Building a New Energy Future

Cuyahoga Regional Energy Development Task Force
Report to the Board of Commissioners of
Cuyahoga County, Ohio

Photo courtesy of Fletcher Miller, Green Energy Ohio

Recommendations for a Lake Erie Offshore Wind Energy Demonstration Project and Research Center

February 8, 2007

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The matters discussed in this report reflect the views of the Task Force as a whole and do not necessarily reflect the views of any individual member of the Task Force or the organizations they represent.

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Executive Summary

The acquisition and delivery of secure, affordable and clean energy is one of the biggest challenges of the 21st century. The Cuyahoga region must embrace the challenge to develop a clean energy strategy. By doing so, we will also make the community healthier and more prosperous. Northern Ohio possesses the natural resources, the workforce, tools and talent to make this happen.

Northern Ohio has a unique opportunity in this regard - to be a world leader both in the generation of power by harnessing winds from our greatest natural resource, Lake Erie, and as a Center of Excellence in wind research and development.

In August 2006, the Cuyahoga Regional Energy Development Task Force ("Task Force") began exploration of the legal, technical, environmental, and financial factors that affect the development of advanced energy in the Cuyahoga region. The Task Force focused initial efforts on the opportunity for offshore wind energy as an economic catalyst for two reasons. The first was due to previous interest in, and discussion of, wind energy in this area. The second was because of the opportunities provided by our unique location on the shores of windy and shallow Lake Erie. As many synergies exist between the off- and onshore wind industries, activities in the Cuyahoga region could serve advancements in both.

As a pioneer in offshore wind, the Cuyahoga region will be able to capture a large portion of the future economic potential in research and manufacturing for utility-class wind turbines – both for offshore and onshore application. Our vision is for the region to become the natural home for a wind energy cluster. This includes the growth of local businesses into and within the wind sector, expanded employment opportunities, and the attraction of wind-related businesses from outside our area.

The Task Force found that Cuyahoga County will prosper from supporting the City of Cleveland in its current onshore wind efforts, as well as from the accelerated development of offshore wind energy technologies, including offshore deployment of wind turbines for power generation and a related research center. At a minimum, policy changes should be made at all levels of government to encourage, and in some cases, require, the use of advanced energy. Creation of energy benchmarks and market incentives will have a direct impact on economic and social growth as well as environmental improvement.

There are significant financial, technical, legal, regulatory, and environmental assessment obstacles to developing a first-of-a-kind offshore wind energy generation and research center. These challenges, however, are far outweighed by the benefits of making the Cuyahoga region a world leader in this market.

In short, it will be difficult, but possible, and very much worth the risk.

The Task Force recommends that the County and private partners fund a feasibility study to be conducted by experienced professionals (sourced through an RFQ/RFP process) for an offshore wind energy demonstration project up to 20 megawatts in Lake Erie near downtown Cleveland and an affiliated research center for utility-scale wind technology.

If the feasibility study is approved, the Task Force will continue with its mission to investigate the regional economic development potential offered by other advanced energy technologies, such as energy efficiency, solar, biofuels, and fuel cells. The Task Force remains available to assist the work of the professionals performing the offshore wind feasibility study.

Though the final Task Force recommendation involves an offshore wind project of somewhere between 5 and 20 megawatts (MW) in size, the analysis in this report is based upon a 20 MW wind project, which, if implemented, would include:

- Approximately 8 -10 turbines at 2 MW each
- Generating enough energy on an annual basis equivalent to the electricity needs of over 6000 typical homes
- 100 meters hub height of each turbine
- At least 500 meters between turbine towers[i]
- Turbine installation at least 3 miles away from shoreline[ii]

The construction costs of offshore projects are generally twice that of onshore projects. Offshore logistics for ongoing maintenance are also more complex, requiring access to major port-based cranes and deep water facilities. Offshore wind has not been developed anywhere in the United States, though some saltwater offshore instances exist in Europe. Instead, most wind companies have developed installations onshore, where they are easier and cheaper to build and operate.

Nevertheless, the Task Force believes that an offshore wind facility in Lake Erie is worth pursuing by the County, in order to put in place a long-term economic development strategy for the region. The Task Force recommends that the County and other parties fund a more detailed feasibility study to:

- Ensure that there are no prohibitive obstacles to the development of an offshore wind demonstration project;
- Develop a community engagement strategy;
- Specify the parameters of the project;
- Conduct an environmental assessment of the project;
- Develop an implementation plan to engineer, finance, construct and operate the project center; understand the needs of the wind manufacturers, developers, and suppliers so as to scope the possibilities of local development and manufacturing;
- Identify any opportunities to improve wind technology through local research and development; and
- Scope the need and feasibility of a research center and options to finance its development.

To be sure, there are many challenges that must be overcome for the project to come to fruition. The consultant's feasibility study should go deeper than the initial investigations that the Task Force has performed, which have surfaced no "deal-breakers". This is to ensure that an offshore project of some specification can in fact be completed. Once feasibility is more definitively proven, completion of the project could take 3-6 more years, with perhaps as little as 12-18 months associated with construction. Many of these challenges will require time and resources to resolve in a collaborative and public process.

Synopses of Committee Reports

The Task Force formed five Committees to address and report issues of policy, legal and regulatory matters, site evaluation, technical development, and finance and economics. The following is a synopsis of the findings made by each of the Committees:

The Policy Committee recommended multi-level governmental policy reforms to encourage/require the use of renewable energy, including creation of a system to trade "credits" of renewable energy on the open market; supports updates to standards governing power project connection to the electrical grid, and financial incentives for clean energy projects.

The Legal and Regulatory Committee identified two primary legal issues that will determine the complexity of the project and its cost: environmental regulation and laws regulating the interconnection of the project to the existing electric grid; estimated regulatory and environmental approval to take one year after project design approval; suggested incentives for making development attractive to overcome regulatory hurdles; and proposed a research or pilot project.

The Site Evaluation Committee identified a list of factors for site evaluation and identified sites offshore from Cuyahoga County that meet and exceed wind speeds recommended for the project; recommended a 3-mile offshore development boundary; and recommended exploration of underwater obstructions, landmarks, fisheries, and a determination of submerged land leases and property ownership.

The Technical Development Committee recommended complete wind studies from several sources and a project scope created by an experienced design and engineering firm; placed feasibility and development into two categories: technical development of planning/installation and interconnection to the electric grid; recommended that multiple vendors evaluate wind resource and propose specific wind turbines with guarantees; and recommended consideration of a wind research center.

The Finance and Economics Committee identified factors to initially define the scope and size of the project as: 1) the number and size of turbines and 2) their exact location; developed a list of questions to be answered thereafter to further assess costs, including the economics of research and testing facilities; concluded that half or more than half of overall costs will come from non-private sector, including, but not limited to: low-interest debt, grants, local public sector, local philanthropic organizations, corporate partners/participants.

Background and Introduction

The Cuyahoga region has untapped potential for environmentally friendly economic development. Adoption of an advanced energy strategy for this region would create energy from renewable and other cleaner energy sources such as wind, solar, fuel cells, low-impact hydropower, geothermal and biomass energy, co-generation heat and power, and/or clean coal. In light of current concerns about limited fossil fuel and global climate change, such a strategy would produce electricity with limited environmental impact. It would also bring the possibility of economic and urban renewal, as well as an influx of new jobs and talent to this area. The Cuyahoga region is in a prime position to take part in the design, development, and manufacturing of these new technologies by creating a localized economic cluster for advanced energy research and manufacturing.

Several key research institutions have diligently examined the ability of the renewable energy industry to promote energy independence and economic development in the United States. A September 2004 report by the Renewable Energy Policy Project specifically identified Cuyahoga County as a region that could substantially benefit from further exploration of the economic opportunities presented by the wind industry[iii].

In August 2006, the Cuyahoga Regional Energy Development Task Force ("Task Force") was formed to explore the legal, technical, environmental, and financial aspects of developing advanced energy sources in Cuyahoga County and to make recommendations to the County Commissioners. Prosecutor Bill Mason, attorney and legal counsel to the Board of Commissioners, was asked to serve as chairman of the Task Force. Comprised of local expertise in both the public and private sectors, the Task Force's primary objective is to perform a preliminary analysis of issues and factors affecting utilization of clean energy for the simultaneous objectives of economic development and growth, environmental improvement, and civic revitalization.

The Mission Statement of the Task Force is as follows:

> *"The Cuyahoga Regional Energy Development Task Force is to propose to the Commissioners and community a plan that will establish advanced energy as a critical component of the Region's energy portfolio and economic development profile designed to promote the Region's prosperity, health, welfare, and safety.*
>
> *This Mission shall include, but not be limited to, investigating and seeking to implement, where appropriate, advanced energy projects relating to energy supply such as renewable wind power and solar power, production of bio-fuels, such as ethanol, from bio mass materials or agricultural products, co-generation of electricity from surplus heat or steam from industrial facilities or other utilities, supporting the State of Ohio's Third Frontier Program related to fuel cells and projects relating to energy demand such as energy conservation and energy efficiency projects."*

This report details the major findings and recommendations of the Task Force in its first six months of work, during which it has focused on offshore wind opportunities.

This report discusses issues of policy, legal and regulatory matters, site evaluation, technical development, and finance and economics as identified by the specific Task Force Committees. The key recommendations as determined by the Task Force Committees are highlighted in the Executive Summary, with further analysis and recommendations outlined in the body of this report. The Committee findings were based on expertise of Task Force members, research, and meetings/discussions with vendors and industry experts.

Conclusions and Recommendations

The Cuyahoga region is now at a crossroads for energy and economic development. We can continue to rely upon fossil fuels and power generated outside the region, or we can create new wealth, energy security, and environmental benefits by pursuing a clean energy strategy that develops the world's first freshwater wind facility in Lake Erie. The future market for offshore wind is substantial now, and potentially enormous in the future. While most wind development in the next several years will likely be onshore, eventually the best and cheapest onshore wind sites will be developed, leaving the vast expanses of water surfaces with steady and strong winds to be tapped.

The U.S. Department of Energy is planning for a future in which 20% of our country's electricity supply is provided by wind energy. While there is ample land for much of this wind capacity, most of it is not located near where the electricity is needed, and transmission capacity to ship the power is scarce and difficult and/or expensive to expand. Transmission is not a problem for most of the Great Lakes, which sit in the middle of or near several of North America's largest metropolitan regions, including Cleveland, Detroit, Chicago, Toronto, Milwaukee, Buffalo, and Toledo.

Initial studies of Lake Erie's offshore wind potential show that up to 40 percent of Ohio's waters are viable for wind energy development.[iv] Eventually, the U.S. and the world wind market will look offshore to supply ever-increasing amounts of renewable energy. Given that each megawatt installed represents well over $1 million in capital investment, the offshore wind market will reach hundreds of billions of dollars within the relevant planning horizon for any long-term economic development approach.

The question is not *if* but *when*. Geographic areas that tackle the challenges of the offshore wind market first will be in the best position to own a significant portion of the research and development, and manufacturing activity to supply this emerging market. Consider the current position of Houston and New Orleans, which dominate the expertise, technologies and manufacturing to support the offshore oil and gas production industry worldwide. These cities were proximate to the first area that substantively undertook offshore oil and gas production in the Gulf of Mexico. This is what the Task Force envisions for Cleveland with respect to offshore wind.

There is, therefore, an opportunity to act upon what preliminary wind data analysis already shows: that offshore wind projects in the Great Lakes are viable. Not far out onto Lake Erie, the wind resource is substantial: high average wind speeds and steady winds. This is a prime environment for wind turbines to constantly operate and produce electricity. As technologies associated with offshore installation are optimized over time with further applications and refinements, the full economic potential of offshore wind energy can be achieved, and may eventually compare favorably with onshore wind economics.

A wind pilot and research project in Lake Erie would also bolster the Cuyahoga region's emerging reputation for embracing economic development through clean energy. The marketing and tourism benefits already generated by the Great Lakes Science Center wind turbine could grow exponentially with the development of the world's first freshwater wind farm right off our shores. Much like Seattle has the Space Needle and St. Louis has the Gateway Arch, Cleveland could have its own iconic structure: wind turbines in an aesthetically pleasing configuration in Lake Erie.

The main impact of moving forward with the proposed offshore wind project, however, is not for the relatively modest amounts of energy even a 20-megawatt installation would produce, nor is it for its visual impact on the region. Rather, it is for long-term economic development potential.

As mentioned, no freshwater offshore wind farms exist in the world. More importantly, the Task Force is aware of developer interest in an offshore Lake Erie wind farm. Meanwhile, the wind industry is known to seek additional platforms and facilities to develop the future generation of wind turbine technologies, including those specially designed for offshore application. For example, our neighbor to the west, the City of Toledo, recently submitted a proposal to the National Renewable Energy Laboratory to create a large-scale wind blade testing facility. This will be a natural complement to the in-water research center envisioned for the Cuyahoga region. We have the potential to become a hub for wind research, manufacturing and deployment activity, but only if the opportunity is seized in a timely manner. We must act now in order to stay in the lead for developing an offshore wind facility.

In addition, the Cuyahoga region has rich knowledge resources (including NASA Glenn, where most of the U.S. wind research program of the 1970's and 1980's was located), a prime location, and the enviable manufacturing capacity needed to create a vibrant hub for the wind industry. Through its exploratory process, the Task Force developed innovative public-private and multi-stakeholder partnerships harnessing community energy, talent, and resources. Further efforts would serve to reduce institutional and knowledge barriers, attract companies to our region, catalyze the growth of local businesses, and develop a technical cluster in a booming industry worldwide.

For all of these reasons, the Task Force recommends that the County first secure and commit funding to hire a qualified consultant who will be responsible for identifying and planning an offshore wind energy facility. The facility will include both a wind energy generating project of several turbines to produce 5-20 megawatts, as well as a research center for the development and monitoring of new technologies and designs optimized for the challenges of offshore application. The consultant's responsibilities will also include further identifying the community, legal, technical, environmental, financial, and economic issues involved in planning both the offshore facility and the research center.

To this end, the Task Force has drafted a Request for Qualifications for a Project Manager for the Lake Erie Offshore Wind Energy Demonstration Project and Research Center. This will be followed by a Request for Proposals (to be drafted by the Task Force) once qualified candidate firms have been identified and have submitted comments. The Project Manager will be responsible for ensuring the feasibility of the concept, refining the concept to a specific design, and developing a plan for the design. The manager's responsibilities will also include the financing, construction and operation of a facility that includes both a freshwater offshore wind research and development center, as well as a demonstration wind energy project of between 5 and 20 megawatts. It is envisioned that the feasibility study and implementation plan can be completed within a year by a consultant, or team of consultants, for a cost of well under $1 million.

Once the initial challenges have been overcome, it should dramatically streamline and speed-up the process for subsequent development of offshore wind projects in Lake Erie and the Great Lakes more broadly, as the trail will have been blazed. As the market for deployment of wind turbines offshore expands, so too will the need for increased manufacturing, which must be on a

deepwater port in order to haul the massive equipment. Cleveland is well-suited to being the supply hub for the Great Lakes wind industry that should emerge over time.

To synchronize its policies with the long-term direction of this economic development strategy based on offshore wind, the County should also implement an advanced energy portfolio standard that mandates the purchase of increasing percentages of its energy requirements from advanced energy sources.

Offshore wind, and wind more generally, is not the only economic development opportunity potentially available to the County. The advanced energy industry will be further emerging in the coming years. Correspondingly, through the ongoing work of the Task Force, the County should continue to maintain awareness of other clean energy options developing regionally and throughout the state. These include, but are not limited to: solar power, bio-fuels such as ethanol, electricity generated from surplus heat or steam, energy efficiency technologies such as LED lighting, and fuel cells.

Committee Reports

Policy Committee

Energy policy critically affects the economics of any new energy project. This is especially true for advanced energy technologies, such as renewable energy sources including wind, solar, or energy derived from biomass, or advanced energy sources such as clean coal and hydrogen powered fuel cells. In this report, the Committee refers to all these sources of energy as "advanced" energy.

This Committee finds that, without policy reform in Ohio, it is unlikely that wind power can be brought to Lake Erie or that other advanced energy strategies will be successful. States that have advanced energy portfolio standards and other policy reforms (explained below) are in a position to overcome the challenge of providing secure, affordable, and clean energy to our citizens and have taken steps to do so. States, such as Ohio, that have not made this policy reform have not implemented advanced energy opportunities, nor can they since policy reform is a necessary condition of such progress.

To this end, the Committee recommends certain policy changes at all levels of government to encourage or, in some cases, require the use of renewable energy. These recommendations include the creation of a system to trade "credits" of renewable energy on the open market, updates to standards governing power project connection to the grid, and governmental financial incentives for new clean energy projects. Creating the appropriate market incentives and energy benchmarks via local, statewide, and even federal policy will bear directly on the economic, environmental, and social impact of our efforts.

The Committee examined a wide range of issues relating to this topic before focusing upon state advanced energy portfolio standards (AEPS) and renewable energy portfolio (RPS) standards. Such portfolio standards require a certain percentage of a state or region's energy to derive from selected sources by a target date. In the case of an RPS, these sources are "renewable"— for the most part, wind, biomass or solar power. In an AEPS, sources may include "non-renewable" or fossil fuel sources such as coal or fuel cells powered by hydrogen from fossil fuel sources. Task Force research identified 23 US states and the District of Columbia as having an RPS or AEPS policies[v].

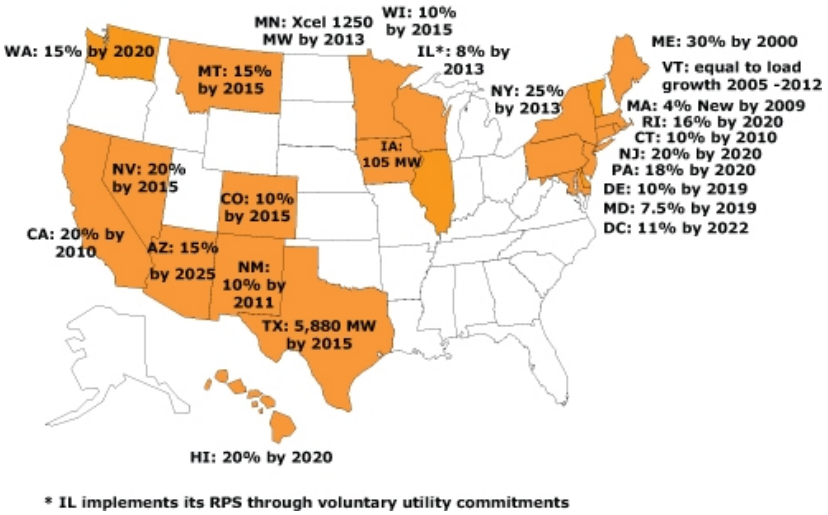

Figure 1: Pew Center on Global Climate Change Map of US State RPS and AEPS Activity

This Committee's work resulted in the recommendation that Ohio pursue an advanced energy portfolio standard similar to the model already implemented in Pennsylvania. In the Task Force's November 2006 recommendations to Ohio's governor-elect, "advanced" energy includes wind, solar, biomass, clean coal, fuel cells, and several other clean energy sources. A synopsis of the Pennsylvania model is available in the Appendix, along with a copy of the Board of County Commissioners' policy recommendations to Governor Strickland on this topic.

