visit. Note that field delineation of wetlands and aquatic resources or confirmation of presence or absence of T&E species, avian and bat populations is not included in this work scope. The purpose of the site visit is only to verify the accuracy of the information used for the detailed feasibility study and determine the need of further investigations. E & E assumes a person familiar with the site locations will meet and escort the E & E biologist to these locations. This escort will either be a KEMA representative or an EBEC representative knowledgeable about the sites. E & E also assumes KEMA will establish and provide access agreements to all locations requiring a site visit by E & E.
- **Permitting requirements.** Based on the presence of regulated natural resources in each of the selected sites, E & E will determine the potential level of involvement from federal and state agencies and make recommendations to minimize and avoid protected resources to mitigate potential impacts. A determination of local regulatory agency involvement will also be conducted based on the location of sites being considered. The matrix included in the report shall (a) list all possible permits, reviews and approvals for this type of project, (b) indicate the extent to which each listed item is relevant to the project, and (c) indicate the expected degree of difficulty in successfully completing each listed item.
- **Noise modeling.** E & E will evaluate the potential noise impacts at wind speeds of 6 and 7 m/s, tonal noise, and low frequency noise from a single model turbine being considered for

construction at the sites. E & E will use published baseline noise levels based on the land use composition of the selected sites to model the predicted noise levels at the nearest sensitive receptors (i.e. home sites, churches, parks, nursing homes, etc.). If requested, baseline noise data will be collected from each of the sites during leaf-off conditions.

- **Viewshed impact.** Up to 3 photo simulations will be produced for each site from prominent vantage points in or near the selected sites. The photographs will be taken to best represent what would be seen by the naked eye in order to provide an accurate representation of what the view shed impact would be from these locations after a wind energy facility is constructed. E&E will create the photo simulations using industry standard software (WindPRO). The software accounts for topography and elevations of the proposed turbine locations to give the best representation of the view shown in the photomontage and to determine if any wind turbines would be shielded by topographic changes in the foreground.
- **Strobing and Shadowing.** E & E will determine the location of sensitive receptors (i.e. home sites, churches, parks, nursing homes, etc.) and use industry-standard software (WindPro Shadow Module) to map the geographic area falling within the shadow zone of one or more wind turbine rotors, and calculate the maximum hours per year and minutes per day of potential flicker for the nearest residents based on existing topography and the amount of sunshine within the project area. Meteorological data from the Newport State Airport or other nearby weather station will be used to calculate the sunshine “probabilities.” This analysis will not take into consideration existing trees thereby producing the worst case scenario for shadow flicker caused by the proposed project and assumes a potential turbine layout is available.

Task 2 deliverables to KEMA will consist of a report summarizing the findings of the environmental feasibility study described above. Discussions will include general habitat assessments, general avian and wildlife use of the sites, potential location of wetlands and water bodies, potential presence of threatened and endangered species, regulatory environment, noise analysis, and shadow flicker analysis. The report will be based on information obtained from database searches and windshield reconnaissance of the project area and surrounding areas from publicly-available vantage points. Environmental concerns, including the likely presence of rare or endangered species and wetlands, through a cursory site inspection and agency consultation will be included.

SCHEDULE

Should KEMA be awarded the project by the EBEC, E & E is prepared to commence Task 1 efforts on this within three business days of our receipt of a signed subcontract agreement and will provide KEMA with a deliverable for Task 1 within 15 business days. Task 2 efforts will be begin after receipt of written notification from KEMA.

COSTS, TERMS, AND CONDITIONS

Invoices shall be submitted by E & E on a monthly basis. E & E's standard invoice provides a list of labor hours and rates by labor category plus a list of project Other Direct Costs (ODCs) and subcontracted services. Customized formats and copies of individual timesheets and receipts can be provided for an additional administrative charge. Payment terms are net 30 days. Late payments will be assessed a 1% per month carrying charge.

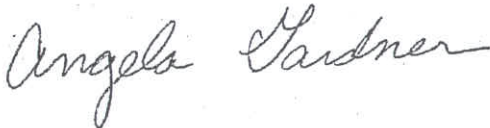
QUALIFICATIONS

Per your request, E & E has attached project summaries demonstrating our experience on similar projects, a company profile, and short biographies of E & E's key project staff members. Mr. Sean Meegan will be Project Manager and will oversee the day-day activities and will attend all required meetings and conference calls for the project. Mr. Joe Forti will be the Contract Manager, and Ms. Angela Gardner and Mr. Mike Morgante will be Resource Specialists for the project. This project team will be available to complete the scope of services as scheduled and to provide KEMA and the EBEC technical support as requested.

E & E looks forward to working with KEMA on this project. Please contact me at 716/684-8060 or agardner@ene.com if you have any questions or require additional information.

Sincerely,

ECOLOGY AND ENVIRONMENT, INC.

A handwritten signature in cursive script that reads "Angela Gardner".

Angela Gardner
Senior Biologist

Attachments

Attachment A

COMPANY PROFILE AND RELEVANT EXPERIENCE

ECOLOGY AND ENVIRONMENT, INC.

COMPANY OVERVIEW

56 Pine Street, Suite 3A, Providence, RI 02903 — Telephone: 401/351-2472

E & E is committed to providing professional services so that global sustainable economic and human development may proceed with minimum negative environmental impact. E & E employs nearly 1,000 specialists in over 75 scientific, engineering, and technical disciplines, based in offices in major cities across the U.S. and around the globe. Our client list includes governments; commercial industries and multinational corporations. Since its founding in 1970, E & E has provided practical solutions to human health and environmental problems for over 25,000 environmental assignments in over 80 countries.

E & E is a fully integrated ecological and environmental engineering company that is stockholder-owned and traded on the NASDAQ stock exchange.

E & E has helped evaluate and support permitting for a total planned output of over 4,500 megawatts (MW) of renewable wind energy. We have assisted with all facets of wind project development for numerous customers worldwide. Our work includes initial feasibility assessments, regulatory involvement assessment, facility siting, permit applications, environmental and social impact assessments, including avian and bat surveying, and environmental monitoring during installations. These activities involved identification of threatened and endangered (T/E) species' habitats and avian migration patterns.



E & E has worked on more than 50 major wind energy projects in the U.S.

E & E is also a consulting member of the American Wind Energy Association (AWEA). Our staff members are active participants on the AWEA siting committee and have presented training sessions and technical papers at AWEA national conferences and special workshops on topics such as avian impacts, visual analysis, permitting, offshore wind energy development, and public involvement. We are cognizant of the unique issues associated with wind energy development. Our network of experienced environmental staff gives us the geographic presence to understand state and local issues and the depth and breadth of specialists required to complete specialized studies necessary to permit even the toughest projects cost effectively and on schedule.

E & E is leading the way in developing innovative methods to address emerging avian and bat mortality concerns. Our avian and bat experts are nationally recognized in the wind industry. They are involved at the site selection phase in preparing fatal flaw analyses and preliminary risk assessments; they develop surveys for bats, raptors, migratory birds, and breeding-bird populations and direct literature reviews to support permit applications and NEPA documents, and they develop survey protocol for post-construction mortality studies. We compile and evaluate data on seasonal use and proximity, and develop and implement survey plans to support determinations regarding whether or not T/E species are present in the project area by conducting qualitative analyses of migratory activities,

including species and quantity of birds and bats present and a determination of the risk to birds and other avian species posed by the proposed wind project.

E & E offers a uniquely strong capability to solve an array of environmental problems. The clear commitment and dedication of E & E's managers to a cleaner world is backed by the firm's respect for community needs, unmatched record of experience, top-level experts in the environmental and engineering sciences, and state-of-the-art technology resources. This background provides E & E with an ideal foundation for successfully executing programs of any size in a cost effective and efficient manner.

ECOLOGY AND ENVIRONMENT, INC.

RELEVANT PROJECT EXPERIENCE

MTC Wind Studies, Massachusetts. In support of a subcontract agreement to the Massachusetts Technology Collaborative (MTC) E & E conducted fatal flaw analyses for 7 municipal projects. Tasks included federal, state, and local regulatory involvement reviews, desktop and field wetland surveying, threatened and endangered (T/E) species presence assessment, and general environmental setting assessment. Field reconnaissance efforts involved site visits, interfacing with regulatory agency staff and local municipal representatives; and conducting local setting surveying. Project findings were reported in letter reports as data matrices.

Steel Winds Waterfront Wind Farm Assessment, BQ Energy, New York. E & E investigated the feasibility of developing a 10-turbine wind energy facility on a small portion of the Bethlehem Steel Works, which is situated on approximately nine acres of slag fill along the shore of Lake Erie. We prepared a Phase I avian risk assessment to address potential project impacts on birds and other avian species. E & E's avian expert compiled and evaluated existing information on project site area, including data on seasonal use and proximity to several important birding areas, and developed and implemented the avian survey plan. The project included visual surveys during the spring raptor migration season, a review to address the proximity of a nesting colony of ring-billed gulls, and confirmation of actual site conditions. The surveys also supported determinations regarding whether T/E species are present in the project area. The fieldwork resulted in a qualitative analysis of spring migratory activities, including the species and quantity of birds present and a determination of the risk to birds and other avian species posed by the proposed wind project. The work included a literature search, interviews with local and regional experts and site visits. E & E also conducted a visual impact assessment to determine if there was any flexibility in terms of project design, orientation, and mitigation. E & E also supported the client in proceeding before the Lackawanna Planning Board to successfully obtain site plan approval and a negative declaration under the State Environmental Quality Review Act (SEQR).

Avian and Bat Surveys, Bird and Bat Risk Assessments for Potential Wind Farm Sites—12+ locations in New York. For Noble Environmental Power, LLC, E & E developed eight work plans for pre-construction bird and bat studies, and coordinated with regulatory agencies. We conducted avian studies including migratory bird surveys, breeding bird surveys, raptor surveys, and habitat evaluation for T/E species at all sites. We coordinated avian radar studies and passive bat acoustical monitoring with subcontractors, including methodology development and review of all reports. Conducted active bat acoustical monitoring at two sites. We prepared bird and bat risk assessments for each site evaluating potential impacts of proposed project (construction and operation) on birds and bats. EIS sections on bird and bats also prepared for each site. We prepared nine post-construction monitoring work plans. We conducted post-construction monitoring study at existing wind farm (Wethersfield wind farm).

Avian Impact Assessment for Potential Wind Farm Site, Steuben County, New York. For Airtricity Inc., E & E developed work plan for pre-construction bird and bat studies and coordinated with regulatory agencies. We conducted site visit to evaluate potential avian and bat issues associated with proposed project. We conducted raptor surveys, migratory bird surveys, breeding bird surveys, T/E bird species/habitat searches, and bat habitat evaluation.

Noble Power Wind Projects, New York, New Hampshire, Texas, and Oklahoma. As lead environmental consultant for one of the largest wind developers, E & E has supported all facets of wind project development, including numerous EAs and EISs. Each wind project requires preparation of an EIS addressing the full range of environmental concerns, including geology/soil, vegetation and wildlife, water and air quality, noise, archaeological and cultural resources, visual resources and aesthetics, environmentally sensitive areas, socioeconomics, transportation, and existing infrastructure/utilities; as well as alternatives to the proposed project. For each project, E & E personnel worked closely with client and agency representatives to develop the specific project schedule, permitting strategy, and EIS work scope. To evaluate potential project impacts on local avian and bat populations, E & E conducted avian risk assessments and avian mortality surveys and surveys of autumn and spring migrant and wintering birds, evaluated bat habitat, oversaw the completion of radar and acoustic studies to support the ecological risk assessments, and completed surveys to help determine the best locations for wind turbines based on the avian and bat survey results. For each site, E & E's avian expert coordinated the development of fatal flaw analyses; conducted literature reviews for site-specific issues; prepared the work plans for bird and bat studies and survey protocol; coordinated the planning effort with state agency representatives; led and participated in the various field surveys for raptors, migratory birds, breeding birds, and threatened/endangered species; and coordinated the study design and activities of nocturnal radar and bat acoustical monitoring study subcontractors. The bird and bat risk assessments became part of the respective project draft EISs. In addition, E & E was responsible for addressing all permit issues related to birds for the proposed wind power facilities. We developed protocol for and implemented an avian and bat mortality study at an existing, 10-turbine wind farm in Wyoming County and prepared post-construction bird and bat mortality monitoring work plans for eight of the sites.