Advanced Energy Portfolio Standard (AEPS)

A state or county AEPS would obligate each retail seller of electricity to include in its resource portfolio a certain percentage of electricity from renewable energy resources such as wind, biomass or solar power. Usually an AEPS has a specific end date, however, it can also terminate when it is no longer needed to achieve the policy goal and once renewables have become competitive in the market.

The AEPS for Ohio should include the following:

Purpose: By the year 2015, the State of Ohio should be required to derive 10% of its electricity from advanced energy resources and by the year 2020, this be should be increased to 20%. By setting forth this goal, the AEPS will force retailers to purchase energy from clean sources. In turn, advanced energy will become a lasting competitive force in the marketplace.

Standards of 20% advanced energy by 2030 are currently being considered at the federal level. Adopting preemptive policies locally would facilitate federal compliance if and when national energy policy is legislated.

Objective: The AEPS promotes economic development, energy security and electric system reliability. This legislation will increase jobs, improve our environment, reduce reliance on depleting fossil fuels, strengthen our rural communities, and make Ohio a leader in advanced energy technology development and manufacturing. The steps set forth are important for addressing today's energy challenges, i.e., rising fuel costs and ever-increasing reliance on foreign imports to meet our energy needs.

Compliance: A generation or distribution company that fails to comply with the AEPS should be subject to an alternative compliance payment that will be recycled to programs promoting advanced energy programs in Ohio.

The electric distribution supplier or electric generation company should not be allowed to satisfy Ohio's advanced energy portfolio by utilizing an advanced energy source that has already been used to meet another state's portfolio requirements.

The AEPS should provide appropriate reporting mechanisms to verify compliance and impose penalties for non-compliance. If a retailer were to fail to comply, its operating license should be subject to being revoked and it should be required to pay a fine, $45.00 times the number of additional advanced energy credits needed in order to comply.

Advanced Energy Trading System

An Advanced Energy Trading System should be established so that qualified advanced energy generation or efficiency units can be traded in an open market. These units are known as "credits."

Energy credits are green electricity that is sold into the local electric grid where the advanced energy project is located. The credits are sold separately as a commodity in the market place.

One advanced energy credit should represent one-megawatt hour of qualified advanced electric generation, whether self-generated, purchased along with the electric commodity, or bought separately through tradable instruments. The credit should meet the requirements of the Public Utilities Commission of Ohio ("PUCO" or "the Commission") regulations and the program administrator.

The Commission should be responsible for establishing an advanced energy tradable credits program and approve an independent entity as needed, as well as for monitoring and determining compliance.

Interconnection Standards

Interconnection, net metering, and smart metering regulations consistent with PUCO's staff recommendations to the commission dated August 28, 2006, should be adopted.

Financial Incentives

Ohio should provide seed capital to assist the market in meeting the AEPS requirements, e.g., providing up to $250 million per year of tax-exempt bond financing for next generation energy projects. Grant programs should also be considered and links to existing programs should be strengthened.

County and Local Advanced Energy Portfolio Standards

The Committee has also researched future opportunities for county and local governments to foster the growth of advanced energy technologies. The County, other local and regional governments, as well as other significant consumers of electricity can adopt their own voluntary advanced portfolio standards. These standards do not impose advanced energy requirements on the citizens of these political subdivisions, but commit governmental operations to purchase a certain percentage of their energy needs from advanced sources. Adopting such a standard shows leadership and commitment regardless of action or not at the state or national level.

In evaluating such standards, the Committee looked at other counties and cities around the country that have adopted such standards. Before moving forward, however, more work needs to be done. The Committee needs to evaluate the availability and price of advanced energy in the market place prior to determining whether it is in the best interests of the County to adopt its own standard or to recommend standards to other governments in the region. A preliminary research memo from McMahon DeGulis LLP is included in the Appendix.

Legal and Regulatory Committee

Other offshore wind projects studied by the Task Force have been bogged down by community opposition and the need to secure regulatory approval. A Northeast Ohio project could be an opportunity to create a successful model for community and governmental engagement for utility-scale wind projects.

As policy lays the groundwork for a regional wind industry, legal and regulatory considerations will determine just how complex and costly the process will be for navigating permits, zoning, and other legal aspects of a wind project.

The Legal and Regulatory Committee identified two primary legal issues confronting a wind power project in Cuyahoga County: environmental regulation and laws determining interconnection of power projects to the community's electric grid.

The first and most important issue is securing environmental regulatory permits, which requires navigation of several agencies and layers of government. The environmental permitting associated with an offshore wind project is extensive, and represents a formidable barrier to entry for any commercial development of wind power on Lake Erie.

Permitting issues are as much a policy matter requiring interface with relevant agencies as they are strictly a matter of administrative law. The driving issue in the permitting process for both the Ohio Department of Natural Resources and the Army Corps of Engineers is addressing the avian and wildlife issues. Both agencies are responsive to their respective state or federal wildlife authorities, and have resisted wide-scale wind power projects without a thorough resolution that such projects will not have an adverse impact on wildlife. The Task Force recommends collaborating with key agencies to further discuss permitting issues, including submerged land leases held for portions of Lake Erie.

The Committee created a chart (see Appendix D) listing most of the regulatory players, permits needed, and a rough estimate of the timeframe for obtaining those permits. The key finding from this process is that regulatory approval is expected to take one year after a specific project is designed and proposed.

With respect to the interconnection issue, a project developer needs to be aware of the project's size to determine what regulations will apply. As the Task Force model project of 20 MW is below the Ohio Power Siting Board regulatory threshold, potential legal issues with grid interconnection are minimized.

Regulatory hurdles face any project on the Lake, and will take significant time and resources to overcome. By taking responsibility for permitting, the County could create an additional incentive to make development more attractive.

A research or pilot project that overcomes these hurdles can provide a valuable template for future commercial development. The Committee researched zoning legislation in Ohio, Pennsylvania, and elsewhere, and has examined the territorial scope of Ohio municipal authority with respect to Lake Erie. Zoning issues need to be further explored, and a community zoning and approval guide for wind development in Cuyahoga County would be a helpful tool to develop.

Site Evaluation Committee

With the City of Cleveland exploring onshore wind power options[vi], the Task Force Site Evaluation Committee chose to focus on wind energy possibilities offshore. The opportunity for Cleveland and the region to be positioned as a leader in offshore wind development can be captured by an appropriately sited research project. The Committee identified and evaluated offshore sites near downtown Cleveland for one or more wind turbine research projects.

Several sources of information were gathered and reviewed, including the State of Ohio Wind Map, Green Energy Ohio's Tall Towers Report, available land GIS data bases, nautical charts, Port Authority land lease coordinates, recreational boater uses, bird migratory pattern maps, and the AWS TruWind offshore wind report sponsored by The Cleveland Foundation. According to the Ohio Wind Map and subsequent offshore testing by Green Energy Ohio, areas of Lake Erie off the shores of Cuyahoga County meet and exceed the wind characteristics to support utility class wind turbines.

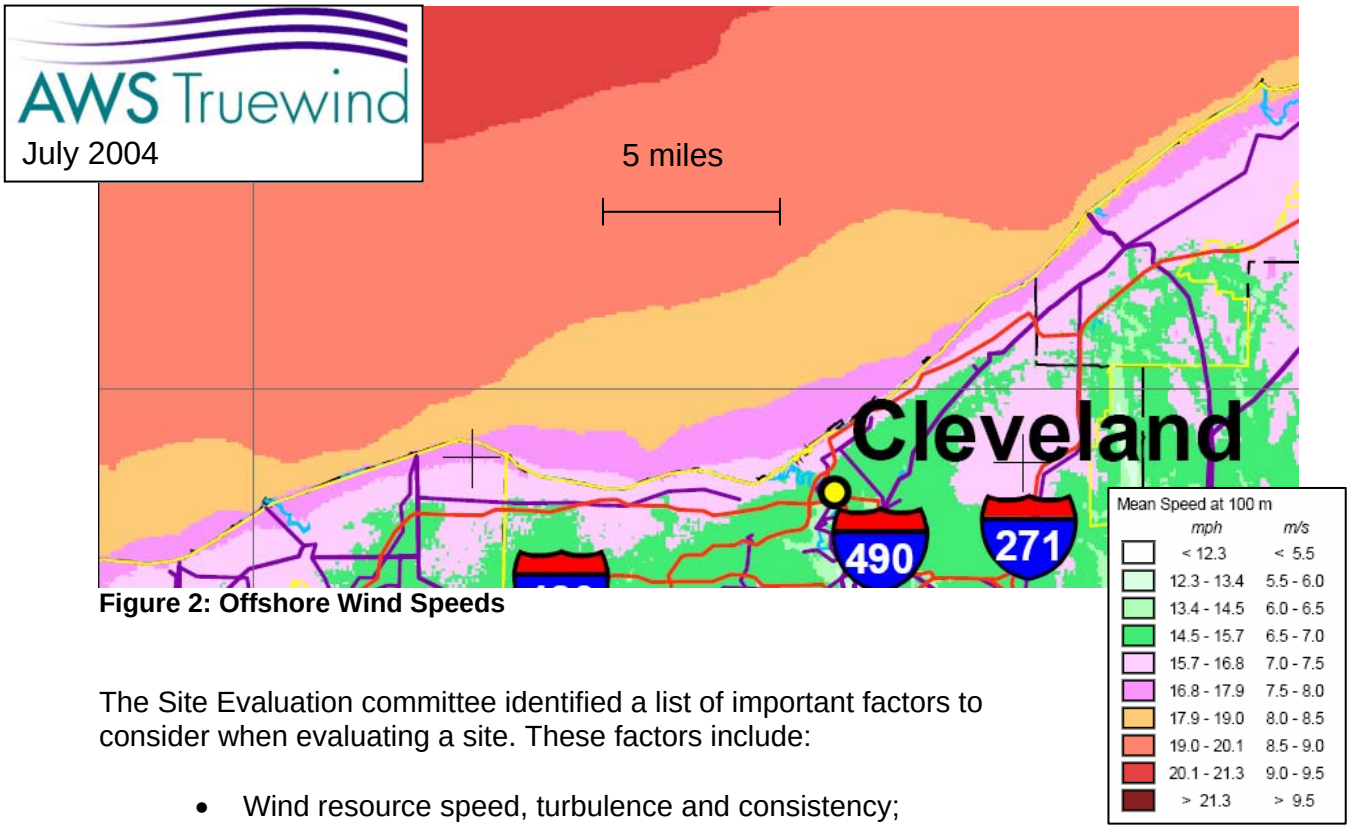

Figure 2: Offshore Wind Speeds

The Site Evaluation committee identified a list of important factors to consider when evaluating a site. These factors include:

- Wind resource speed, turbulence and consistency;
- Site access: road, rail and water, highway access, any specific bridge height concerns or other issues that may affect construction;
- Constraints such as site contamination and sub-surface geological concerns that may interfere with construction and maintenance;
- Soil and underground characteristics need to support a project foundation plus 400 tons of equipment:
- Distance to high-energy use areas (i.e. City of Cleveland). Site selectors should take care not to site the farm too far from load centers, as cabling costs increase with distance:

- Surrounding ecosystem and environmental effects development may have, including interference with bird migratory patterns:
- Nearest residential buildings, as an impediment to wind projects in the US is the "NIMBY," or "Not in My Back Yard" philosophy. Residents may object to having a turbine within their property's view:
- Interconnection: voltage, capacity, and distance from turbine site. Proximity of the project to distribution infrastructure appears to be vital in controlling the cost of the project:
- Possibilities for upgrades to the project by adding additional turbines or power capacity:
- Permitting restraints: permissions needed from the FAA, Ohio Department of Natural Resources, local building codes, zoning codes, and federal or state permitting required for the site:
- Public access to site, as there may be tourism benefits tied to a wind farm;
- Nautical constraints such as: shipping lanes, race courses, dumping grounds, historic land marks, shipwrecks, fishing zones, water depths and other nautical constraints: and
- Existing uses, leases or underground obstructions such as recreational uses, land leases, and mining exploration.

Offshore development in Lake Erie near Cleveland will present a unique set of parameters to consider. Regional wind models show strong potential in Lake Erie for utility-class turbines. Any project should incorporate at least a 3-mile offshore development boundary to avoid airport restrictions and migratory bird routes. It also should accommodate nautical obstructions such as shipping lanes and water intakes, and take into account aesthetics associated with turbine visibility from shore. Sites should be located in lake depths of 60 feet or less to facilitate foundation and construction.

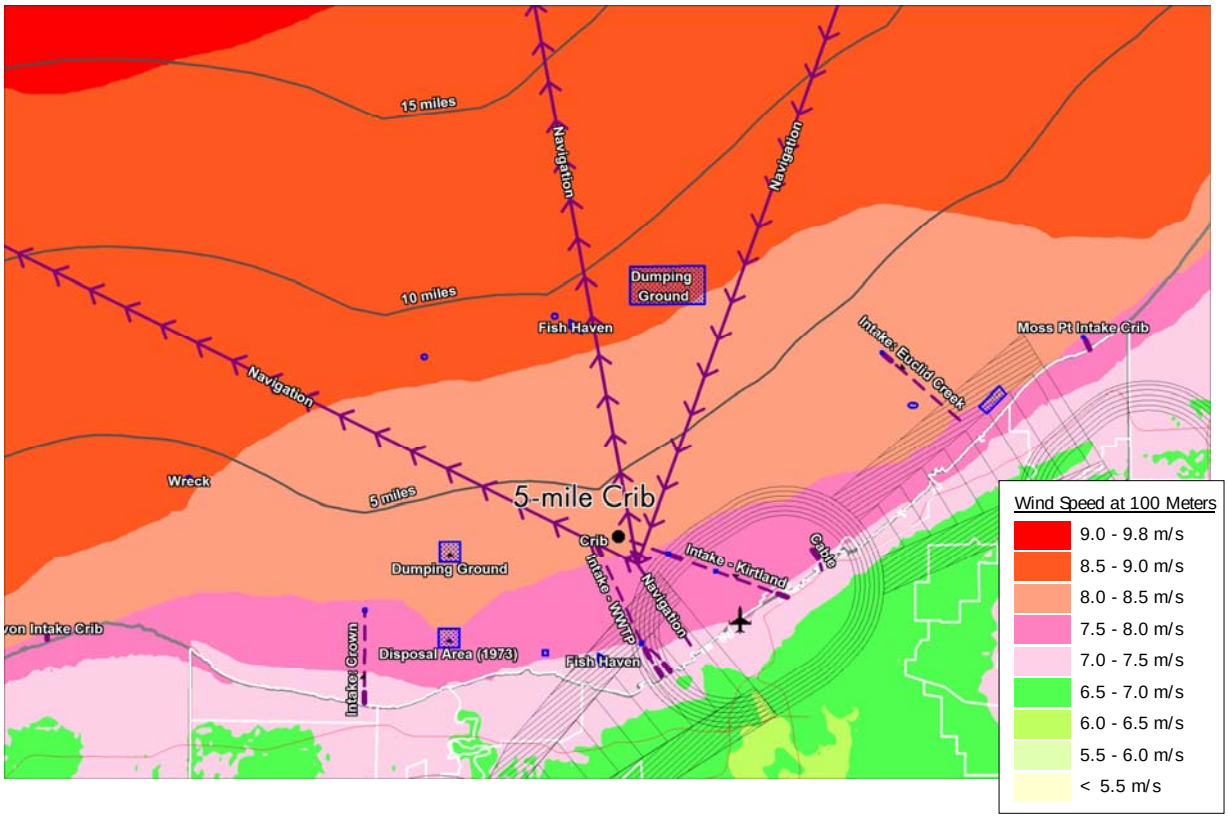

Figure 3: Off-shore Shipping Lanes and Nautical Obstructions & FAA constraints

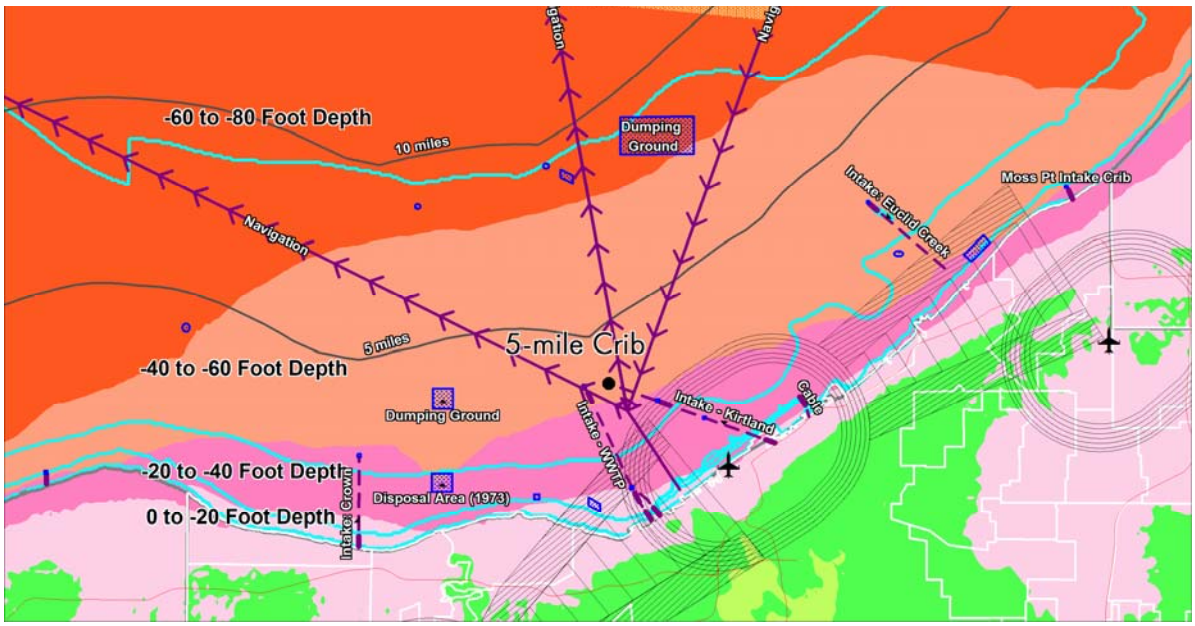

Figure 4: Lake Depth (75 ft. max in current study area)