Chautauqua Wind Project, Western New York. E & E organized the numerous avian field studies for the proposed 50-MW wind power facility, which planned to feature 34 wind turbines. Avian issues were considered the project's most sensitive environmental concern and presented the greatest potential roadblock for obtaining permit approval. E & E's avian expert prepared the avian studies scope of work (SOW) and field protocol for numerous bird surveys to be conducted during spring and early summer and presented the SOW at meetings with town authorities, agencies, and the public. We procured a specialized subcontractor to perform radar ornithology surveys, developed a SOW for performance of diurnal surveys during the spring migration season and nocturnal surveys during the spring and fall migration seasons, and evaluated data. E & E provided daily logistics planning and was a primary participant for all of the surveys, including those for raptors, migratory birds, breeding birds, and avian mortality. We compiled the voluminous field data and presented results at meetings with NYSDEC, USFWS, the public, and the co-lead agencies.

The draft avian risk assessment (ARA) was based on a lengthy review of potential risks posed by wind energy facilities and required development of a quantitative estimating method based on site data. As a primary author and key contributor to the comprehensive ARA, E & E's avian expert helped develop a new methodology (Utilization Avoidance-Mortality Method) to quantify annual mortality risk. E & E presented the ARA at public meetings and to NYSDEC, USFWS, the New York State Energy Research and Development Authority, and the Buffalo Wind Action Group. When two new bald eagle nests were reported in the vicinity of the proposed project, he developed a SOW for a bald eagle study, coordinated with involved agencies, interviewed with local community members who reported seeing eagles, documented one of the nests for the first time, and conducted and oversaw studies to observe bald eagle flight patterns in the project vicinity.

Sheffield Wind Farm, Sheffield, Texas. For Citizen's Energy Corporation, E & E conducted an avian fatal flaw analysis that included his compilation and review of local and regional information.

Tierra Energy Wind Farm, Odessa, Texas. To support the fatal flaw analysis for the 750-acre 30-MW wind farm, E & E compiled and reviewed local and regional avian information, reviewed site topography, and evaluated avian habitat in the project area. E & E prepared an environmental assessment (EA), including biological assessment (BA) and avian studies to support interconnection with Western Area Power Administration electric transmission system.

Notrees Wind Farm, Odessa, Texas. For Duke Energy, E & E performed a fatal flaw analysis and Phase I environmental site assessment for this potential wind energy facility site located in Ector and Winkler Counties. The team compiled and reviewed local and regional avian information, reviewed site topography, and evaluated avian habitat in the project area. For DESG Wind I, LLC, we also provided environmental permitting support, avian surveys, and cultural resource surveys. Currently in the construction phase, the project is expected to begin operation in 2009.

Dyess AFB, Abilene, Texas. Under E & E's multisite program for USAF HQ ACC, E & E ornithological surveys to evaluate the potential impacts of clearing vegetation within a proposed 100-meter zone around a weapon storage area. E & E conducted two rounds of point-count bird surveys to document the occurrence/abundance of breeding and migratory species in the project area. E & E gave particular attention to resident neotropical birds such as the Bullock's oriole, painted bunting, yellow-billed cuckoo, and Bell's vireo that are monitored by Partners in Flight, an organization with a signed cooperation/support agreement with USAF. Other species of concern included the yellow-crowned night heron, Swainson's hawk, loggerhead shrike, and grasshopper sparrow. We prepared a report detailing the survey findings and helped identify mitigation measures.

Third Planet Windpower Facilities, Nationwide. E & E was awarded an indefinite-delivery MSA with Third Planet Windpower, LLC, to provide support services covering all facets of wind project development at a variety of sites nationwide. Services will include initial feasibility assessment, facility siting, development of permit applications and EISs, and environmental monitoring during windpark installation to support permit requirements. E & E performed baseline avian surveys, including spring migration surveys, breeding bird surveys, fall migration surveys, winter raptor surveys and passive bat acoustical monitoring surveys. E & E avian and bat experts conducted weekly visits to the project site to assess the potential avian and bat impacts from the proposed wind project.

Ely Wind Project, Elko, Nevada. For EnXco, E & E performed an environmental permitting feasibility study for a 100-MW wind generation facility on BLM land in the Egan Range.

Wind Farm Site, Confidential. For FPL Energy, LLC, E & E conducted permitting feasibility study and aviation analysis addressing proposed construction of a utility-scale wind farm. We identified nearby facilities and calculated FAA height restrictions and the potential for issues concerning radar system impacts.

Tonawanda Powertrain Facility Wind Project, Tonawanda, New York. For General Motors, E & E worked with General Motors to develop a wind and landfill gas-powered facility to eliminate power outages at the Tonawanda Powertrain production facility. E & E designed a project feasibility study and prepared the application for a NYSEDA grant to provide part of the project financing.

Wind Projects FSs, Wyoming and Utah. For EnXco Development Corporation, E & E conducted feasibility study for the Wheatland Wind project in Wheatland, Wyoming. Also, for EnXco, E & E conducted the feasibility study, including critical issues and environmental permitting analysis, for 80-

MW wind turbine project being considered for location on land administered by BLM for the Mineral Mountain Wind Project in Beaver County, Utah.

Chateau Hill Wind Energy Park, New Mexico. For AltaGas, E & E conducted feasibility study and provided permitting support.

Campbell Hills Wind Farm, Casper, Wyoming. For Duke Energy Generation Services, E & E conducted a natural resources survey, a feasibility study, and a fatal flaw analysis for the permitting of a 12,000-acre proposed wind farm. E & E also performed avian cultural resources surveys.

Wind Farm Feasibility Study, Moore County, Texas. For BQ Energy, LLC, E & E conducted site characterization and feasibility study for permitting of new wind farm. We focused on identifying all potential natural resource issues that might pose significant regulatory or financial hurdles to facility construction or operation, including water resources, wildlife (particularly T/E species and bird and bat issues), and land use. E & E identified all applicable potential federal, state, and local requirements.

Geysers Wind Project, Lake/Sonoma Counties, California. For PPM Energy, Inc. (now Iberdrola Renewable Energies USA), E & E provided an environmental review and permitting assistance for 201-MW wind project proposed on 7,000 acres of federal land administered by the Bureau of Land Management (BLM). We determined that permitting process would require compliance with the National Environmental Policy Act (NEPA), Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), et al. E & E distributed one-year avian ‘baseline’ surveys using point count stations throughout the site. Raptor nest surveys combined helicopter observations and on-ground observations.

Invenergy Wind Energy Project, Northern California. For Invenergy, E & E conducted evaluation to identify critical issues and potential fatal flaws for this wind energy project. We wrote and submitted 17-page avian and bat critical issues analysis report for large project area. We conducted desktop review of project area and database review/literature research, in which E & E summarized occurrences for special-status wildlife species and evaluated general habitat conditions. We determined suitability of local environment to support species of interest, and contacted natural resources agencies for additional information and concerns. We conducted site reconnaissance survey, and prepared suggested protocol for additional studies and list of recommendations.

Kittitas Wind Project, Kittitas County, Washington. For EnXco, E & E addressed environmental permitting and compliance issues for proposed wind energy facilities. We evaluated all environmental issues, including bird and bat collisions with turbine structures, and disruption of wildlife habitat. We prepared draft wetland, stream, and fishery sections of environmental impact statement (EIS) to meet State Environmental Policy Act (SEPA) and NEPA requirements.

Montezuma Wind Plant, Solano County, California. For Solano County Department of Resource Management, E & E provided avian monitoring during project operation; application of avian mitigation bank credits; and final environmental report (ER) concerned impacts on golden eagles, avian habitat and other biological resources.

Padoma Wind Projects, California. For Padoma Wind Power, E & E provided a desktop critical issues analysis, including fatal flaw/critical issues and permitting feasibility analysis of California Environmental Quality Act (CEQA) impacts at three locations. We placed special emphasis on evaluating presence of avian and bat species and habitats, including migrants and notable flyway residents, and those species afforded special protection under MBTA, Bald and Golden Eagle Protection

Act, and ESA. We reviewed local avian data (e.g. Christmas bird counts and breeding bird surveys) to assess proximity of site to major avian migration pathways, important bird areas, known nesting and roosting sites, and presence of bat hibernacula and known migration areas.

PdV Wind Energy ER, Kern County, California. For Kern County Planning Department/EnXco, E & E prepared ER for proposed 300-MW wind energy plant in Kern County, within Tehachapi Wind Resource Area—planned installation of 100 to 300 wind turbines and associated facilities on 5,820 acres of private land owned by 45 landowners. The Draft ER identified potential impacts on avian and bat species due to potential collisions with turbines or other structures.

Shiloh I, Third-Party CEQA ER, Solano County, California. For Solano County Department of Resource Management, E & E prepared ER under CEQA process for 180-MW wind-generation facility within Montezuma Hills Wind Resource Area, Solano County—evaluated potential environmental impacts associated with construction of up to 120 wind turbines and associated facilities. We addressed public concerns involving impacts on migrating birds/waterfowl and the recreational quality of the Suisun Marsh. We addressed potential bird and bat mortality resulting from passage of migrating avian species through the operating turbines, and potential impacts on waterfowl using the adjacent marsh. E & E developed mitigation measures including setbacks from sensitive features, the establishment of compensatory mitigation funds, and monitoring of bird and bat mortality.

Shiloh II Wind Farm, Solano County, California. For Solano County Department of Resource Management, E & E prepared third-party ER addressing construction and operation of 176-MW wind energy plant adjacent to the Shiloh I facility in the Collinsville-Montezuma Hills Wind Resource Area. Issues addressed ER include avian and bat mortality and impacts on wildlife and wildlife habitat, including nearby marsh areas utilized by numerous avian species.

Windy Flats Wind Farm, Klickitat County, Washington. For Windy Point Partners, E & E conducted ER for proposed 250-MW wind energy facility to be located on shore of Columbia River for this controversial project due to potential avian impacts. We provided key guidance for coordination of habitat and avian field studies, directed development of permit applications, and ensured effective coordination with state/local agencies. We provided technical support/expert testimony during appeals of environmental permits, and assisted in negotiating mitigation requirements with WA Department of Fish and Wildlife.

Avian Meta-Study and Coordination for Proposed Plum Island Wind Park, Long Island, New York. For Winergy, E & E prepared literature review of offshore bird studies and analysis of potential survey methods for near-shore project; prepared work plan for pre-construction bird and bat studies; and attended site visit to assist with agency visits and permit coordination.

Avian Review Studies for Nine Mile Point Wind Turbine Project, New York. For Constellation Power, Inc., E & E reviewed existing data on avian mortality associated with wind turbines to identify potential impacts. We assisted with completion of State Environmental Quality Review Act (SEQR) permitting forms, and attended public hearings to help client address issue of impacts on birds and bats resulting from proposed projects.

Avian Surveys, Tonawanda, New York. For Lew Staley Associates, E & E performed avian surveys for potential two- to four-turbine wind project at industrial facility.

Avian Surveys for Potential Wind Farm, New York. For AES Somerset, E & E conducted year-round avian surveys, including extensive migratory raptor surveys, to initiate environmental permitting process for proposed 100-MW wind power facility. We prepared baseline report describing occurrence/distribution of birds in proposed project area and avian use of project area during migratory, breeding, and winter seasons.

Attachment B

RESUMES OF KEY PERSONNEL

EDUCATION

J.D., State University of New
York at Buffalo

B.S., Education, Syracuse
University

An experienced program and project manager specializing in regulatory compliance and permitting, Mr. Forti has 25 years' experience. He specializes in energy project permit acquisition and the review and analysis of federal and state environmental legislation to guide project development and regulatory compliance. He identifies permitting requirements, develops permitting strategies, consults with regulatory agencies, and negotiates permit conditions. He also tracks and interprets federal and state regulatory and legal developments affecting the energy industry.