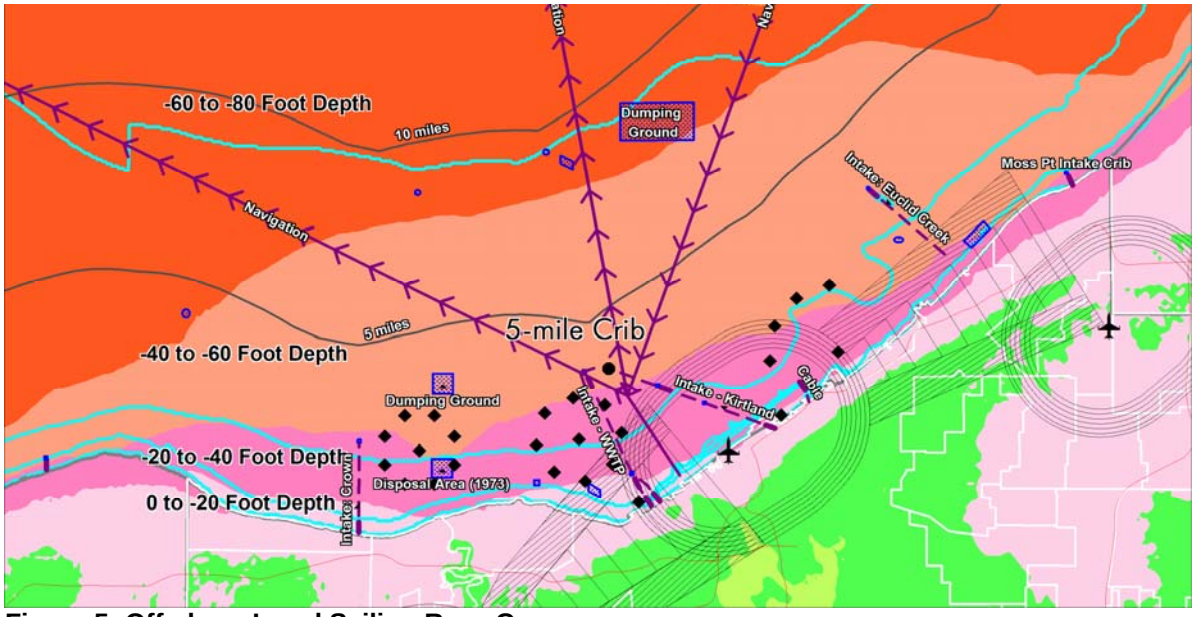

Figure 5: Off-shore Local Sailing Race Courses

Lake Erie is used for a variety of functions, from transportation to multiple recreation activities. Located of the project will be critical to minimize the effects of these additional obstructions.

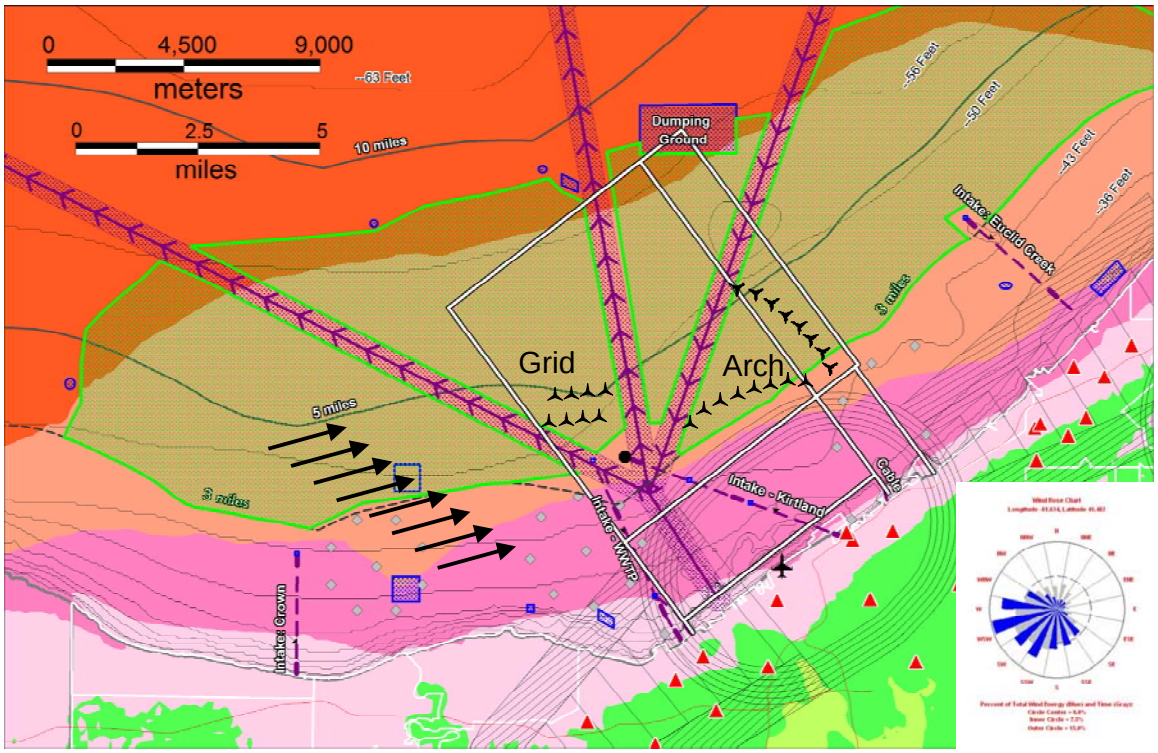

Figure 6: Potential Offshore Turbine Configurations

After studying offshore siting factors, the Committee identified zones for development reasonably close to Cleveland Public Power assets. Based on these zones, the Committee proposes potential turbine configurations off the shores of Cuyahoga County, taking advantage of the fact that winds generally blow from the southwest.

The turbines should be spaced 500-800 meters apart to avoid obstacles, maximize performance, and facilitate construction logistics. The turbine plans above are not set locations. Several key questions remain to be explored, such as identifying underwater obstructions, historically significant landmarks, avian and fishery concerns, and determining submerged land leases and property ownership.

In the course of its research, the Committee identified additional steps, educational tools, and studies that would be helpful in moving forward with on- or offshore wind projects:

- Preparation of a community engagement strategy to gather and address public comments and concerns;
- Preparation of a guide that identifies local wind potential by collecting additional wind data in Cuyahoga County;
- Further research into environmental and potential wildlife effects, similar to the University of Toledo's current avian study;
- Coordination with government agencies involved in siting issues, such as the Ohio Department of Natural Resources and the FAA;

- Establishment of zoning guidelines for wind development throughout Cuyahoga County, including standards for the development of wind projects that can be used by municipalities throughout the County.

The information evaluated has not uncovered any obstacle that prevent the development of an offshore wind project. The Committee recommends the County proceed with investigating the development of a wind research project off the shores of Cuyahoga County and Cleveland greater than 3 miles from shore and adjacent to current electric infrastructure. The Committee further recommends the County assist in the development of zoning guidelines and resources for communities in Cuyahoga County for the development of distributed on-shore wind projects.

Technical Development Committee

A Northeast Ohio offshore project will provide an opportunity for this region to contribute to the wind industry by answering technical questions around freshwater installation. Key questions to address in the course of exploring technical feasibility and development of an offshore wind project fall roughly into two main categories: technical planning and installation, and interconnection to the electric grid.

For the project to be viable, the Committee recommends having complete wind studies from several sources in place and a project scope established by an experienced design and engineering firm.

Technical Planning and Installation: Securing Financing, Supplies, and Expertise

Determining a target "cost of power" is critical to project design, and, as such, accurate wind studies are critical to developing payback and power production for a wind project.

The availability of suitable equipment and expertise is also critical to project viability. The Committee explored several possible suppliers for wind turbines, as well as several developers and sources of installation expertise. There are a limited number of experienced contractors in offshore construction of wind farms, and the Committee recommends that multiple vendors evaluate the wind resource and propose specific products with guarantees. The suppliers and developers listed in the tables below are not intended to be a comprehensive list of experts, suppliers, or parts needed, and no commitments exist with any of these firms:

Table 1: Major Wind Turbine Suppliers

Major Wind Turbine Suppliers	Offshore Models Available	Offshore Experience
Bonus/Siemens	Yes	230 MW installed
Clipper	To be contacted	
Enercon	In test phase	
Gamesa	None	
GE	Yes (prototype only)	35 MW installed
Mitsubishi	None	Will continue to focus on onshore
Suzlon	None	
Vestas	Yes	300 MW installed

Table 2: Major Wind Farm Developers

Major Wind Farm Developers	Offshore Experience & Interest
John Deere Credit/Suzlon/FPL (considering Long Island project, USA)	Not interested
Babcock and Brown	Recommend contact
BP	Have a pilot offshore project, but not interested in third party offshore
EnXco	Offshore development is an emphasis area for the company and it has expressed interest in our project
European developers, various	Not contacted
FPL	Offshore development in process in Long Island
Goldman Sachs (Horizon)	May be interested
Outland Renewable Energy	No offshore experience; not interested in offshore at this time
Second Wind	Not contacted
Shell	Have a pilot offshore project, but not interested in third party offshore

Offshore projects incur more costs than onshore projects, due to additional hauling of equipment into waterways, additional cabling, and special requirements for turbine foundations. Offshore construction logistics require access to port-based cranes and deep water facilities. Additional challenges arise during installation, operation, and maintenance. Turbine manufacturers are constantly upgrading models, therefore maintaining an adequate long-term supply of spare parts is critical. Maintenance offshore is more expensive than onshore. Because troubleshooting a cable to shore is difficult and costly, the Committee recommends evaluating the need for a backup power cable connection.

Typical warranties from turbine manufacturers are five years, while the typical lifetime of a turbine is in excess of 20 years. Plans for fifteen or more years out-of- warranty time period must be incorporated into the project cost and benefit analyses. Long-term maintenance contracts are recommended to minimize unexpected costs and downtime, and the Committee recommends receiving performance guarantees from the manufacturer and the installer. Decommissioning costs at the end of a turbine's useful life need to be evaluated.

A freshwater location such as Lake Erie brings into play technical issues associated with freshwater icing and ice flows, which have been minimally explored since all existing offshore projects are located in saltwater.

Interconnection to Grid: Market Demand and Feasibility

Project planners must determine whether or not connecting to the electric grid is physically possible. In the course of examining a potential wind site, planners need to determine if a market for the electricity exists, and locate a utility that will enter into a Power Purchase Agreement (PPA) to receive the electricity generated. The purchasing utility and wind farm developer and operator need to identify contingency plans for power in the case that the turbines over- or under-produce their estimated power output due to wind variation or technical difficulty.

The Committee recommends connecting a regional offshore wind power project via 34.5kV class cable. As mentioned, redundant cables may be required, as it would be highly adverse to project economics if the power generated by the wind was not able to be transmitted and sold onshore for an extended period of time due to cable failure. Final determination of the need for a redundant cable would be based on cost/benefit analyses.

Below is a sample schematic connecting ten turbines in a two-by-five configuration to a power substation[vii]:

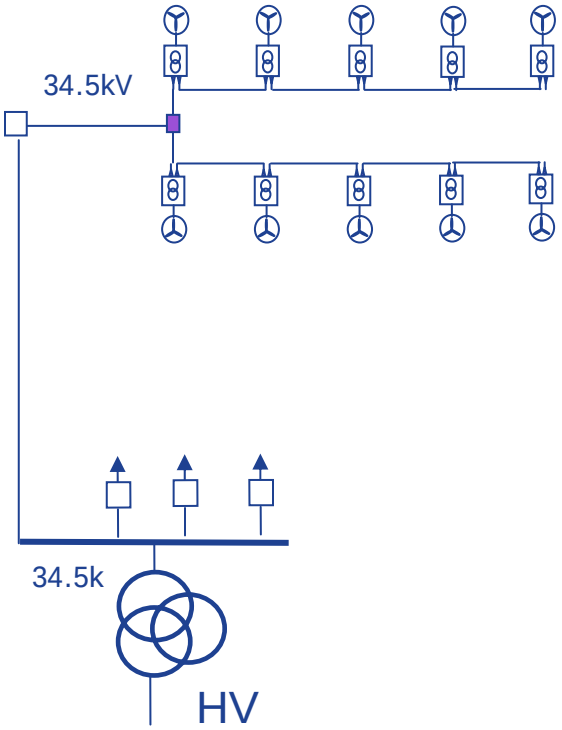

Figure 7: Possible Schematic for Wind Project Interconnect

Examples of Offshore Projects

A. European Offshore Project Examples: Tunø Knob and Horns Rev Wind Farms, Denmark

Offshore wind installations do not currently exist in North America, and a freshwater installation does not yet exist anywhere in the world. In order to identify key issues and lessons learned in offshore development, the Committee analyzed Elsam Essential Energy's experience with two projects. Elsam, an experienced builder and operator of on-shore wind farms, built their offshore development experience in a 1995 5 MW Tunø Knob pilot project before completing the Horns Rev installation in 2002. The Horns Rev farm comprises 80 wind turbines erected under real offshore conditions 14 to 20 kilometers out in the North Sea. It offers 160MW of power, 32 times the generating capacity of the Tunø Knob pilot project.

There is substantial investment in offshore wind turbine projects in Europe, and Horns Rev is one of several offshore projects around the world.

Table 3: Completed and Operational Offshore Projects Worldwide

Location	Country	Online	MW	Turbines	Rating
Vindeby	Denmark	1991	4.95	11	Bonus 450kW
Lely (Ijsselmeer)	Holland	1994	2	4	NedWind 500kW
Tunø Knob	Denmark	1995	5	10	Vestas 500kW
Dronten (Ijsselmeer)	Holland	1996	11.4	19	Nordtank 600kW
Gotland (Bockstigen)	Sweden	1997	2.5	5	Wind World 500kW
Blyth Offshore	UK	2000	3.8	2	Vestas 2MW
Middelgrunden, Copenhagen	Denmark	2001	40	20	Bonus 2MW
Uttgrunden, Kalmar Sound	Sweden	2001	10.5	7	GE Wind 1.5MW
Yttre Stengrund	Sweden	2001	10	5	NEG Micon NM72
Horns Rev	Denmark	2002	160	80	Vestas 2MW
Frederikshaven	Denmark	2003	10.6	4	2 Vestas 3MW,1 Bonus 2.3MW and 1 Nordex 2.3MW
Samsø	Denmark	2003	23	10	Bonus 2.3 MW
North Hoyle	UK	2003	60	30	Vestas 2MW
Nysted	Denmark	2004	158	72	Bonus 2.3MW
Arklow Bank	Ireland	2004	25.2	7	GE 3.6 MW
Scroby Sands	UK	2004	60	30	Vestas 2 MW
Totals			**587**	**316**	

Source: Wind Energy, Opportunities and Challenges for Offshore Applications, Virginia Tech

Besides wave, ice, and environmental issues, the size and siting of the Elsam Tunø Knob pilot required that a number of offshore-specific factors be examined in detail:

- Accessibility by boat and helicopter
- Waterborne design
- Erosion at turbine foundations
- Installation techniques
- Interaction between wind turbine and foundation
- Operation and service strategy
- Weather variations

The Horns Rev project took approximately 6 years from concept to commissioning. Installation and commissioning of the farm took a year to complete. Navigating legal and regulatory requirements and completing environmental assessments carried on for nearly the entire project period. The Horns Rev project was constructed on market terms without subsidies, though the power produced was sold on special terms. Policy incentives for the selling of the power included:

- *Guaranteed purchase price*: Elsam was guaranteed to obtain a selling price of DKK 0.33 per kWh for power produced during a fixed number of full-load hours, equivalent to approximately ten years of production. When the number of full-load hours has been

reached (expected after ten years of operation), all subsidies are discontinued and power from Horns Rev is sold at market prices:

- *Green Certificates*: Elsam was eligible to receive Green Certificates, which are securities traded on a dedicated exchange for additional revenue. The Green Certificates will be available throughout the full service life of the wind turbines, and they are expected to trade at DKK 0.10-0.27 per kWh.

As a result of these policy incentives, power from Horns Rev has been sold at the lowest price for renewable energy in Denmark's history.

The Committee recommends contacting several European developers in the course of further research to incorporate their offshore experience and recommendations.

B. Significant North American Offshore Projects Under Consideration

There are several North American offshore projects in the planning stages, including those listed here. In terms of models for Northeast Ohio offshore development, the Trillium project in Lake Ontario represents a Great Lakes freshwater effort.

Canadian Offshore Wind Project: Trillium Wind Development (Freshwater)

- 142 Units at 5 MW each for a total of 710 MW of power
- Location: Lake Ontario, East of Toronto
- Serves the Toronto Metro area
- Offshore in shallow waters
- Developer: Trillium Energy

Canadian Offshore Wind Project: Nai Kun Wind Development

- 200 Units at 3.5 MW each for a total of 700 MW of power
- Location: Haida Gwaii - West of Prince Rupert Island (West of Vancouver)
- Developer: Nai Kun

US Offshore Wind Project: Cape Wind Project (Saltwater)

- 130 Units at 3.2 MW each for a total of 420 MW of power
- Location: Off Cape Cod
- Impact: ¾ of Cape Cod's electricity needs
- Developer: EMI Wind
- 600-900 yards apart
- Project status: on hold pending permitting, objections due to aesthetic concerns
- Job Impact
  - 1000 jobs construction phase
  - 150 permanent jobs operational phase
  - 50 highly paid

US Offshore Wind Project: Long Island (Saltwater)

- 40 Units at approximately 3.6 MW each for 140 MW of power

- Location: 3.6 miles off Jones Beach
- Serving Long Island electricity markets
- Developer: FPL
- 700 yards apart

Further American offshore activity is anticipated in the Texas Gulf coast area. No offshore activity is feasible in the State of Washington coastal area due to ocean depths. Other projects are under consideration up and down the East coast.