Wind Energy Experience

Noble Wind Projects, New York and Texas. For Noble Environmental Power, LLC, Mr. Forti is E & E's project manager for 10 wind power projects being developed in New York State, plus two projects in Texas. All of the New York projects require acquisition of wetland and stream disturbance permits from USACE and the New York State Department of Environmental Conservation (NYSDEC), as well as wind energy conversion system permits from the local municipalities. Each project also requires preparation of an EIS. Mr. Forti has directed the performance of avian risk assessments, visual impact studies, noise modeling and studies, and Phase 1 archeological surveys in support of the EISs. Three of the projects are operating and four more are currently under construction.

Steel Winds Waterfront Wind Farm, Lackawanna, New York. For BQ Energy, Mr. Forti managed E & E's investigation of the feasibility of developing a wind energy facility on a site located along the shore of Lake Erie, just south of Buffalo Harbor. The project included an avian risk assessment to address potential project impacts on birds and other avian species, a visual impact assessment that included development of computer-generated visual simulations of preferred alternatives from several vantage points, and a noise assessment. Phase 1 of the project is operating and E & E recently completed the environmental studies for Phase II. For BQ Energy, Mr. Forti also had a key role in E & E's feasibility evaluation for an offshore wind park in Lake Erie.

Ripley-Westfield Wind Farm, Chautauqua, New York. For Babcock and Brown (now Pattern Renewables), Mr. Forti is E & E's program manager for a 200+-MW wind project that is scheduled to be constructed in 2010. He is directing the environmental studies, preparation of the EIS, and development of NYSDEC and USACE wetland permit applications.

Airtricity Wind Projects, New York State. Mr. Forti has directed several wind projects currently under development by Airtricity. He provided QA for E & E's preliminary siting studies, fatal flaw analyses, wetland delineations, avian risk assessments, and permit preparation.

Arcadia/Bluewater Wind Project, Atlantic Ocean off South Shore of Long Island, New York. Mr. Forti managed E & E's provision of assistance to Arcadia/Bluewater Wind (the primary project developer) in its preparation of a proposal to be submitted to LIPA for a 100- to 140-MW offshore wind farm. His team supported the selection of preliminary turbine site locations and cable routing, designed a program to assess project environmental impacts, and developed a permitting strategy and

Joseph Forti, J.D. (Cont.)

planning document. The planning document included a project timeline for the permitting process, as well as an outline of the major elements of an effective public education and public participation process.

York Wind Power Project, Chautauqua County, New York. Working with the project developer, he had a key role in the preparation of a New York State Energy Research and Development Authority (NYSERDA) development proposal for a grant to subsidize the energy production for the Chautauqua Windpower Project. He also helped develop the project permitting strategy and supported the project's regulatory components.

General Motors Wind Project, Tonawanda New York. Mr. Forti worked with General Motors to develop a wind-/landfill gas-powered facility to eliminate power outages at the Tonawanda Powertrain production facility. Working with the plant's environmental manager, he designed a project feasibility study and was responsible for preparing the application for a NYSERDA grant to provide part of the project financing.

Wind Energy Projects, Kansas and Missouri. For a major wind energy developer, Mr. Forti is overseeing work at eight project sites in various stages of development. At one site, he is directing the preparation of a habitat conservation plan that addresses potential project impacts on Indiana bats, an endangered species protected under the Endangered Species Act.

MTC Wind Studies, Massachusetts. Under a contract with the Massachusetts Technology Collaborative (MTC), E & E and KEMA, its consulting partner, to support community wind development statewide, Mr. Forti led E & E's provision of comprehensive services to help local communities study, plan, and develop small to mid-size wind projects. E & E's primary tasks included the preparation of feasibility studies, EIAs, and permit applications, as well as public outreach.

EDUCATION

B.S., Natural Resources,
Cornell University

A.A.S., Aquaculture/Aquatic
Science, State
University of New York
College of Agriculture
and Technology at
Morrisville

A.A.S., Natural Resources
Conservation, State
University of New York
College of Agriculture
and Technology at
Morrisville

Ms. Gardner has nine years' experience, specializing in energy project environmental permitting; the performance of biological surveys including wetland, stream, and terrestrial investigations; and development of wetland and stream mitigation projects. She develops permitting strategies, permit applications, and EISs and EAs and conducts wetland delineations, habitat evaluations, threatened and endangered species surveys, floristic surveys and environmental regulatory compliance evaluations. Her fieldwork includes the sampling of biota, sediment, surface water, soil, and groundwater, as well as the monitoring of subcontractor activities to ensure timeliness, cost-effectiveness, and compliance with applicable regulations and permits. She also participates in sample field screening activities and has performed ambient air and health and safety monitoring during site investigation and cleanup operations.

Ms. Gardner specializes in the development and permitting of wind energy facility projects. Over the last 3 years, she has been involved with over 20 different wind energy facility projects within the Northeast and Midwest. Ms. Gardner was E & E's primary point of contact with Noble Environmental Power, LLC (Noble), one of the largest wind energy companies in the Northeast. Noble developed and

constructed 4 windparks in northern NY state in 3 years in which Ms. Gardner worked closely with Noble to develop specific project schedules and permitting strategies. She worked closely with Noble to develop a siting strategy that integrated constraints associated with wetland and stream resources, other natural resources, residential and agricultural land use, landowner requirements, and town code and setback requirements to minimize and avoid impacts to have each project permitted (environmentally) for construction within 18 months. She also coordinated with USFWS, NYSDEC, and USACE to ensure that each agency's concerns related to threatened and endangered (T/E) species, wetlands, and bodies of water were addressed. She provided T/E species consultation, attended pre-application meetings to introduce the project and address potential agency concerns, provided post-application site reviews, and designed the wetland mitigation sites and EIS scopes. Ms. Gardner also directed the completion of all environmental studies, provided overall team technical management; and oversaw preparation of the draft EIS (DEIS) and other documents required under the New York State Environmental Quality Review Act (SEQR).

For a variety of other wind energy facility projects, she assisted in the early stages of project development by helping to evaluate project alternatives and identify a preferred alternative, selecting optimal turbine locations, supporting public outreach, and developing a permitting strategy and schedule. The environmental studies include constraints mapping and analysis, wetland delineations, noise impact analysis, visual impact analysis, historical and cultural resources, communications, and biological and water resource investigations. For one of the projects, Ms. Gardner coordinated an engineering effort to develop a preliminary project component layout.

EDUCATION

M.S., Civil Engineering,
State University of New
York at Buffalo

B.S., Civil/Environmental
Engineering, Clarkson
University

CERTIFICATIONS

Licensed Professional
Engineer, State of New
York

Mr. Morgante combines his training and understanding of civil engineering with the various avian field studies and avian risk assessments in the process of developing and evaluating a wide-variety of projects. Mr. Morgante has coordinated and provided expert ornithological support for E & E's avian field studies, avian risk assessments, and related environmental studies throughout North America for 11 of his 15 years at E & E.

Since 2002, he has been involved with avian and bat studies and the evaluation of potential impacts to bird and bat populations at approximately 40 proposed and existing wind projects in the United States. Mr. Morgante has prepared the avian studies scopes of work and field protocol for numerous bird surveys; led and participated in the various surveys for raptors, threatened and endangered species, migratory birds, and breeding birds; coordinated the activities of nocturnal radar studies, prepared avian risk assessments, developed protocols for and implemented avian and bat mortality studies, and

made numerous presentations at meetings with government authorities, regulatory agencies, and the general public. Beyond avian and bat studies, Mr. Morgante has also managed the preparation of several environmental impact statements for proposed wind projects in the Northeastern US.

An avid and lifelong birder, he is an active member of several state and local organizations, including the Buffalo Ornithological Society (BOS) and the New York State Ornithological Association (NYSOA), and is well known and respected by both NYSDEC and local birding experts. Since March 2000, he has been the Region 1 (Niagara Frontier) editor of NYSOA's quarterly journal, The Kingbird, responsible for summarizing regional bird sightings and avian occurrence, distribution, and trends. Since 2002, he has served in a leadership capacity as Vice President (2006-present), BOS council member (2002-2005), and Council President (2005). He was elected as Statistician in 2007 and reviews all avian field sighting data, coordinates with the New York State record committee, summarizes the noteworthy records in a monthly publication, and maintains the database of historical sightings. He was previously the BOS compiler of avian records (1996 to 2002) which involved similar tasks. He twice chaired a BOS committee that produced the seventh and eight editions of the verification date guide for species in western New York and southern Ontario. He also served on a BOS committee that researched over 40 years of records and prepared a seasonal distribution checklist for species occurring in western New York in 2003.

EDUCATION

M.S., Natural Resource
Science, West Virginia
University

B.S., Environmental/Forest
Biology, magna cum
laude, State University
of New York College of
Environmental Science
and Forestry at
Syracuse

With 17 years' experience, Mr. Meegan provides permitting assistance and conducts fieldwork analysis and mitigation and conservation measures to support EAs and EISs being prepared for development projects involving energy facilities in accordance with NEPA and applicable state regulations. His project work often involves avian field studies. To support E & E projects for government agencies and the private sector, he also conducts endangered species surveys and environmental regulatory compliance evaluations.

Mr. Meegan has managed the preparation of several environmental permitting and public outreach programs for proposed wind projects in the Northeastern US, including Plum Island Wind Project, Long Island, New York, for which Mr. Meegan provided permitting assistance to Winergy Power, LLC, (now Deepwater Wind, LLC) for the development of this offshore wind park. He wrote a revised

project description and prepared a scoping document under the State Environmental Quality Review Act (SEQR), based on input from agencies, ocean wind power ecological and baseline studies of the New Jersey Department of Environmental Protection, and the *Final Programmatic Environmental Impact Statement for the Outer Continental Shelf Alternative Energy and Alternate Use Program* that had been prepared by Minerals Management Service. To support Winergy Power in its development of proposal documents for a New Jersey offshore wind renewable energy facility solicitation, he determined baseline conditions for two locations off of the New Jersey shoreline, summarized mitigation measures to minimize project impacts to key environmental factors, and developed a technical approach for the geophysical and geotechnical studies needed to design and permit the project.

Mr. Meegan also has been involved with avian and bat studies and the evaluation of potential impacts to bird and bat populations for energy industry and military installation projects, including NRG Energy's IGCC Plants in New York and Delaware. He provided ecological expertise as part of E & E's environmental permitting/public outreach projects supporting the expansion of two integrated gasification combined cycle (IGCC) coal-fired power plants. He reviewed environmental impacts associated with sensitive habitat, threatened and endangered species, fisheries, and avian issues; and he visited each site to complete a preliminary delineation of sensitive habitat. For the Southern Staten Island Unit Management Plans, in support of NYSDEC's mandate to develop UMPs for State-owned lands, Mr. Meegan conducted wetland/salt marsh natural resource inventories to quantify the land, wildlife, and water resources currently or potentially in use. He assessed migratory birds; established baseline conditions; and made recommendations for managing the marine and freshwater environments and acquiring the necessary permits within the UMP project area. For the Navy's Atlantic Division, Mr. Meegan managed E & E's waterfowl field investigations supporting the high-profile, controversial, supplemental EIS addressing the introduction of 162 Atlantic Fleet F/A-18 E/F aircraft to three East Coast military installations. He coordinated the development of a historic waterfowl database, summarized the results, and led a one-year overwintering study to document waterfowl distribution and movement in conjunction in the vicinity of proposed outlying landing fields with a Navy avian radar study. The work has required his completion of numerous interviews of agency staff and other waterfowl experts.

Appendix C – KEMA Standard Terms and Conditions

CONSULTING AGREEMENT

This AGREEMENT is made and entered into as of _____ 2009 (the "effective date") by and between KEMA, Inc., with a principal place of business at 67 South Bedford Street, Suite 201 E, Burlington, MA 01803 ("KEMA"), and _____ with a principal place of business at _____ ("Client").

WITNESSETH

WHEREAS, KEMA is engaged in the business of providing consulting services;

WHEREAS, Client and KEMA intend to set forth in this Agreement the terms and conditions under which KEMA shall make available, and Client shall obtain from KEMA, such services;

NOW, THEREFORE, in consideration of the promises, the mutual covenants and agreements herein contained, and other valuable consideration, the receipt, adequacy and sufficiency of which are hereby acknowledged, and in consideration of Client proceeding with this Agreement, the parties do hereby covenant and agree as follows:

1. SERVICES TO BE PERFORMED - TASK ORDERS

KEMA shall provide consulting services to Client as more specifically authorized in Task Orders to be attached to and made a part of this Agreement. Each Task Order shall be sequentially numbered and shall contain information such as:

- i). A description of the scope of work;
- ii). Period of performance of the Task Order;
- iii). Total dollar value of the Task Order;
- iv). Type of contract and payment terms including applicable rates;
- v). Client point of contact for the Task Order;
- vi). Any other terms and conditions applicable to that particular Task Order.