Concept for a Research Center

To improve the development of high-quality, sustainable jobs in the region, the Committee recommends exploring the idea of a wind research center. One approach to a research center would be to develop a research and test facility affiliated with the offshore wind project. This facility would enable manufacturers and technology developers to evaluate new and innovative designs for wind components, proof or type testing, promote new businesses (both physical and virtual), and to make accurate comparisons to their conventional counterparts located and operating nearby.

Our region has strong manufacturing, engineering, research, and technical assets that could be capitalized upon. For example, NASA Glenn is a pioneer in technical research and development, and is a known center of excellence in power and propulsion. Multiple regional universities could contribute significantly to this effort. A research facility would build upon such existing assets for new economic development and growth in the wind industry and related fields. The research center would naturally link with current local wind manufacturing supply chain players, including but not limited to Eaton, Lubrizol, Lincoln Electric, Mittal, Parker Hannifin, and Timken. The existence of the center would not only create local employment opportunities, but facilitate the further co-location of manufacturing opportunities for component parts and commercialized designs.

The center could also be the hub for a collaborative consortium of local universities, manufacturing companies, government, and non-profit organizations on advanced energy development. The consortia could study the functional aspects of the wind farm over an extended period of time, establish industry benchmarks, develop and test ancillary technology manufactured in Northeast Ohio and/or perform research on innovative wind energy technology designs. This concept could evolve into a Wright Center sponsored in part by the Ohio Third Frontier program.

As many synergies exist between the off- and onshore wind industries, the research center could and should serve advancements in both.

Finance and Economics Committee

With hundreds of projects completed or in the later stages of implementation, the economic assumptions, financial/legal structuring, and quantitative forecasting of onshore wind projects in the U.S. are well-established.

When considering a wind project of some form in Lake Erie, offshore to downtown Cleveland, much more investigation is required to develop a substantive financial/economic evaluation.

First, the scope and size of the project must be defined. The economics of the wind farm component of the project will vary considerably depending on:

- The number and size of the turbines selected for the project;
- The exact location of the turbines, which affects their installation costs. (This is a function of lake depth and length of interconnection to shore, as well as their electricity production); and
- The wind resource at the specific site.

Once the wind project is more precisely defined, further work remains to be done. Depending on the project's exact specifications, many issues will need to be addressed with fairly detailed study, including (but not limited to):

- Which turbine manufacturers will offer (with warranty) which wind turbine products for offshore installation? At what prices?
- What are likely to be the maintenance and replacement issues for such turbines in freshwater offshore application?
- What will be the installation cost of towers and foundations, given the specific lake-bottom conditions at the location selected?
- How much engineering and project-specific installation/support gear will be required for the project?
- What will be the costs of laying transmission cable to the project in the water from the shore? How should redundancy of the cable be handled?
- How will periodic maintenance of turbines be conducted, how frequently, and at what cost?
- What is the possible down-time for turbines when they cannot be visited (e.g., during winter)?
- How much time and cost should be allocated for study of aquatic and avian issues? For other public review and comment (i.e. aesthetic issues)?
- What is the most advantageous legal structure for ownership and operation of the project?
- What sources of capital and subsidies are available to the selected structure?
- What terms for the power sale/purchase agreement can be negotiated (with a counterparty such as the County or Cleveland Public Power)?
- What will be the prices and liquidity of emissions and/or renewable energy credits (and potentially carbon offsets in a future market environment involving greenhouse gas reduction requirements)?

The economics of the center for use by outside parties must also be assessed. In turn, this will require a deeper understanding of the research and testing needs of the turbine/component developers and manufacturers, in order to identify the required equipment and staff to construct

and operate the center. Once we have a clearer view of the demands for offshore (and very large onshore) wind turbine technology/product developers, a capital and operating budget, as well as a revenue projection (associated with the terms of use for the research/test center) can be developed.

While there is much ambiguity about the exact nature of the envisioned offshore wind project and its overall economic and financial prospects, one thing is clear today: the project cannot be financed solely by the private sector. This is for three reasons:

- The costs of offshore wind are significantly higher than onshore wind (due to the challenges associated with installation and maintenance out in the water rather than on land). Private sector financing is usually stretched to generate reasonable returns even in onshore applications;

- The envisioned project is smaller and closer to shore than economically optimal, in order to break through the challenges of future offshore wind technology development and deployment and to provide a visual icon for the region, rather than to maximize financial returns from the project; and

- The first-of-a-kind nature of the envisioned offshore wind project will undoubtedly entail several engineering and technology risks that could affect project performance, which the private sector may not be willing to accept.

It is virtually certain that a substantial portion, half or even more than half, of the overall costs of this project will have to come from sources other than the private financial sector. Other sources for funding to be explored include but are not limited to:

- Public-sector low-interest debt, such as:
    - Debt financing offered by the Ohio Air Quality Development Authority (OAQDA)
    - Clean Renewable Energy Bonds (CREBS)
    - The Cleveland-Cuyahoga County Port Authority
- Grants from:
    - Federal sources:
        - R&D programs sponsored by agencies such as DOE's National Renewable Energy Laboratory (NREL)
        - Legislative appropriations
    - State sources:
        - Grants from Ohio Department of Development (ODOD)
        - R&D programs approved by the Third Frontier Program
    - Local public sector, such as:
        - Cuyahoga County
        - The City of Cleveland
        - The Cleveland-Cuyahoga County Port Authority
    - Local philanthropic sector, such as:
        - The Cleveland Foundation
        - The Fund for Our Economic Future
        - Other philanthropic interests
    - Corporate partners/participants, such as:
        - Wind turbine manufacturers
        - Engineering/construction firms

It is because many of these potential sources of funding outside the private financial sector are highly interested in research and development opportunities that the Task Force appended the concept of a research and testing center to the original concept of simply an offshore wind farm for power generation purposes.

All of these financial and economic considerations will thus require substantial further investigation as part of the overall feasibility study proposed for the offshore wind project.

Appendix A

R E S O L U T I O N

Establishing the Cuyahoga Regional Energy Development Task Force

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WHEREAS, the public health, welfare and safety of citizens of Cuyahoga County and the surrounding Region depend upon a secure and adequate supply of reliable energy at competitive market prices; and,

WHEREAS, world markets for fossil fuel based energy are in turmoil and the citizens of Cuyahoga County and the surrounding Region face the prospect of significantly rising energy prices for the foreseeable future; and,

WHEREAS, fossil fuel based energy supplies necessarily contribute to air pollution and other impacts upon the environment and public health, welfare and safety; and,

WHEREAS, Cuyahoga County and the surrounding Region are at risk of going into Serious Non-Attainment Status under the Federal Clean Air Act with respect to ozone and fine particulates due to air pollution emissions; and,

WHEREAS, while new technologies may add new clean energy sources to the mix of existing energy sources available to Cuyahoga County and the surrounding Region, these technologies need to be carefully evaluated to determine their economic viability and value to the citizens of Cuyahoga County and the surrounding Region; and,

WHEREAS, the Board of County Commissioners for Cuyahoga County, Ohio, recognizes that existing information indicates that wind power may be the most promising technology to evaluate first; and,

WHEREAS, the Board of County Commissioners for Cuyahoga County, Ohio, desires to exercise leadership to evaluate these new technologies as part of their duty to protect the public health, welfare and safety of the citizens of Cuyahoga County; and,

WHEREAS, the Cuyahoga County Prosecuting Attorney serves as legal counsel and advisor to the boards, commissions, agencies and employees of Cuyahoga County, and has the required knowledge in renewable energy sources and economic development, his leadership and participation is necessary in order to facilitate, coordinate, and expedite the interaction and participation of the various governmental agencies, experts, and business interests involved in energy development;

THEREFORE, BE IT RESOLVED, that the Board of County Commissioners of Cuyahoga County, Ohio, does hereby establish the Cuyahoga Regional Energy Development Task Force (Task Force).

BE IT FURTHER RESOLVED, that the mission of Task Force shall be to propose to the Board of County Commissioners for Cuyahoga County, Ohio, and to the community a plan that will establish advanced energy as a critical component of the Region's energy portfolio and economic development profile designed to promote the Region's prosperity, health, welfare, and safety. This Mission shall include, but not be limited to, investigating and seeking to implement, where appropriate, advanced energy projects relating to energy supply such as renewable wind power and solar power, production of bio-fuels, such as ethanol, from bio mass materials or

agricultural products, co-generation of electricity from surplus heat or steam from industrial facilities or other utilities, supporting the State of Ohio's Third Frontier Program related to fuel cells and projects relating to energy demand such as energy conservation and energy efficiency projects

BE IT FURTHER RESOLVED, that the first priority of the Task Force shall be to explore the feasibility of a pilot project for the commercial generation of electricity from wind power and to pioneer an efficient process for the development of future regional market opportunities.

BE IT FURTHER RESOLVED, that the first Chair of the Task Force shall be Bill Mason, the Prosecutor for Cuyahoga County, Ohio, and that he shall select the first members of the Task Force from interested and knowledgeable members of all sectors of the community, with the advice and consent of the Board of County Commissioners.

On motion of Commissioner _____, seconded by Commissioner _____, the foregoing resolution was duly adopted.

Ayes: Hagan, Jones, Dimora

Nays: None

Resolution Adopted.

Penelope M. Hughes,
Clerk of the Board

Journal ___
August __, 2006
_____

MEMORANDUM

TO: Dave Nash, Cuyahoga Regional Energy Development Task Force
FROM: Elise Rindfleisch
DATE: January 4, 2007
RE: City and County-Level Renewable Energy Models

OVERVIEW

This memorandum examines renewable energy models at both the city and county levels. It contains summaries of models implemented by cities and counties across the country. This listing is not comprehensive, although it does present a variety of different models. Information about additional programs can be found on the Database for State Incentives for Renewables and Efficiency's (DSIRE) website, http://www.dsireusa.org/. Models can be found by clicking on a state on the map and then scrolling down to the Rules, Regulations & Policies section of the state's listing. As chart listing many city and county models can be found at http://www.newdream.org/procure/products/Energy_Purchases.pdf; however, the chart was last updated in August 2005, and is somewhat outdated.

This memorandum also summarizes the EPA's Green Power Partnership. This partnership is an effective way for cities or counties to receive assistance from the EPA in their voluntary efforts to purchase renewable energy. Organizations using large amounts of green power receive significant recognition from the EPA.

COUNTY RENEWABLE ENERGY STANDARDS

ALAMEDA COUNTY, CA

Alameda County is engaged in a Green Power Partnership with the EPA. This is an on-site commitment at the Santa Rita Jail. The county also has plans to expand to six other sites. The county's annual goal is 6% (2.29) MW. As of August 2005 they were already generating 1.18 MW through the jail's existing solar system.[viii]

BERKELEY COUNTY, SC

The Berkeley County, SC Chamber of Commerce is also engaged in a Green Power Partnership. Their annual goal is to purchase enough renewable energy to constitute 20% of their energy usage.[ix]

CLARK COUNTY, WA

The Clark County, WA government instituted the Clark Public Utilities' Green Lights Program in September 2002 to promote the development of renewable energy resources.[x] Through the program, Clark County commits to purchase 10% (120,600 kW) of renewable energy annually.[xi] This includes electricity purchased for all county buildings and facilities.[xii] The energy will be sourced from photovoltaics and wind.[xiii]

LAKE COUNTY, IL

Lake County was the first county to commit to a Green Power Partnership with the EPA. Through this partnership, Lake County committed to purchasing 6% (720,000 kW) of renewable energy for Waukegan facilities and the Des Plaines River Wastewater Treatment Plant. The source of this renewable energy is biomass.[xiv]

MONTGOMERY and PRINCE GEORGE'S COUNTIES, MD

In 2004 an aggregation of Montgomery County, Prince George's County, six county agencies, and 11 municipalities agreed to annually purchase wind energy to supply 5% (38 million kW) of their combined energy usage. The purchasers signed a two-year contract with

Washington Gas Energy Services and Community Energy, Inc., to purchase wind energy sourced from the Mountaineer Wind Energy Center in West Virginia.[xv] Additionally, this purchase was proposed to be included in the regional implementation plan for achieving ground-level ozone standards under the Clean Air Act. As of August 2005 this was the largest wind power purchase by a local government.[xvi]

PITKIN COUNTY, CO

Pitkin County and the Pitkin County Airport committed to annually purchase wind energy to supply over 10% of their energy demands. In Pitkin County, this purchase will go towards energy usage by municipal facilities.[xvii]

SAN FRANSISCO BAY AREA, CA (EAST BAY MUNICIPAL UTILITY DISTRICT)

Through the EPA Green Power Partnership, the East Bay Municipal Utility District committed to meet the energy needs of their main wastewater treatment plant through biogas.[xviii]

SOLANO COUNTY, CA

In 2003 Solano Country installed a 230 kW solar electricity system on their health and social services building in conjunction with the EPA's Green Power Partnership. This system produces 381,500 kW of energy, approximately 36% of the building's energy demands.[xix]

CITY RENEWABLE ENERGY STANDARDS

ASPEN, CO

In 2005, Aspen committed to purchasing 75% of their energy from renewable energy sources (non-carbon sources) by 2010. In December 2006, the City accomplished this goal. The City began by increasing its supply of renewable energy by ten percent in 2005, with the goal of expending no more than $388,800 annually to meet this percent increase. It increased its renewable energy purchases by another sixteen percent in 2006, and plans to continue to do so while expending no more than $240,200 annually to meet this percent increase. Energy is sourced from wind and hydroelectric power from existing dams.[xx]

BASALT, CO

The City of Basalt committed to purchasing wind energy to supply over 10% of the city's energy demands.[xxi]

BOULDER, CO

Boulder's Amendment 37 requires Xcel Energy, Boulder's sole energy provider, to get three percent of retail sales in 2007-2010 and ten percent by 2015 from renewable sources. Although most of the requirement will likely be satisfied by wind power, the law requires that four percent of the total come from solar. If this goal is met, Boulder's electricity-related emissions will drop by ten percent by 2015. The Amendment also stipulates that Xcel must offer a minimum solar energy rebate of $2 per watt.[xxii]

Boulder does not have a municipal utility, and therefore claims it cannot control the resource mix used to produce energy for its city. However, the City is considering acquiring the power system from Xcel upon expiration of its franchise agreement in 2010. The City purchases of wind power for all of its municipal building's electricity use.[xxiii] It also installed a solar water heating system on one of its municipal pools. The system has 128 thermal panels.[xxiv]

CARBONDALE, CO

The City of Carbondale committed to purchasing wind energy to supply over 10% of the city's energy demands.[xxv]

CONWAY, SC

Through the Santee Cooper's Green Power program, the City of Conway purchases 50 200-kW blocks (10,000 kW) of renewable energy per month. The power is produced by methane from the Horry County Solid Waste Authority's landfill. Six other cities purchase green energy from Santee Cooper.[xxvi]

DAVIS, CA

California State Senate Bill 1038 allows Davis to purchase power generated at the Photovoltaics for Utility Scale Applications (PVUSA) site in Davis for use by the City. The City of Davis uses 100% of the power generated at the site. Between 1,600,000 kW and 2,000,000 kW are generates at the site per year. The City currently owns the facility, but does not operate the facility.[xxvii]

FORT COLLINS, CO

Fort Collins' Electric Energy Supply Policy, implemented by the Fort Collins City Council in March 2003, establishes a renewable portfolio standard for the City's municipal utility. Specifically, the policy states that the utility must provide a minimum of 2% of renewable energy by 2004, with an increase to 15% by 2017. To fund the Policy's goals, electric rates were increased 2% (1% for demand side management programs and 1% for renewable energy). Funding was used to add a 2.5 MW turbine at the Platte River's Medicine Bow Wind Plant.[xxviii]

PORTLAND, OR

The City of Portland currently uses renewable energy for 12% of the City's total electricity use.[xxix] Energy is sourced through photovoltaics, wind, biomass, geothermal, and anaerobic digestion. Eventually, the City plans to purchase 100% of its municipal facility's electricity from renewable sources. Portland's 2003 goal of 10% was met through self generation—a 200 kW biogas fuel cell, 120 kW biogas microturbines, a 150 kW hydro generator, and a 10 kW urban wind turbine.[xxx]

SALT LAKE CITY, UT

Salt Lake City purchases 1,557 MWh of renewable energy annually through Utah Power's Blue Sky wind power program. This constitutes 21% of the energy used at the City and County Building and the Main Public Library. Although wind power is more costly, Salt Lake City offsets these costs through energy conservation measures in the City and County Building.[xxxi]

SAN DIEGO, CA

San Diego is working to install 50 MW of renewable energy over the next decade. The energy can be generated from photovoltaics, wind, landfill-gas facilities, small hydroelectric generators, geothermal systems, and other similar technologies.[xxxii]

EPA'S GREEN POWER PARTNERSHIP

The Green Power Partnership is the EPA's means of encouraging organizations, such as local governments, to voluntarily purchase green power. Under this program, "green power" is considered electricity generated from sources such as solar, wind, geothermal, biogas, biomass, and low-impact hydro resources. Organizations interested in purchasing green power can receive support from the EPA through this project.[xxxiii]

Local governments participating in the program must purchase a minimum amount of green power, which is determined by their annual electricity use. The following chart outlines these requirements:

Appendix B

Community's Annual Electricity Use	Minimum Percentage of Green Power Community Must Use
Over 100,000 MWh	2%
100,000-10,000 MWh	3%
Under 10,000 MWh	6%

Half of the minimum required percentage of green power must be met though "new" sources of renewable energy. Additionally, communities interested in participating in the Green Power Partnership must initiate and support a Green Power Community campaign and the local government (or its utility) must provide electricity use data and campaign updates.[xxxiv]

Quarterly the EPA lists their top 10 Local Partners, Partners who have completed the largest annual green power purchases within their sector. The current list is as follows:

Green Power Usage (kWh)	% of Total Electricity	Resources	Provider
1. City of Austin, TX			
65,454,000	54%	Biogas, Wind	Austin Energy
2. City of San Diego, CA			
65,400,000	25%	Biogas, Small-hydro, Solar	On-Site Generation
3. Montgomery County Wind Buyers Group			
49,432,972	6%	Wind	Washington Gas Energy Services
4. Austin (TX) Independent School District			
45,720,000	26%	Biogas, Wind	Austin Energy
5. East Bay Municipal Utility District/Main WWT Plant			
38,800,000	92%	Biogas	On-site Generation
6. New York State Municipal Wind Buyers Group			
31,584,167	20%	Wind	Community Energy
7. City of Portland, OR			
17,602,000	13%	Biogas, Small-hydro, Solar, Wind	On-site Generation, PPM
8. City of Boston, MA			
17,300,000	9%	Wind	Constellation NewEnergy/ERT
9. Round Rock (TX) Independent School District			
16,496,000	27%	Biogas, Wind	Austin Energy
10. Rochester City School District			
8,920,000	19%	Wind	Rochester Gas & Electric/Community Energy

The list will be updated in January 2007.[xxxv] Additional information about EPA's Green Power Partnership is available at http://www.epa.gov/greenpower/index.htm.