Each Task Order shall be dated and signed by both parties, and shall be governed by the terms of this Agreement. In the event of any conflict between the terms of this Agreement and the terms contained in any Task Order, the terms of the Task Order shall take precedence.

2. INDEPENDENT CONTRACTOR

KEMA shall at all times be deemed to be an independent contractor. Nothing contained in this Agreement shall be construed as creating the relation of employer and employee, agent or joint venturer between KEMA and Client. KEMA shall have the right in its sole discretion to determine which of its staff shall be assigned to perform services for Client under this Agreement, and shall have the sole right to re-assign or replace any staff person.

3. PERIOD OF PERFORMANCE

This Agreement shall have a period of performance commencing with the effective date as set forth above and continue in full force and effect until the later of i). one (1) year, or ii). until the completion of all Task Orders entered into in accordance with this Agreement, unless earlier terminated in accordance with Article 8. below. This period of performance may be extended by the mutual written agreement of the parties.

4. PAYMENT

The method of payment for services to be performed under this Agreement shall be specified on each Task Order. Unless otherwise set forth in the Task Order, KEMA shall submit invoices for each Task Order at the end of each month for services performed during that month. Client shall pay KEMA the undisputed portion of each invoice within thirty (30) days of receipt.

5. ASSIGNMENT

Neither party shall assign, transfer or otherwise delegate its obligations under this Agreement or any interest, or right or claim thereunder, nor subcontract any portion of the work to be performed, without the prior written consent of the other party, which consent shall not be unreasonably withheld.

6. STANDARDS OF PERFORMANCE

KEMA shall perform its services with care, skill and diligence in accordance with the applicable professional standards currently recognized by such profession, and shall be responsible for the professional quality and completeness of all deliverables or other items and services which may be required under this Agreement. Within sixty (60) days from the date of providing any service or item hereunder, should such service or item provided by KEMA be found to be defective by Client, Client shall identify the nature of such deficiency in writing and KEMA shall within thirty (30) days from the date of receipt of such notice attempt to correct, re-perform or replace the defective services or item.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES AND CONDITIONS EXPRESS OR IMPLIED INCLUDING, BUT NOT LIMITED TO, THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

7. CHANGES

Any changes in, modifications of, or amendments to this Agreement or any Task Order shall be in writing and signed by both parties.

8. TERMINATION

Either party shall have the right, with or without cause, to terminate this Agreement and/or any Task Order by providing the other party with thirty (30) days prior written notice. Unless such notice also provides for termination of all outstanding Task Orders, this Agreement shall remain in effect until final payment is received by KEMA for all work performed under any Task Orders issued hereunder.

Either party shall have the right to terminate this Agreement and/or any Task Order should the other party default in its obligations under this Agreement or any Task Order, and either fail to correct such default within ten (10) days after receipt of written notice specifying same, or, if the default is not curable within such time, fail to take the reasonable and necessary steps to begin to cure the default.

In full discharge of its obligations to KEMA with respect to this Agreement and/or any Task Order and any termination in accordance with this Article, Client shall pay an amount to KEMA which includes: i). payment in accordance with the payment terms of the Agreement and/or Task Order for services performed and items delivered up to the effective date of termination; and ii). costs and related overhead and profit for services and items in progress up to the date of termination; and iii). costs and related overhead incurred as a result of the termination. KEMA shall not be entitled to loss of anticipated profit under this provision.

9. CONFIDENTIALITY

During the term of this Agreement, either party (the "Disclosing Party") may disclose confidential information (the "Information"), to the other party (the "Receiving Party"). Information shall mean any information that is owned or controlled by Disclosing Party and not generally available to the public, including but not limited to performance, sales, financial, contractual and marketing information, and ideas, technical data and concepts. It also includes information of third parties in possession of Disclosing Party that Disclosing Party is obligated to maintain in confidence. Information may be in intangible form, such as unrecorded knowledge, ideas or concepts or information communicated orally or by visual observation, or may be embodied in tangible form, such as a document. The term "document" includes written memoranda, drawings, training materials, specifications, notebook entries, photographs, graphic representations, firmware, computer information or software, information communicated by other electronic or magnetic media, or models. All such Information disclosed in written or tangible form shall be marked in a prominent location to indicate that it is the confidential information of the Disclosing Party. Information which is disclosed verbally or visually shall be followed within ten (10) days by a written description of the Information disclosed and sent to the Receiving Party at the address and in accordance with the terms established in Article 19.

The Receiving Party shall hold the Disclosing Party's Information in confidence and shall take all reasonable steps to prevent any unauthorized possession, use, copying, transfer or disclosure of such Information. The Receiving Party shall give such Information at least such protection as the Receiving Party gives its own information and data of the same general type, but in no event less than reasonable protection. The Receiving Party shall not use or make copies of the Disclosing Party's Information for

any purpose other than as contemplated by the terms of this Agreement and/or Task Order. The Receiving Party shall not disclose the Disclosing Party's Information to any person other than those of the Receiving Party's employees, agents, consultants, contractors and subcontractors who have a need to know in connection with this Agreement. The Receiving Party shall, by written agreement, require each person to whom, or entity to which, it discloses the Disclosing Party's Information to give such Information at least such protection as the Receiving Party itself is required to give such Information under this Agreement. The Receiving Party's confidentiality obligations hereunder shall not apply to any portion of the Disclosing Party's Information which:

- (a) has become a matter of public knowledge other than through an act or omission of the Receiving Party;
- (b) has been made known to the Receiving Party by a third party in accordance with such third party's legal rights without any restriction on disclosure;
- (c) was in the possession of the Receiving Party prior to the disclosure of such Information by the Disclosing Party and was not acquired directly or indirectly from the other party or any person or entity in a relationship of trust and confidence with the other party with respect to such Information;
- (d) the Receiving Party is required by law to disclose; or
- (e) has been independently developed by the Receiving Party from information not defined as "Information" in this Agreement.