RECOMMENDATIONS

Cuyahoga county, or any of the cities within, should engage in the EPA's Green Power Partnership to purchase renewable energy. Through this partnership they can access valuable resources at the EPA to find the best means of purchasing this energy. This support from the EPA will likely lessen the time and resources that a county or city will need to invest in such a project. Furthermore, the partnership includes a community campaign, which will raise awareness in the community and generate positive recognition of the county or city.

Many cities and counties currently purchase wind energy to meet roughly 10% of their energy needs. In keeping with this trend, a local city or Cuyahoga county may want to begin with this percentage and possibly establish goals to increase the percentage. The potential for expansion of wind power generation in our region seems quite promising. To offset some of the city/county's costs of purchasing wind power, energy conservation measures can be installed in municipal and county facilities, such as was done in the Salt Lake City's City and County Building. Cities or the county may also want to consider biogas energy generation. The San Francisco Bay area and several South Carolina cities have met a significant percentage of their energy needs through this source.

WILLIAM D. MASON
CUYAHOGA COUNTY PROSECUTOR

November 29, 2006

Governor-elect Ted Strickland
Central Ohio Office
309 South 4th Street
Suite 100
Columbus, Ohio 43215

Dear Governor-elect Strickland:

On August 10, 2006, the Cuyahoga County Commissioners established the Cuyahoga Regional Energy Development Task Force.[1] The mission of the Task Force is to investigate and implement advanced energy projects that are appropriate for building a new energy future for the region. It is our belief that a commitment to advanced energy would decrease the community's dependence upon fossil fuels, create jobs as well as business opportunities and help build a healthier and cleaner community for our children.

Through the efforts of the Task Force, we have identified certain policy initiatives that must be implemented at the state level. These suggested reforms of Ohio's energy policy are critical components in our collective efforts to revitalize Ohio's economic and industrial engine. The Cuyahoga Regional Energy Development Task Force respectfully presents the following rationales, goals and recommendations for your immediate consideration.

RATIONALES:

Ohio ranks seventh in population and fourth in industrial energy and overall electricity consumption. We are a net importer of energy, resulting in an outflow of dollars to pay for energy consumption. Energy policy, therefore, is important to the state.

Decades of alternately missteps and inaction at both the state and federal levels have crippled our ability to adapt to rapidly changing energy markets:

1. The national response to the Arab Oil crises of 1973-74 and 1980-81 began with enthusiasm, but petered out after OPEC turned the spigot back on.

[1] The Task Force, chaired by Cuyahoga County Prosecutor William Mason, is made up of recognized leaders in the public and private sectors of Northeast Ohio. The Task Force solicits input and participation from environmental, government and business experts from around the state and US.

OFFICE OF THE PROSECUTING ATTORNEY
Justice Center • Courts Tower • 1200 Ontario Street • Cleveland, Ohio 44113
(216) 443-7800 • FAX: (216) 698-2270 • E-MAIL: MASONCCPO@AOL.COM

2. The partial deregulation of the electricity market in the 1990's has failed the consumer.

3. World markets for fossil fuel-based energy are in turmoil, and the citizens of Ohio face the prospect in the foreseeable future of significantly rising energy prices.

4. Fossil fuel-based energy necessarily contribute to air pollution and otherwise adversely impact the environment and public health, welfare and safety.

5. Cuyahoga and four surrounding counties are at risk of descending into Serious Non-Attainment status under the Federal Clean Air Act with respect to ozone and fine particulates due to air pollution emissions from fossil fuel usage.

Ohio can and must be a leader in revitalizing its own energy policy and physical infrastructure. An October 2006 Brookings Institution study of Great Lakes states' economic strengths and weaknesses recognizes that the region possesses a strong industrial infrastructure that could be used to lead the nation in building new and advanced energy sources and energy efficiency practices and technologies.[2]

GOALS:

Ohio must be a leader in renewable/advanced energy, capitalizing on assets already in place. Ohio should aspire to become a net energy exporter by 2020, including that generated both within Ohio and from generation equipment manufactured in Ohio but exported for use elsewhere. These goals are consistent with national objectives announced both by the Bush Administration and the Senate Democratic Caucus. These goals also fit the 165 Ohio policy incentives recently published by the Voinovich Center's Consortium for Energy, Economics and the Environment (CE3) at Ohio University.

ADVANCED ENERGY PORTFOLIO STANDARD (AEPS):

The AEPS is a policy that **obligates** each retail seller of electricity to include in its resource portfolio a certain percentage of electricity from renewable energy resources such as wind or solar power. Usually an AEPS has a specific end date; however, it can also terminate when it is no longer needed to achieve the policy goal and once renewables have become competitive in the market.

The AEPS should include the following:

I. PURPOSE:

By the year 2015, the State of Ohio will be required to derive 10% of its electricity from alternative energy resources and by the year 2020, it will have increased to 20%. By setting forth this goal the AEPS will force retailers to purchase alternative energy. In turn alternative energies will become a lasting competitive force in the marketplace.

---

[2] See, *The Vital Center*, P 29, http://www.brookings.edu/metro/pubs/20061020_renewgreatlakes.pdf.

II. OBJECTIVE:

The AEPS promotes economic development, energy security and electric system reliability. This legislation will increase jobs, improve our environment, strengthen our rural communities and make Ohio a leader in advance energy development. The steps set forth are important for addressing today's energy challenges, i.e., rising fuel costs and ever increasing reliance on foreign imports to meet our energy needs.

III. DEFINITIONS:

The AEPS will clarify any terms or qualifying resources that are stated in the policy. This will provide retail sellers with a clear and precise understanding of their responsibilities.

IV. QUALIFYING RESOURCES:

The following will qualify in Ohio as eligible alternative energy sources:

a) Wind power
b) Clean Coal technology, integrated combined coal gasification technology or other approved clean coal technologies
c) Fuel cells
d) Solar energy/photovoltaic
e) Low-impact hydropower
f) Geothermal energy
g) Biologically derived methane gas
h) Biomass energy
i) Coal mine methane
j) Distributed generation systems
k) Demand-side management
l) Large-scale hydropower
m) Municipal solid waste and generation of electricity utilizing by-products of the pulping and wood manufacturing processes including bark, wood chips, sawdust and lignin in spent pulping liquors

V. ALTERNATIVE ENERGY TRADING SYSTEM:

An Alternative Energy Trading System should be established so that qualified alternative energy generation or efficiency units can be traded in an open market.

- Energy Credits are green electricity that is sold into the local electric grid where the alternative energy project is located. The credits are sold separately as a commodity in the market place.
- One alternative energy credit will represent one-megawatt hour of qualified alternative electric generation, whether self-generated, purchased along with the electric commodity or bought separately through tradable instrument and which credit meets the requirements of the Public Utilities Commission of Ohio regulations and the program administrator.
- The commission is responsible for establishing an alternative energy tradable credits program and shall approve an independent entity as needed.
- The commission is responsible for monitoring and determining compliance.

VI. COMPLIANCE:

A generation or distribution company that fails to comply with the AEPS will be subject to an alternative compliance payment that will be recycled to programs promoting alternative energy programs in Ohio.

- The electric distribution supplier or electric generation company shall not satisfy Ohio's alternative energy portfolio by utilizing alternative energy that has already been used to meet another state's portfolio requirements.
- The AEPS will provide appropriate reporting mechanisms to verify compliance.
- If a retailer fails to comply, its operating license may be revoked and it will be required to pay a fine, $45 times the number of additional alternative energy credits needed in order to comply.

VII. INTERCONNECTION STANDARDS:

Interconnection, net metering and smart metering regulations consistent with PUCO's staff recommendations to the commission dated August 28, 2006, should be adopted.

VIII. FINANCIAL INCENTIVES:

Ohio should provide seed capital to assist the market in meeting the AEPS requirements, e.g., providing up to $250 million per year of tax-exempt bond financing for next generation energy projects. Grant programs should also be considered and links to existing programs should be strengthened.

The Cuyahoga Regional Energy Development Task Force stands ready to support you in this critical effort and to leverage the support of other organizations to meet these goals. We stand ready to assist with content expertise, coalition building and education. Please call upon us to help with this crucial step necessary to ensure the health and prosperity of Ohio's citizenry.

WILLIAM D. MASON
CHAIRMAN, CUYAHOGA REGONAL
ENERGY DEVELOPMENT TASK FORCE

JIMMY DIMORA
PRESIDENT, CUYAHOGA
BOARD OF COMMISSIONERS

PETER LAWSON JONES
VICE-PRESIDENT, CUYAHOGA
BOARD OF COMMISSIONERS

TIMOTHY HAGAN
COMMISSIONER,
CUYAHOGA BOARD OF
COMMISSIONERS

Potential Regulatory Programs for Wind Power on Lake Erie			
Permit/Authorization Name and Description	**Required Information**	**Expected Agency Review Time**	**Contact Information**
Corps of Engineers Construction Permit (Section 10 and/or 404) – construction activities in lakes, rivers, streams, wetlands; 33 CFR 320 to 330	❖ Design drawings for facility ❖ Purpose statements and description of overall project ❖ Environmental Assessment would require information on existing environment, expected impacts and alternatives	2 to 18 months depending on permit type issued Potentially expedited for "pilot" project	United States Army Corps of Engineers (Buffalo District)
Water Quality Certificate- Section 401 of the CWA; triggered by application for U.S. Army Corps of Engineers Construction Permit (Section 404 only)	❖ Complete application ❖ Drawings for facility ❖ Description of overall project ❖ Delineation on wetland areas ❖ Information on existing environment, expected impacts and alternatives analysis	6 to 12 months	OEPA- Division of Surface Waters Randy Bournique 122 South Front Street P.O. Box 1049 Columbus, Ohio 43216-1049 Phone: 614.644.2013 http://www.epa.state.oh.us/dsw

Appendix D

Potential Regulatory Programs for Wind Power on Lake Erie			
Permit/Authorization Name and Description	**Required Information**	**Expected Agency Review Time**	**Contact Information**
Federal Endangered Species Consultation - issuance of COE Construction or NPDES permit if it has potential effects to federally threatened species or critical habitat; Section 10 (Exceptions) of the Endangered Species Act (ESA)	❖ Detailed biological assessment of potential impacts	Indeterminate	U.S. Fish and Wildlife Service Reynoldsburg Ecological Services Field Office 6950 American Parkway, Suite H Reynoldsburg, OH 43068-4127 614.469.6923 http://midwest.fws.gov/Reynoldsburg/
ODNR Division of Watercraft – this Division should be contacted for any proposed project that would potentially impact navigation on Lake Erie; the Division's focus includes boating safety, access, education, and law enforcement	❖ Project description ❖ Project location, with maps	Approximately 1 month (project specific)	ODNR- Division of Watercraft Chief, Division of Watercraft 2045 Morse Road A-2 Columbus, OH 43229-6693 Phone: 614.265.6480 http://www.dnr.state.oh.us/watercraft/
Ohio Power Sitting Board (OPSB) **Certificate-** the OPSB is responsible for approving the construction of energy projects in Ohio, including electric generating facilities of at least 50 MWs, electric transmission lines of 125kV or greater and pipelines capable of transporting gas at pressures above 125 psi	**Pilot project would not reach threshold** - Required filing information will vary according to the project and the type of filing (i.e., construction notice, letter of notification, application); details on required contents are included in the Ohio Administrative Code, Chapter 4906	Approximately 1 to 3 months for construction notices and letters of notification; approximately 6 to 12 months for applications, expedited schedules may be an option for coal R&D projects	Ohio Power Sitting Board 180 East Broad Street Columbus, OH 43215 Phone: 866.270.OPSB (6772) http://www.opsb.ohio.gov/

Appendix D

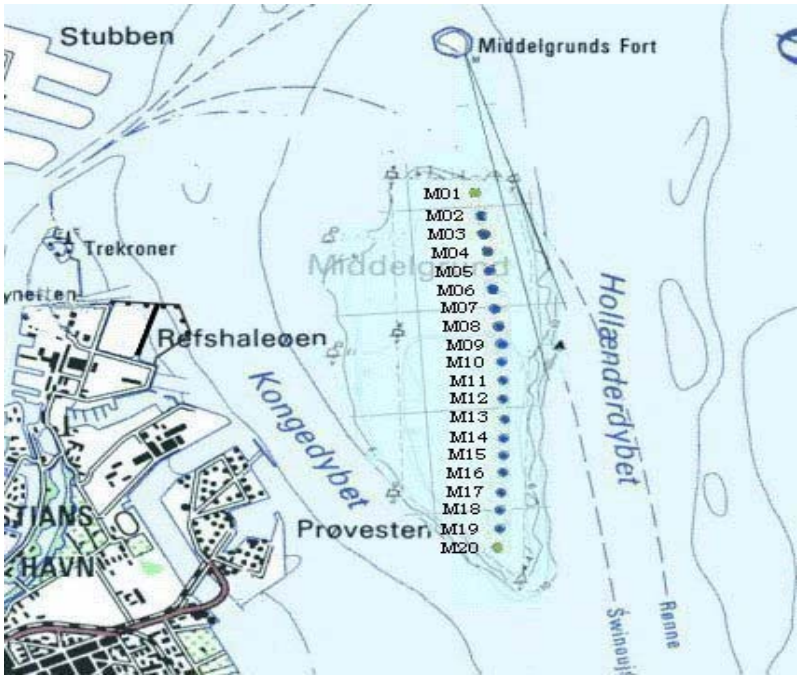
Potential Regulatory Programs for Wind Power on Lake Erie			
Permit/Authorization Name and Description	**Required Information**	**Expected Agency Review Time**	**Contact Information**
Consultation with the Office of Aviation and FAA (Ohio Department of Transportation)**-** consultation with the Office of Aviation can assure that the project does not introduce any safety issues for air traffic and potential FAA approval	❖ Project description ❖ Project location, including longitude and latitude readings ❖ Proposed structure heights ❖ Identification of nearby airports		Ohio Department of Transportation-Office of Aviation 2829 West Dublin- Granville Road Columbus, OH 43235-2786 Phone: 614.793.5040 http://www.dot.state.us/Aviation/
ODNR Division of Natural Areas and Preserves- this Division should be contacted if the proposed project would be located on or would impact a State Scenic River, State Nature Preserve, or property owned by the Division; Division can provide information of presence or absence of rare and endangered species, scenic rivers, and state nature preserves within the vicinity of the proposed project	❖ Project description ❖ Project location, with maps ❖ Description of proposed structures ❖ Summary of construction activities ❖ Environmental/biological assessment	Approximately 1 month (project specific) – in concert with other ODNR review if necessary	ODNR- Division of Natural Areas and Preserves Chief, Division of Natural Areas and Preserves 2045 Morse Road F-1 Columbus, OH 43229-6693 Phone: 614.265.6543 http://www.dnr.state.oh.us/dnap/

Appendix D

Potential Regulatory Programs for Wind Power on Lake Erie			
Permit/Authorization Name and Description	**Required Information**	**Expected Agency Review Time**	**Contact Information**
ODNR Division of Wildlife- this Division would be involved with the review of any project that has potential impacts to wildlife and their habitat; compensatory mitigation may be required if projects impact rare or endangered animals, aquatic or terrestrial, in the state, compensation may be required if wildlife species are killed.	❖ Project description ❖ Project location, with maps ❖ Summary of construction activities ❖ Environmental/ biological ❖ assessment ❖ Construction schedule	Approximately 1 month in general, but bird issues will require significant time and attention	ODNR- Division of Wildlife Chief, Division of Wildlife 2045 Morse Road G-3 Columbus, OH 43229-6693 Phone: 614.265.6300 http://www.dnr.state.oh.us/wildlife/
ODNR Division of Geological Survey- this Division should be consulted with regards to suitability of the placement of structures and possible impacts to geological processes	❖ Project description ❖ Project location, with maps ❖ Description of proposed structures ❖ Summary of construction activities	Approximately 1 month (project specific), but bird issue will require significant time and attention	ODNR- Division of Geological Survey Chief, Division of Geological Survey 2045 Morse Road C-4 Columbus, OH 43229-6693 Phone: 614.265.6576 http://www.dnr.state.oh.us/geosurvey/default.htm

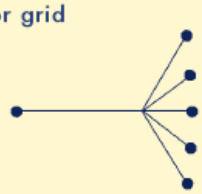
Appendix D

Potential Regulatory Programs for Wind Power on Lake Erie			
Permit/Authorization Name and Description	**Required Information**	**Expected Agency Review Time**	**Contact Information**
Ohio Department of Natural Resources (ODNR) Office of Costal Management- permits and other regulatory programs administered by this office include submerged land leases, state & Federal consistency, and shore structure permits.	❖ Project description ❖ Project location, with maps ❖ Description of proposed structures ❖ Summary of construction activities	Allow 6 months for responses and processing	ODNR- Office of Coastal Management Chief, Office of Coastal Management 105 W. Shoreline Drive Sandusky, OH 44870 Phone: 419.626.7980 http://www.dnr.state.oh.us/coastal/regs/default.htm
National Pollutant Discharge Elimination System (NPDES) Permit- Clean Water Act Section 402; Ohio Revised Code 6111.03(J); discharge of wastewater to surface waters; required prior to operation, recommend prior to construction	❖ Application Forms 1 and 2D with Antidegradation Addendum ❖ Water balance diagram ❖ Expected wastewater flows and characteristics ❖ Water pollution control equipment and systems	4 to 9 months	Ohio EPA- Division of Surface Waters District Offices http://www.epa.state.oh.us/dsw

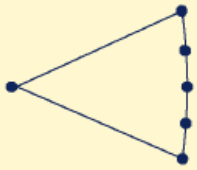


The Site: The shallow area of Middelgrunden is situated East of the northern tip of Amager. Here 20 wind turbines are installed in a slight curve with 180 meters distance and a total length of 3.4 kilometers. The total effect of the wind farm will be 40 MW. The twenty 2000 kW turbines have a total estimated electricity production of about 89,000,000 kWh per year.

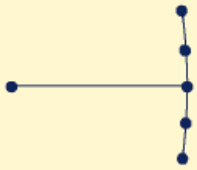
3 alternative solutions for grid connection



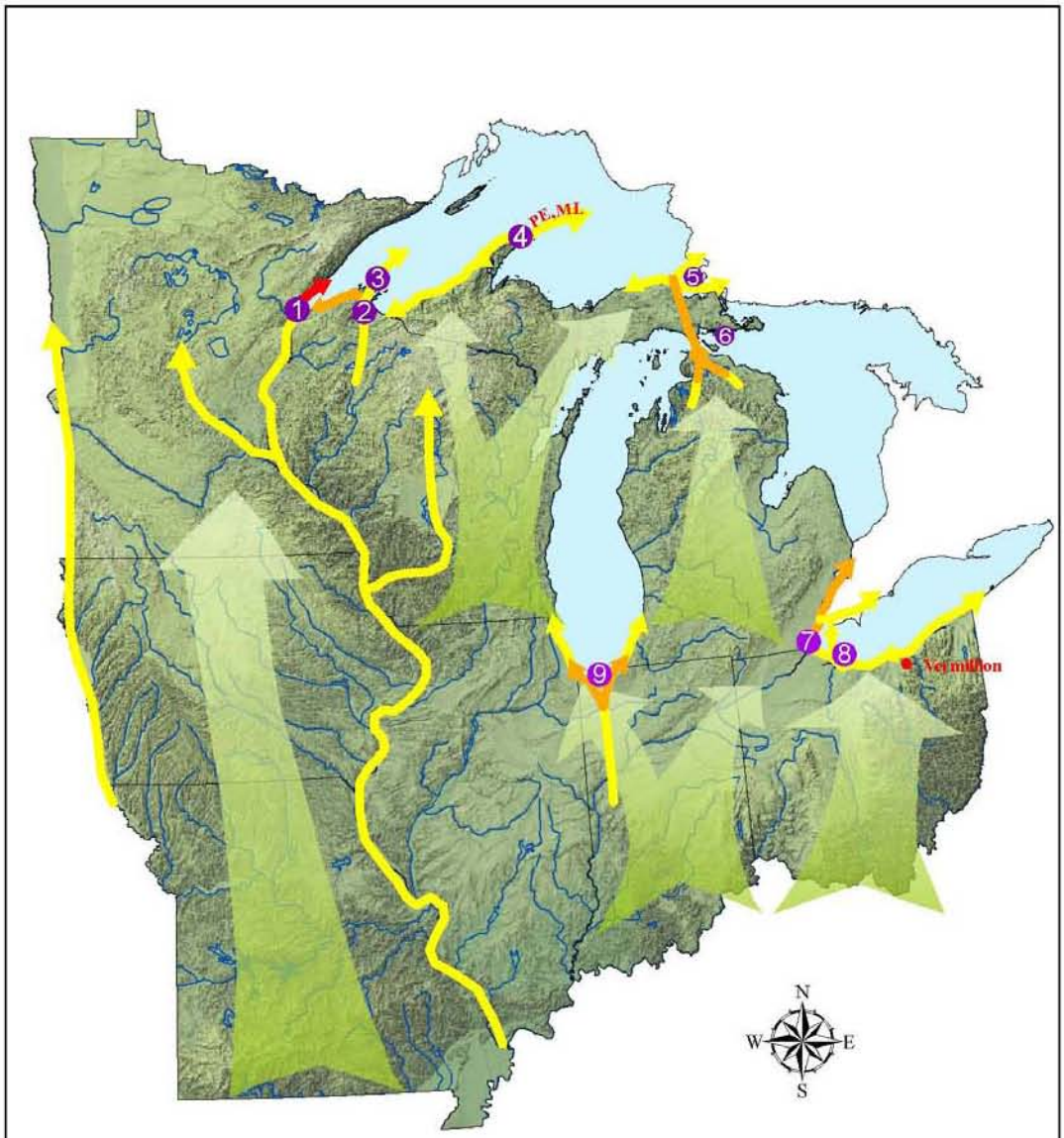
1: Star connection – each turbine is directly connected to the power plant This solution is very flexible and stable but very expensive. At the early stages the utilities demanded a star connection, which in reality would have stopped the project. After a lot of political work the demand was dropped.



2: Ring connection – Each of the two turbines at the end are connected to the power plant by a 20 MVA cable. This solution is quite stable. If the cable between two turbines breaks down, all turbines can still transfer electricity to the grid. Depending on where the breakdown is, the capacity will be limited for some of the turbines.



3: Central connection – The central turbine is connected by two 20 MVA cables to the power plant. The other turbines are connected to the central turbine in series connection.
This solution is the least flexible. If the cable between two turbines breaks down, some turbines will be cut off from the main cable.
The third solution was chosen, as the estimated production loss in the last solution was smaller than the extra costs for establishing two separate cables.



SPRING RAPTOR MIGRATION ROUTES

SYMBOL	COMMON NAME
AK	American Kestrel
BE	Bald Eagle
BO	Boreal Owl
BW	Broadwing
CH	Cooper's Hawk
GE	Golden Eagle
LEO	Long-eared Owl
ML	Merlin
NG	Northern Goshawk
NH	Northern Harrier
NSWO	Northern Saw-whet Owl
OS	Osprey
PG	Pregrine Falcon
RL	Rough-legged Hawk
RS	Red-shouldered Hawk
RT	Red-tailed Hawk
SEO	Short-eared Owl
SS	Sharp-shinned Hawk
TV	Turkey Vulture

Major Raptor Migration Observation Sites

1. West Skyline Observatory, Duluth (TV,OS,BE,SS, BW,RT,RL,GE)
2. Chequemegon Bay, Ashland (TV,SS,BW,RT,GE,BE)
3. Apostle Islands (AK,ML,PG)
4. Manitou Island/Keewenaw Peninsula (OS,SS,RL, NH,BE,PE,ML)
5. Whitefish Point (TV,BE,NH,SS,RS,BW,RT,RL,GE, AK,ML,PG,NSWO,BO,LEO)
6. Straits of Mackinac (TV,BE,SS,CH,RS, RT,RL,BW,GE)
7. Port Huron (TV,SS,RS,RT,BW)
8. Lake Erie Islands (TV,SS,BE,NH,OS,ML,PG)
9. Indiana Dunes NL (OS,NH,SS,RS,BW,RT,AK)

Legend
Number of Birds
- 2,500 - 5,000
- 5,000 - 10,000
- 10,000 - 20,000
- >20,000

Map Created for: Division of Migratory Birds
October, 2006
Fall Migratory Bird Information provided by
USFWS Migratory Bird Biologist Bob Russell

U.S. Fish & Wildlife Service
Region 3 NWRS
Division of Conservation Planning
Twin Cities, Minnesota 55111

Northeast Ohio Wind Development Offshore

Regional Wind Models[xxxvi] show good potential, notably highland areas in the Southwest suburbs and Eastern "Heights" of Cuyahoga County. However, there are development limitations near airports and dense development.

Since every City in the County has specific zoning regulations and attempting to identify these factors would be difficult without the direct involvement of each municipality, the Committee determined that the most efficient partnership would be the City of Cleveland. Appropriate onshore sites may be found in:

1. Abandoned land & brownfields
2. Industrial parks
3. Schools and campuses
4. Parks

Green Energy Ohio (GEO), a nonprofit organization promoting economically and environmentally-sustainable energy policies and practices in Ohio, is currently monitoring onshore sites in the state for utility-scale wind farm potential. GEO, with the support of the US Department of Energy, is utilizing existing onshore "tall towers" at 100m for research on wind speeds.

Further analysis of potential onshore sites is needed.

Additional Considerations for Onshore Development:

- The process for FAA approval on proposed sites identified in Cuyahoga County.
- The locations of sub-stations and infrastructure necessary for a pilot wind project of 20 MW or less.
- At least a year's worth of site-specific wind data may be required prior to the ground breaking of a project.
- Potential near-term and long-term project goals. The County may want to consider an onshore near-term pilot project and a larger offshore project in the future.

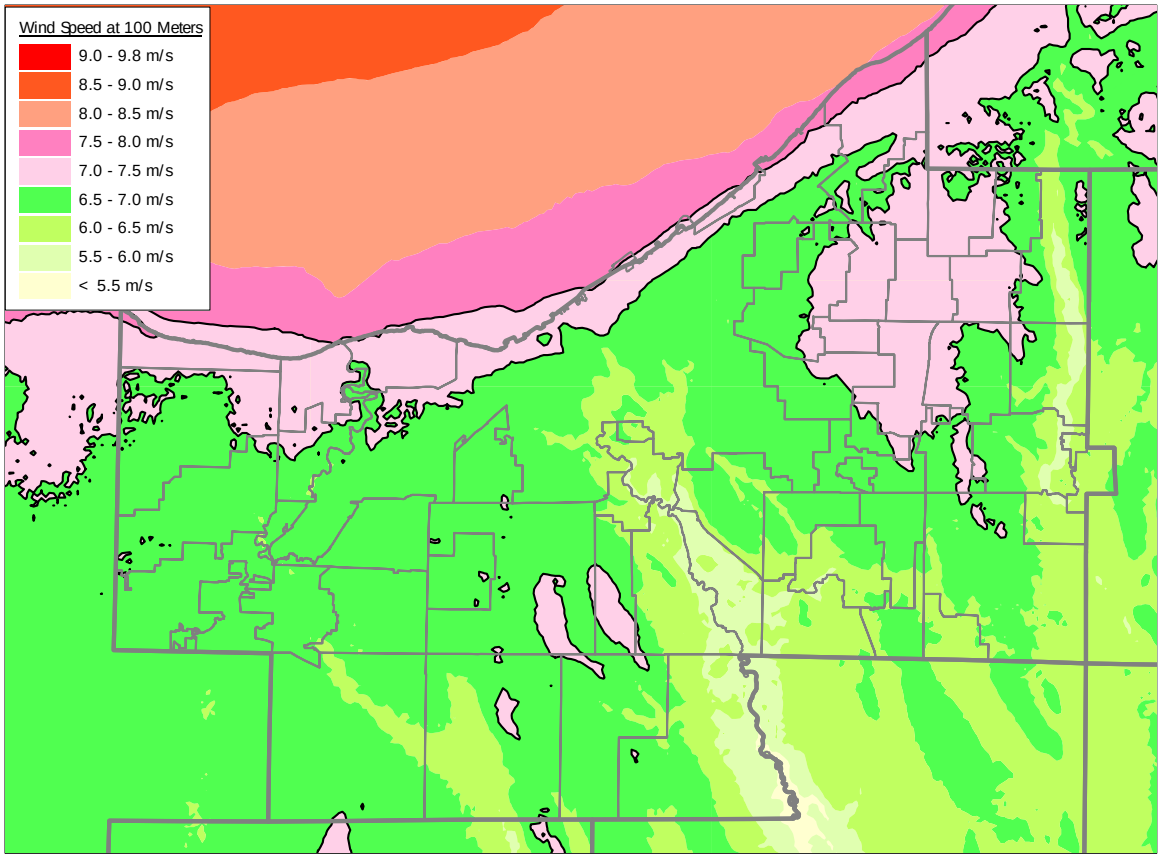


Figure 8: Onshore Wind Speeds

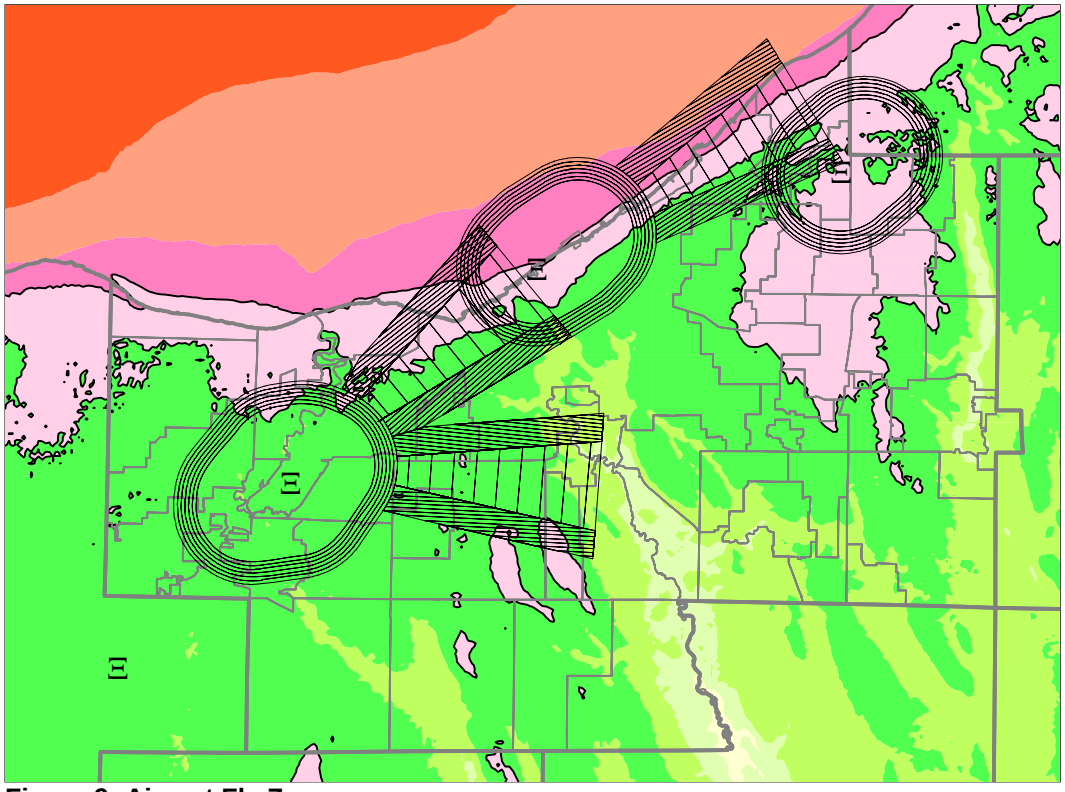


Figure 9: Airport Fly Zones

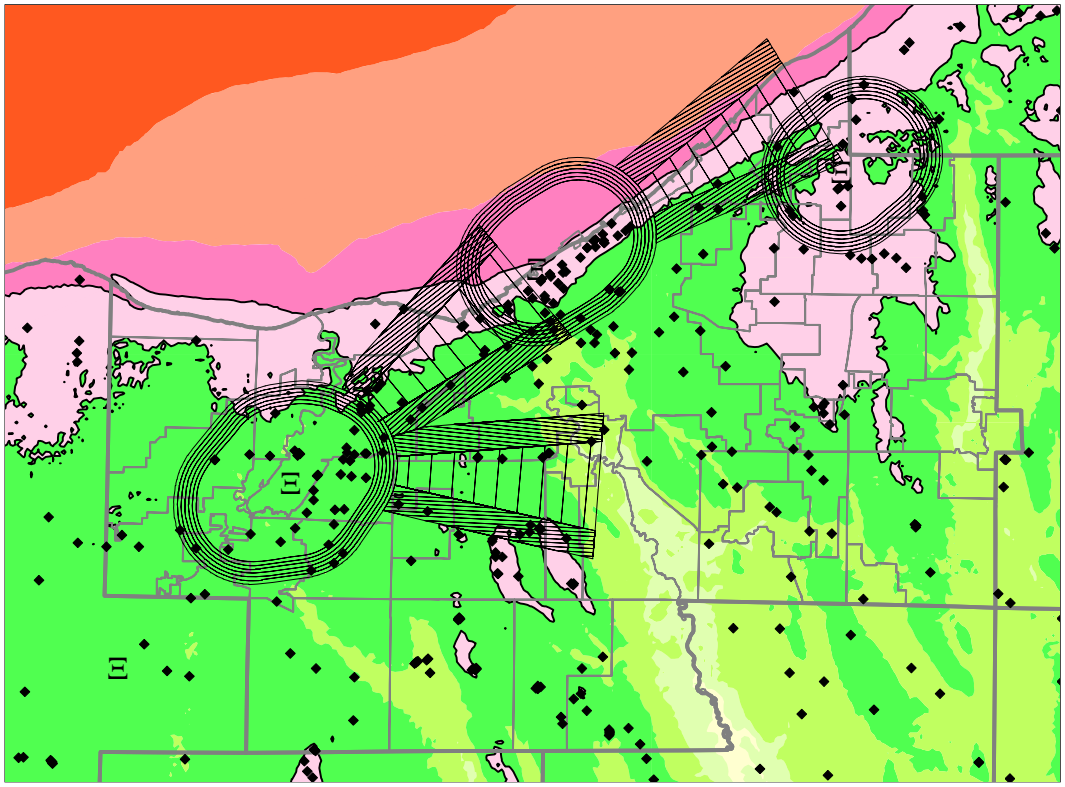
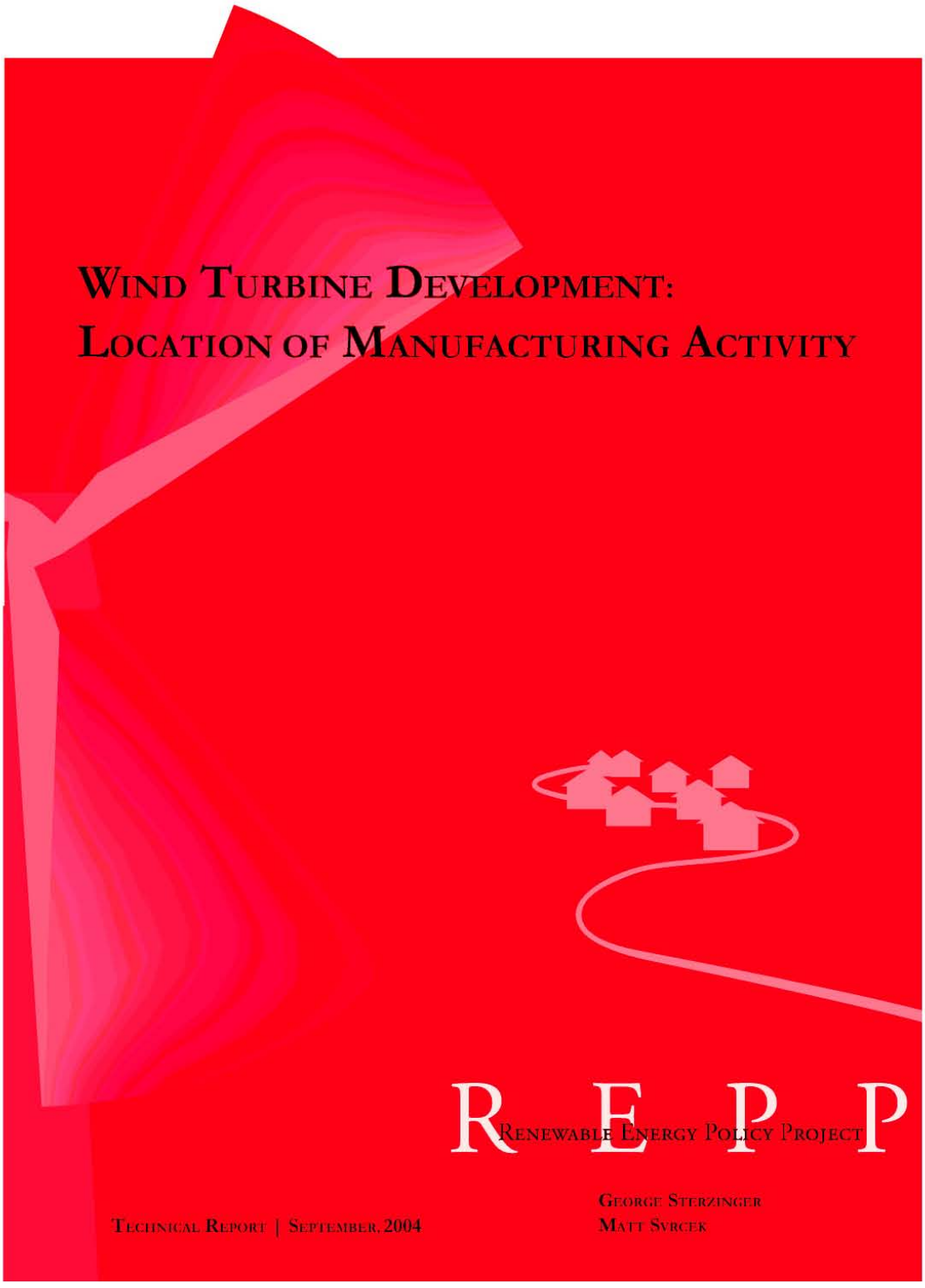