The Receiving Party shall return the Disclosing Party's Information (including all copies thereof) to the Disclosing Party promptly upon the earliest of any termination of this Agreement or the Disclosing Party's written request. Notwithstanding the foregoing, the Receiving Party may retain one copy of such Information solely for archival purposes, subject to the confidentiality provisions of this Agreement.

This Agreement shall not be deemed to grant any rights with respect to either party's Information other than those expressly set forth herein and shall not be deemed to grant any license whatsoever with respect to any patents, inventions, copyrights, trademarks or trade secrets contained in such Information.

This Article shall survive the termination of this Agreement and continue to apply to all Information exchanged by the parties during the period of performance of this Agreement.

10. INDEMNIFICATION

KEMA hereby agrees to indemnify Client from third party claims for damages for bodily injury or death of any person or damage to or destruction of tangible property, to the extent directly resulting from the negligent acts or omissions of KEMA in the performance of the work covered by this Agreement, provided, however, that KEMA shall not be obligated to indemnify Client for the portion of any such claims, liabilities, obligations, damages or causes of action which are the result of the negligent acts or omissions of Client.

Client hereby agrees to indemnify KEMA from third party claims for damages for bodily injury or death of any person or damage to or destruction of tangible property, to the extent directly resulting from the negligent acts or omissions of Client in connection with the performance of the work covered by this Agreement, provided, however, that Client shall not be obligated to indemnify KEMA for the portion of any such claims, liabilities, obligations, damages or causes of action which are the result of the negligent acts or omissions of KEMA.

11. LIMITATION OF LIABILITY

The liability of KEMA for any claim whatsoever related to this Agreement, including any cause of action sounding in contract, tort or strict liability, and including any obligations to indemnify Client as set forth in Article 10 above, shall not exceed the total amount of payments previously made to KEMA hereunder. In no event shall either party be liable to the other for any consequential, exemplary, special, incidental or punitive damages including, without limitation, lost profits, even if such damages are foreseeable or the damaged party has been advised of the possibility of such damages and regardless of whether any such damages are deemed to result from the failure or inadequacy of any exclusive or other remedy.

12. RIGHTS IN DATA

The work product, and all right, title and interest thereto, (the "Data") developed, created, or produced by KEMA and required to be delivered to Client pursuant to this Agreement shall remain the property of KEMA and shall be provided to Client with a non-exclusive, internal use license upon the later of: (a) delivery of such Data to Client or, (b) receipt of full payment by KEMA for the Data. Client may use the Data for its internal business purposes only, and may not provide the Data to any third parties without first receiving KEMA's written consent. In addition, Client acknowledges and agrees that KEMA retains and may use the general knowledge acquired as a result of its creation of the Data or the performance of services hereunder for its general reference and enhancement of its technical capabilities and that KEMA retains unlimited rights in such general knowledge, which shall include the right to use in any manner and for any purpose. All information and material which is owned by KEMA and used by KEMA in the performance of this Agreement shall remain the exclusive property of KEMA whether or not such information or material was incorporated in, adapted for use in, or used to produce any Data delivered under this Agreement, unless otherwise specified in an individual Task Order.

13. NON-SOLICITATION

Both parties agree that during the period of performance of this Agreement, and for a period of one (1) year thereafter, that neither party will directly or indirectly solicit, direct or attempt to induce or induce any employee or sales representative of the other party to leave the employ of that party, except that either party may hire an employee of the other party who initiates contact with that party or who responds to a general advertisement for employment.

14. TAXES

KEMA's prices do not include any local, state or federal sales or use taxes. Should any such taxes be found to be applicable to this transaction, KEMA will invoice Client separately for these taxes, and Client will remit these taxes to KEMA, unless Client provides KEMA written evidence that Client is exempt from such taxes or that Client has remitted these taxes directly to the appropriate taxing authority.

15. EQUITABLE RELIEF

The parties hereto agree that irreparable damage would occur in the event that any of the provisions of this Agreement were not performed in accordance with their specific terms or were otherwise breached. Accordingly, it is agreed that the parties shall be entitled to an injunction or injunctions to prevent breaches of this Agreement and to enforce specifically the terms and provisions hereof in any court of the United States or any state having jurisdiction, this being in addition to any other remedy to which they are entitled at law or in equity.

16. ENTIRE AGREEMENT

This Agreement and all Task Orders issued hereunder contain the entire Agreement between the parties with respect to the matters covered herein. This Agreement cannot be modified except in writing signed by both parties.

17. SEVERABILITY

If any term or provision of this Agreement shall be found by a court of competent jurisdiction to be illegal or otherwise unenforceable, that finding shall not invalidate the whole of this Agreement, but only such term or provision shall be deemed modified to the extent necessary in the court's opinion to render such term or provision enforceable, and the rights and obligations of the parties shall be construed and enforced accordingly, preserving to the fullest permissible extent the intent and agreement of the parties herein set forth.

18. WAIVER

The failure of any party to insist upon strict adherence to any term of this Agreement on any occasion shall not be considered a waiver or deprive that party of the right thereafter to insist upon strict adherence to that term or any other term of this Agreement. To be in force and enforceable, any waiver must be in writing and must be signed by both parties.

19. NOTICES

All notices and other communications hereunder shall be in writing and shall be deemed to be given if delivered personally or by facsimile transmission, telexed or mailed by registered or certified mail (return receipt requested), postage prepaid, or deposited for overnight delivery with a reputable overnight delivery service, such as Federal Express, to the parties at the following addresses (or at such other address for the party as shall be specified by like notices; provided that notices of a change of address shall be effective only upon receipt thereof):

To KEMA

KEMA, Inc.
67 South Bedford Street, Suite 201 E
Burlington, MA 01803
Attn: Legal Department

To Client

20. APPLICABLE LAW

This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Massachusetts, exclusive of its conflict of law rules.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement by their duly authorized representatives as of the day and year indicated below.

KEMA, Inc.

Client Inc.

Signature: _____

Signature: _____

Name: _____
(Type or Print)

Name: _____
(Type or Print)

Title: _____

Title: _____

Date: _____

Date: _____