Figure 10: Existing Antennae Towers (Potential Wind Monitoring Sites)


WIND TURBINE DEVELOPMENT:
LOCATION OF MANUFACTURING ACTIVITY
R E P P
RENEWABLE ENERGY POLICY PROJECT
TECHNICAL REPORT | SEPTEMBER, 2004
GEORGE STERZINGER
MATT SVRCEK

CONTENTS

Acknowledgements: A number of people have contributed to this effort, including Fred Beck, Alex Zvinakis, John Buethe, and Richard Colley . We also want to thank the Energy Foundation for supporting the initial phase of the project. The bulk of this project is being carried out under a contract with the Department of Energy.

Executive Summary

The United States is in the midst of an unresolved debate over energy policy. An important part of that debate is over whether and how best to accelerate the development of renewable energy. An important concern about renewable energy centers on how widely the benefits from a national commitment to renewable energy development will be spread across all regions and areas of the country.

In this national debate two prominent policy proposals have been offered to support renewable development: Production Tax Credits (PTC) and a Renewable Portfolio Standard (RPS). The PTC allows a tax credit for each kWh generated from qualified sources. An RPS is a commitment to generate a certain percent of electricity sold from renewable resources.

Wind, one of the lowest cost renewable energy resources, would be very likely to provide a large part of the renewable energy developed under any national program using these two support mechanisms. Since the best wind resource is in the upper Great Plains region, it is reasonable to conclude that a large portion of the wind developed to meet a national standard will be in that region. Some have interpreted that to mean that a majority of the benefits from a national policy would flow to that region. That conclusion is shortsighted because it neglects to look at the chain of manufacturing related to components and sub-components that go into constructing a modern wind generator. While the economic benefits produced by the construction and operation phases of wind development are important and significant, a substantial portion of the benefits from the investment will result from manufacturing the equipment and will flow to those states and localities that either have or can develop the firms to supply the subcomponents.

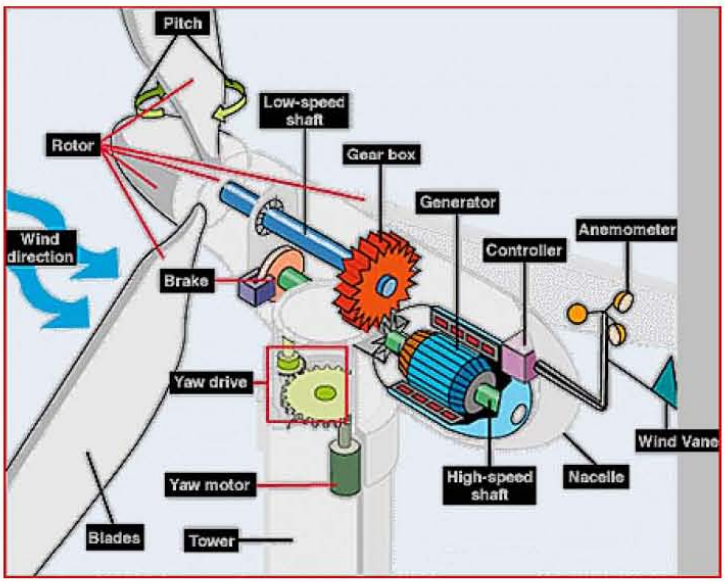


Figure 1 - Wind Turbine Major Components

In order to assess how the benefits could be distributed, this Report takes a modern wind turbine and reduces it to its 20 separate component parts. The Report first identifies 90 companies in 25 states already active in manufacturing these components. However, a large national investment in wind would likely spread beyond these active companies. Hence, as a second step this Report identifies the number of companies with the technical potential to enter the wind turbine market. To identify this potential, the North American Industrial Classification System (NAICS) codes for the 20 components are searched for companies operating in those industry codes. Based on this analysis the Report shows that the manufacturing activity related to the development of wind energy is substantial and widely dispersed. There are 16,163 firms currently operating in one or more of the NAICS codes related to the manufacturing of wind components. These firms are spread over every one of the 50 states, however, they are concentrated in the most populous states, and the states that have suffered the most from loss of manufacturing jobs. The 20 states that, according to our analysis, would receive the most investment and most new manufacturing jobs from investment in wind account for 75% of the total U.S. population, and 76% of the manufacturing jobs lost in the last 3 1/2 years.

U.S. Summary Table – Manufacturing Firms with Technical Potential to Enter Wind Turbine Market

NAICS code	Code Description	Total Employees	Annual Payroll ($1000s)	Number of Companies
326199	All other Plastics Products	501,009	15,219,355	8,174
331511	Iron Foundries	75,053	3,099,509	747
332312	Fabricated Structural Metal	106,161	3,975,751	3,033
332991	Ball and Roller Bearings	33,416	1,353,832	198
333412	Industrial and Commercial fans and blowers	11,854	411,979	177
333611	Turbines, and Turbine Generators, and Turbine Generator Sets	17,721	1,080,891	110
333612	Speed Changer, Industrial	13,991	539,514	248
333613	Power Transmission Equip.	21,103	779,730	292
334418	Printed circuits and electronics assemblies	105,810	4,005,786	716
334519	Measuring and Controlling Devices	34,499	1,638,072	830
335312	Motors and Generators	62,164	2,005,414	659
335999	Electronic Equipment and Components, NEC	42,546	1,780,246	979
Total		**1,025,327**	**35,890,079**	**16,163**

Investment in new wind will create a demand for all of the components that make up a wind generator. As a rule of thumb, every 1000 MW requires a $1 Billion investment in rotors, generators, towers and other related investments. According to a recent analysis done by the Renewable Energy Policy Project (REPP) for a proposed Renewable Portfolio Standard in Pennsylvania, every 1000 MW of wind power developed created a potential for 3000 jobs in manufacturing, 700 jobs in installation, and 600 in operations and maintenance. For the purposes of this Report, a job is defined as one Full Time Equivalent (FTE) employment or 2000 hours of labor. A national program could easily lead to the development over a period of years of 50,000 –77,000 MW or $50 - $77 billion in investments that would in turn drive new orders for manufacturing related to all the components that are required to build a new wind generator.

This Report assumes 50,000 MW will be developed and proceeds in three steps to trace the distribution of benefits. First we determine how the total installed cost of the new wind development will flow into demand for each of the 20 separate components of the turbines (grouped into 5 categories). Second, we spread the total demand among the regions of the country by allocating the $50 billion investment according to the number of employees at firms identified by the NAICS codes. The number of employees is used rather than number of firms to account for the different impact of large vs. small companies, and hence to more accurately distribute the investment. This produces a "map" of manufacturing activity across the United States based on firms that have the technical potential to become active manufacturers of wind turbine components. Third, we translate the regional dollar allocation by assuming that all component manufacturing has the same ratio of jobs/total investment of 3000 FTE jobs/$1 billion of investment.

Employment at Potential Active Companies, Investment and Job Creation Potential
Top 20 States Ranked by Average Investment

State	Employees at Potential Companies	Rotor	Nacelle and Controls	Gearbox & Drive Train	Generator & Power Electronics	Tower	Number of New FTE Jobs	Average Investment ($ Billions)
California	**102,255**	25226	52490	1380	14889	8270	**12,717**	**4.24**
Ohio	**80,511**	30578	33367	6360	3372	6834	**11,688**	**3.90**
Texas	**60,229**	15191	28339	1678	3006	12015	**8,943**	**2.98**
Michigan	**66,550**	27719	30241	2466	926	5198	**8,549**	**2.85**
Illinois	**57,304**	20001	24193	5520	3143	4447	**8,530**	**2.84**
Indiana	**53,064**	18962	20359	4783	2633	6326	**8,317**	**2.77**
Pennsylvania	**50,304**	16647	20844	2565	1997	8251	**7,622**	**2.54**
Wisconsin	**48,164**	17795	21317	3796	567	4689	**6,956**	**2.32**
New York	**47,375**	10855	24188	4020	5966	2347	**6,549**	**2.18**
South Carolina	**20,532**	4398	4510	6780	1765	3079	**4,964**	**1.65**
North Carolina	**30,229**	9431	12814	3142	2036	2806	**4,661**	**1.55**
Tennessee	**28,407**	9761	12513	2128	381	3624	**4,233**	**1.41**
Alabama	**21,213**	6607	7686	927	620	5374	**3,571**	**1.19**
Georgia	**20,898**	6610	8245	2335	253	3456	**3,532**	**1.18**
Virginia	**20,201**	6692	7372	1549	567	4021	**3,386**	**1.13**
Florida	**24,008**	5138	12197	254	1923	4497	**3,371**	**1.12**
Missouri	**23,634**	8389	11031	1202	537	2475	**3,234**	**1.08**
Massachusetts	**27,955**	6956	15952	659	3331	1057	**3,210**	**1.07**
Minnesota	**26,131**	8364	14427	711	1142	1488	**3,064**	**1.02**
New Jersey	**22,535**	8552	10191	819	1299	1675	**2,920**	**0.97**

The results of this initial research into the distribution of manufacturing activity are encouraging. Twenty-five states have firms currently active in manufacturing components or sub-components for wind turbines; all fifty states have firms with the technical potential to become active. The Table provides a breakdown of the twenty states with would receive the greatest portion of the investment, based on the number of employees at potentially active firms identified by the NAICS codes for wind components.

The results indicate that a significant national investment in wind has clear potential to benefit regions of the U.S. other than only those states that have a significant wind resource. Furthermore, investigating the demographics of the top 20 states benefiting from wind manufacturing indicates that investment in wind will particularly target the most populous regions of the country, and will especially benefit regions that are most in need of new manufacturing jobs. The table below juxtaposes the demographics of the top 20 states with the results of this study.

Top 20 States Benefiting from Wind Investment, with Population and Job Loss Demographics

State	Potential Number of Jobs	Average Investment ($ Billions)	2001 Population	Rank in U.S.	Manufacturing Jobs Lost, Jan. 2001 - May 2004*	Rank in U.S.
California	12,717	4.24	34,501,130	1	318,000	1
Ohio	11,688	3.90	11,373,541	7	165,500	3
Texas	8,943	2.98	21,325,018	2	169,600	2
Michigan	8,549	2.85	9,990,817	8	129,300	8
Illinois	8,530	2.84	12,482,301	5	131,500	6
Indiana	8,317	2.77	6,114,745	14	63,500	13
Pennsylvania	7,622	2.54	12,287,150	6	155,200	5
Wisconsin	6,956	2.32	5,401,906	18	68,300	10
New York	6,549	2.18	19,011,378	3	130,500	7
South Carolina	4,964	1.65	4,063,011	26	56,800	17
North Carolina	4,661	1.55	8,186,268	11	156,600	4
Tennessee	4,233	1.41	5,740,021	16	59,700	15
Alabama	3,571	1.19	4,464,356	23	45,300	19
Georgia	3,532	1.18	8,383,915	10	65,700	11
Virginia	3,386	1.13	7,187,734	12	57,500	16
Florida	3,371	1.12	16,396,515	4	56,800	18
Missouri	3,234	1.08	5,629,707	17	36,700	23
Massachusetts	3,210	1.07	6,379,304	13	84,900	9
Minnesota	3,064	1.02	4,972,294	21	38,800	21
New Jersey	2,920	0.97	8,484,431	9	65,400	12
20 State Total	120,017	40	212,375,542		2,055,600	
% U.S. Total	80%	80%	75%		76%	

Notably, the 20 states benefiting the most from investment in wind are almost identically the 20 states that have lost the most manufacturing jobs in the country over the past 3 years. These states account for more than 76% of the manufacturing jobs lost. Investment in wind will particularly benefit these states, sending new jobs where they are needed most. Furthermore, these states are also the most populous, indicating that investment in wind will benefit a large range of people in the country.

Wind Turbine Components

For this Report we broke wind turbines down into 20 separate components. Each component is identified with a ten-digit and therefore a six-digit North American Industrial Classification System (NAICS) code. In addition, we provide technical descriptions of each part. We also describe the Balance-of-System components; however, for this Report we do not count these in the 20 components used to identify manufacturing activity due to the varying nature of Balance-of-System for different installations.

Figure 2 provides a schematic view of a wind turbine's major components.

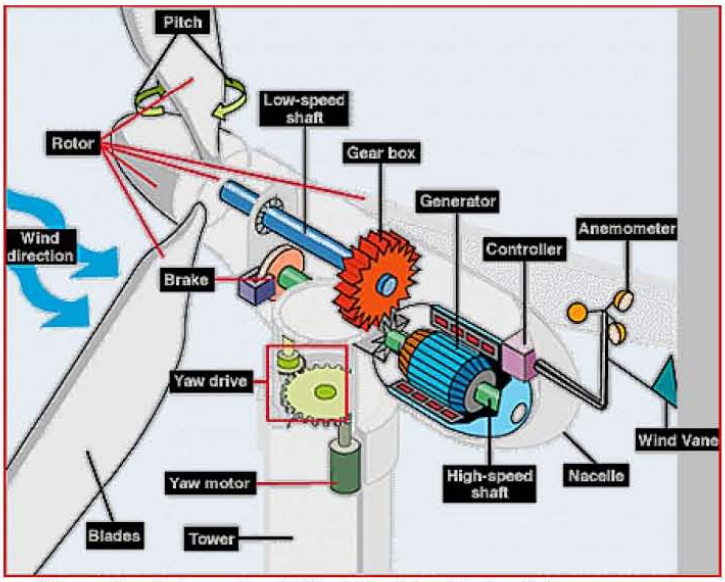


Figure 2 - Schematic of Wind Turbine Major Subcomponents

The nacelle includes:

- An outer frame protecting machinery from the external environment
- An internal frame supporting and distributing weight of machinery
- A power train to transmit energy and to increase shaft speeds
- A generator to convert mechanical energy into electricity
- A yaw drive to rotate (slew) the nacelle on the tower
- Electronics to control and monitor operation

Description of Nacelle Components

Subcomponent	**Description**
Low Speed Shaft and High Speed Shaft	Transmits rotational work from the rotor hub to the gearbox and from the gearbox to the generator.
Gearbox	Converts low-speed rotation from the input shaft of the rotor to high-speed rotation, which drives the high-speed shaft of the generator assembly. Wind turbine gearboxes typically use a planetary gear system.
Coupling	Attaches the gearbox to the generator. Flexible couplings may be used to reduce oscillating loads that could otherwise cause component damage.
Bearings	A number of bearings are required for the shafts, gearbox, yaw mechanism, generator, and other rotating parts.
Mechanical Brakes	A mechanical friction brake and its hydraulic system halt the turbine blades during maintenance and overhaul. A hydraulic disc brake on the yaw mechanism maintains nacelle position when nacelle is stationary.
Electrical Generator	Converts high-speed shaft work into electrical energy
Power Electronics	Couples the generator output to the step-up transformer input, typically with an IGBT bridge, allowing the generator to run at variable speed while still outputting 50 or 60 Hz AC to the grid. Also makes reactive power possible.
Cooling Unit	A large fan drives air to convectively cool the generator and gearbox and exhausts waste heat from the nacelle assembly. Ducting directs cool air to the generator.

Yaw Mechanism and Four-Point Bearing	Rotates the turbine directly into the wind in order to generate maximum power. Typically, four yaw sensors monitor the wind direction and activate the yaw motors to face the prevailing wind. A four-point bearing connects the nacelle to the tower. The yaw mechanism turns the blades 90 degrees from prevailing winds under high winds to reduce stress on internal components and avoid over-speed conditions.
Electronic Controller(s)	(a) A base controller, located at the base of the tower, utilizes PC's and fiber optics to monitor and record performance data, as well as to facilitate communication between both sub-controllers and external parties. (b) A nacelle controller monitors activity within the nacelle assembly. (c) A hub controller, being used in more recent models, communicates directly with the nacelle controller to more precisely monitor rotor activity
Sensors	(a) An anemometer, located on the tower, measures wind velocity and relays data to the yaw mechanism. (b) A wind vane measures wind direction and relays data to the yaw mechanism. (c) A cable twist counter monitors cables within the tower to determine if the turbine has been yawing in one direction for an extended period of time. (d) A thermocouple senses temperature within the nacelle assembly.

The rotor includes:

- Blades, which are generally made of glass-reinforced fiber up to 50m in length. Lighter and stronger carbon fibers are being used in the larger blades.
- Extenders attach the blades to the central hub
- Pitch drives to control the angle of the blades
- The rotor typically has three blades because that number provides the best balance of high rotation speed, load balancing, and simplicity.

Description of Rotor Components

Subcomponent	Description
Rotor Blades	Blades utilize the principles of lift to convert the energy of the wind into mechanical energy. Stall-regulated blades limit lift, or momentum, when wind speeds are too great to avoid damaging the machine. Variable-pitch blades rotate to minimize their surface area and thereby regulate rotational speed.
Pitch Drive	This system controls the pitch of the blades to achieve the optimum angle for the wind speed and desired rotation speed. At lower wind speeds a perpendicular pitch increases the energy harnessed by the blades, and at high wind speeds, a parallel pitch minimizes blade surface area and slows the rotor. Typically one motor is used to control each blade. Power is either electric or provided by hydraulics in the nacelle, and supplemented by a hydraulic accumulator in the event of system failure.
Extenders	These steel components serve as a means to support the rotor blades and secure them to the hub
Hub	The hub serves as a base for the rotor blades and extenders, as well as a means of housing the control systems for the pitch drive. It rotates freely and attaches to the nacelle using a shaft and bearing assembly.

The tower includes:

- Rolled steel tubes connected in series
- Flanges and bolts joining each section
- A concrete base serving as a stable foundation for the turbine assembly

- Concrete segmented towers and hybrid steel/concrete towers may also be used for large turbines in cases where steel tower section transportation is difficult.

Description of Tower Components

Subcomponent	Description
Tower	This component is typically made of rolled, tubular steel, and built and shipped in sections because of its size and weight. Common tubular towers incorporate a ladder within the hollow structure to provide maintenance access. Utility-scale towers range in height from 60-100m and weigh between 200-400 tons.
Base	The base supports the tower and transfers the loads to the foundation soil or bedrock. The foundation size and type depends on the foundation conditions but is typically constructed with steel-reinforced concrete.
Flanges and Bolts	These items join tower segments.

The balance of station includes:

- Electrical collection system: transformer, switchgear, underground and overhead high voltage cable, and interconnecting substation
- Control system: control cable, data collection, and wind farm control station
- Roadway, parking, crane pads and other civil works

Description of Balance of System Components

Subcomponent	Description
Electrical Collection System	(a) Transformers step up voltage transmission in the collector line to convert energy generated by the turbine into usable electricity for utility grids. (b) Underground cables are used to connect the power lines until a standard 25kV overhead collector line may be used. (c) Reclosers and risers act as circuit breakers and isolate a section of the line should there be a power fault. (d) Power substations raise the voltage for standard long-distance transmission.
Communications System	The communications subsystem allows the wind turbines to monitor themselves and report performance to a control station. Data collection equipment and fiber optic cables allow the turbine to monitor and report performance. A control station consolidates data and routes information to the local utility.
Civil Works	Crane pads enable the safe operation of cranes during construction of the turbine and roads provide access during construction and maintenance activities. Maintenance buildings house workers during construction and overhauls.

Identifying Current and Potential Manufacturers

Through phone and internet survey, and by compiling existing databases of manufacturers, REPP created a database of firms that currently manufacture or had recently manufactured one or more of the above components specifically for wind projects. These 90 companies operate in 25 different states, and stand to directly benefit from investment in wind. Several of the companies manufacture more than one component, (most notably GE), and these can be counted as separate manufacturing activities. As such, these 90 companies account for 106 manufacturing activities in the 25 states in which they operate.

Table 1.6 - Wind Component NAICS Codes

Component	Sub component	NAICS 6-digit	Code description	NAICS 10-digit	Code description
Rotor	Blade	326199	All other Plastics Products	A141	Other fabricated fiberglass and reinforced products
	Blade Extender	331511	Iron Foundries	1116	Ductile iron fittings 14 in. or more
	Hub	331511	Iron Foundries	3221	Other ductile iron casting for all other uses
	Pitch Drive	335312	Motors and Generators	30	Integral horsepower motors and generators other than for land transportation equip. (746 watts or more)
Nacelle and Controls	Anemometer	334519	Measuring and Controlling Devices	7025	Other meteorological instruments and parts
	Brakes	333613	Power Transmission Equip.	3111	Friction-type Clutches and Brakes
	Controller	334418	Printed circuits and electronics assemblies	A015	Industrial process control board assemblies
	Cooling Fan	333412	Industrial and Commercial fans and blowers	04	Axial fans
	Nacelle Case	326199	All other Plastics Products	A141	Other fabricated fiberglass and reinforced products
	Nacelle Frame	331511	Iron Foundries	3221	Other ductile iron casting for all other uses
	Sensors	334519	Measuring and Controlling Devices	7	Commercial, Meteorological, Geophysical, and General Purpose Instruments
	Yaw Drive	335312	Motors and Generators	30	Integral horsepower motors and generators other than for land transportation equip. (746 watts or more)
Gearbox and Drive Train	Bearings	332991	Ball and Roller Bearings	3032	Tapered roller bearings (including cups and cones), unmounted
				1023	Complete ball bearings, unmounted, annular, including self–aligning, ground or precision, angular contact, precision
	Coupling	333613	Power Transmission Equip.	3329	Non-gear-type flexible couplings
	Gearbox	333612	Speed Change, Industrial	7438	Enclosed concentric and parallel (Planetary) center distance 6 in. or more
	High and low speed shafts	333613	Power Transmission Equip.	3792	Mechanical power transmission equipment, NEC, except parts
Generator and Power Electronics	Generator	333611	Turbines, and Turbine Generators, and Turbine Generator Sets	0871	Turbine generators
	Power Electronics	335999	Electronic Equipment and Components, NEC	3219	Other rectifying(power conversion) apparatus, except for electronic circuitry
Tower	Tower	332312	Fabricated Structural Metal	5106	Fabricated structural iron and steel for transmission towers, radio antenna, and supporting structures
	Tower Flange	331511	Iron Foundries	116	Ductile iron fittings 14 in. or more

This Report also identifies firms not currently active in the domestic wind manufacturing but reasonably capable of providing components. The Report relied on the NAICS codes to identify the companies that do/could supply an expanded US wind industry. This required associating each component with the correct NAICS code, which was first done at the 10-digit (highest) level of detail to ensure that the codes were accurately identified. The six-digit codes are the standard level of reporting for industry classification, and hence were more useful for this study. For the 20 10-digit component codes there are 12 different 6-digit codes – some of the parts are similar, such as large steel castings, and fall under the same code. For these components that go into a modern turbine, this analysis revealed that there are 16,163 firms that currently operate in one or more of these Industrial classifications. In other words, there are 16,163 firms in 50 states that are now engaged in manufacturing parts or components that are equivalent in terms of manufacturing skills and equipment needs to those required to manufacture components for wind turbines. Our analysis of course does not draw the conclusion that all these firms will benefit. Rather it shows where a technical potential to benefit from a major development of wind exists. This Report shows where these firms are located by state. It is also possible to show these firms on a county-by-county basis.

Since there are already 16,163 firms engaged in manufacturing activities related to those required to manufacture components for wind turbines, a critical question facing policy makers is whether and how to encourage the development of the domestic manufacturing capability. A national commitment to renewable energy will establish the demand for investment, but the development of a strong, competitive domestic manufacturing industry, capable of competing with imports from an already established world industry, will require additional incentives. There are currently a number of incentives for manufacturing ranging from New Market Tax Credits to a variety of economic development zones. A critical part of a national program to expand renewable energy should include a program to collect and focus all available supports for new and expanded manufacturing in order to offer the supports in a "one stop" program. This effort could also include an expansion of the present portfolio of tax credits for firms that locate new or expand manufacturing in certain designated areas.

If the debate over whether or not to make a national commitment to renewable energy is indeed over how widespread the benefits of such a program will be, it is critical that the potential of a large-scale wind development to stimulate precisely the states that have suffered the greatest loss of manufacturing jobs be realized. A federal commitment to renewable energy should be combined with federal supports for manufacturing wind components in order to greatly increase the economic benefits of renewable development, expand the distribution of benefits, and greatly increase the number of people who will see the program as having significant benefits for them.

Cuyahoga County Department of Development

Developing News

Volume IV, Issue 1 Fall 2006

Inside this Issue

New Task Force Studies Alternative Energy

On August 10, 2006, the Cuyahoga County Commissioners unanimously adopted a resolution establishing the Cuyahoga Regional Energy Development Task Force. Prosecutor Bill Mason, who is the attorney and legal counsel for the Commissioners, was asked to serve as chairman of the Task Force.

The 18-member board appointed by the Commissioners will explore, investigate, and implement advanced energy projects that are appropriate for economic development.

The Task Force has set a priority to evaluate the feasibility of a pilot project for the commercial generation of electricity from wind power. It is expected that such a project would serve as a road map and streamline the process for the development of wind as a regional development opportunity.

The Task Force is broken down into five committees: the Site Evaluation Committee, the Finance and Economics Committee, the Technical Development Committee, the Legal and Regulatory Committee, and the Policy Committee. The Site Evaluation Committee is charged with identifying and evaluating sites for one or more wind turbine pilot projects, including at least one in Lake Erie, as well as investigating methods to improve collection of relevant data and expedite the evaluation of wind resources at regional sites. The Finance and Economics Committee will analyze the feasibility of the requirements for pilot wind projects, wind farms, and other aspects of wind power in the region, as well as sources of public and private funding. The Technical Development Committee will analyze and evaluate the technical issues associated with installing, operating, and maintaining wind turbines at selected sites, including Lake Erie. This committee will also discuss other issues, such as interconnection to the power grid. The Legal and Regulatory Committee will identify legal hurdles and requirements relating to the development of wind power in the region, as well as opportunities to streamline legal and regulatory requirements. Finally, the policy committee will analyze state, federal, and local policies and regulations with respect to renewable energy.

"There are tremendous opportunities in this region for economic and environmental benefits that need to be evaluated," said Prosecutor Bill Mason. Cuyahoga County, with its manufacturing base, can become a hub of technology and business expertise in advanced energy.

Prosecutor Mason will report the recommendations of the Task Force to the County Commissioners in February of 2007.

Special thanks to Steve Dever of the County Prosecutor's office for submitting this article.

Wind power along Lake Erie just might fly

Friday, January 12, 2007
Tom Breckenridge, Plain Dealer Reporter

Local leaders propose a windy addition to the Lake Erie horizon - massive wind turbines that would crank out megawatts and spin off research, development and jobs.

An energy task force will recommend to Cuyahoga County commissioners next month that the region pursue a demonstration project of four to 10 turbines, spinning at least three miles out on Lake Erie.

It would be an unprecedented venture - while European countries have water-borne windmills, the United States has none, task force officials said. And there are no freshwater wind turbines in the world, they said.

"We believe it's feasible as a research and development project," said Cuyahoga County Prosecutor Bill Mason, head of the Cuyahoga Regional Energy Development Task Force.

Cuyahoga County commissioners appointed the 22-member task force last summer, with the idea of boosting alternative-energy use in the region and creating a cluster of businesses.

The task force includes some of the area's top legal and business expertise, including companies that could manufacture wind-power components, such as the Lubrizol Corp., Parker Hannifin Corp. and Eaton Corp.

Their preliminary research showed that turbines sitting at least three miles out could catch fruitful wind speeds averaging 16 mph.

Ten turbines could generate up to 20 megawatts, powering tens of thousands of homes and businesses, officials said.

But the project would likely cost tens of millions of dollars and need significant public subsidies, task force members said.

It's unclear where the money would come from. Task force members are already soliciting local foundations and believe funds might be available from Ohio's Third Frontier program, which promotes high-tech innovation, and the U.S. Department of Energy.

Besides money, other daunting issues include environmental impacts, bird flyways, airport flight paths and shipping channels.

Engineering challenges include anchoring towers in a lake that's 50 to 60 feet deep. The towers would stretch 240 feet or more above the water and hold rotating blades that, tip to tip, are longer than a football field. The towers must withstand waves and winter ice.

But encountering the difficulties would generate unique research and development, potentially making the region a hub for off-shore wind power, said Richard Stuebi, the Cleveland Foundation's energy expert.

"We could show industries worldwide we're serious about off-shore" ventures, he said.

He and other task force members are crafting a bid request for commissioners that will accompany the task force recommendation next month.

The county should seek experts to direct the demonstration project and detail how the region would position itself as a center for off-shore wind power development and manufacturing, officials said.

Time will tell whether this is another Cleveland pipe dream or an idea with profound impact.

"I personally think there's potential with this," said David Rosenberg, a market development manager for GE Energy and a task force member. "But there's definitely issues associated with wind out on the water."
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December 28, 2006

THE ENERGY CHALLENGE

It's Free, Plentiful and Fickle

By MATTHEW L. WALD

Correction Appended

Wind, almost everybody's best hope for big supplies of clean, affordable electricity, is turning out to have complications.

Engineers have cut the price of electricity derived from wind by about 80 percent in the last 20 years, setting up this renewable technology for a major share of the electricity market. But for all its promise, wind also generates a big problem: because it is unpredictable and often fails to blow when electricity is most needed, wind is not reliable enough to assure supplies for an electric grid that must be prepared to deliver power to everybody who wants it — even when it is in greatest demand.

In Texas, as in many other parts of the country, power companies are scrambling to build generating stations to meet growing peak demands, generally driven by air-conditioning for new homes and businesses. But power plants that run on coal or gas must "be built along with every megawatt of wind capacity," said William Bojorquez, director of system planning at the Electric Reliability Council of Texas.

The reason is that in Texas, and most of the United States, the hottest days are the least windy. As a result, wind turns out to be a good way to save fuel, but not a good way to avoid building plants that burn coal. A wind machine is a bit like a bicycle that a commuter keeps in the garage for sunny days. It saves gasoline, but the commuter has to own a car anyway.

Xcel Energy, which serves eight states from North Dakota to Texas and says it is the nation's largest retailer of wind energy, is eager to have more. Wind is "abundant and popular," said Richard C. Kelly, the chairman, president and chief executive, speaking at a recent conference on renewable energy.

But Frank P. Prager, managing director of environmental policy at the company, said that the higher the reliance on wind, the more an electricity transmission grid would need to keep conventional generators on standby — generally low-efficiency plants that run on natural gas and can be started and stopped quickly.

He said that in one of the states the company serves, Colorado, planners calculate that if wind machines reach 20 percent of total generating capacity, the cost of standby generators will reach $8 a megawatt-hour of wind. That is on top of a generating cost of $50 or $60 a megawatt-hour, after including a federal tax credit of $18 a megawatt-hour.

By contrast, electricity from a new coal plant currently costs in the range of $33 to $41 a megawatt-hour, according to experts. That price, however, would rise if the carbon dioxide produced in burning coal were taxed, a distinct possibility over the life of a new coal plant. (A megawatt-hour is the amount of power that a large hospital or a Super Wal-Mart would use in an hour.)

Without major advances in ways to store large quantities of electricity or big changes in the way regional power grids are organized, wind may run up against its practical limits sooner than expected.

At a recent discussion of clean energy technologies held at General Electric's research center in Niskayuna, N.Y, Dan W. Reicher, a former assistant secretary of energy for conservation and renewable energy, predicted that renewables, led by wind, could reach 20 percent of demand in the next decade or two. President Bush has also said that wind could supply 20 percent of the nation's electricity.

But Mr. Reicher drew a quick response from James E. Rogers, chief executive of Duke Energy, one of the nation's largest utilities, and chairman of the Edison Electric Institute, the industry's trade association. "I love his optimism," Mr. Rogers said. "But unfortunately, I have to deliver electricity every day."

Mr. Rogers said that wind and another big renewable source that is available only when nature cooperates, solar power, will be necessary because the government would eventually regulate carbon emissions from coal-fired power plants. He later said that his reply to Mr. Reicher had been a "cheap shot," but he and others are still wondering how much wind the nation can absorb.

General Electric, a major maker of wind machines, says that along with lowering the price for a megawatt-hour, engineers have made other improvements in wind machines. With better electronic controls, many of them now help stabilize voltage on the grid, and have been cured of their tendency to shut off when detecting a voltage fluctuation, a problem that can escalate into a blackout.

Juan de Bedout, manager of the electric power and propulsion systems lab at G.E., said this was more important now because wind machines had grown from a few hundred kilowatts to 1.5 megawatts, and his company was exploring machines four times bigger than that. "That's ginormous," he said.

In many places, wind tends to blow best on winter nights, when demand is low. When it is available, power from wind always displaces the most expensive power plant in use at that moment. If wind blew in summer, it would displace expensive natural gas. But in periods of low demand, it is displacing cheap coal.

And in places where suppliers enter bids each day to supply power on the next day, on an hour-by-hour basis, wind is at a disadvantage. Wider use of wind requires the invention of a new kind of weather forecasting, according to the Electric Power Research Institute, a nonprofit consortium based in Palo Alto, Calif., sponsored by the utility industry and its suppliers. Rather than forecasting from temperature or rainfall, what is needed is a focus on almost minute-by-minute predictions of wind in small areas where the turbines are.

The economics of wind would change radically if the carbon dioxide emitted by coal were assigned a cash value, but in the United States it has none. Coal plants produce about a ton of carbon dioxide each megawatt hour, on average, so a price of $10 a ton would have a major impact on utility economics.

Another possibility is energy storage, although this presents other difficulties.

In May, Xcel and the Energy Department announced a research program to use surplus, off-peak electricity from wind to split water molecules into hydrogen and oxygen. The hydrogen could be burned or run through a fuel cell to make electricity when it was needed most. Xcel plans to invest $1.25 million, and the government $750,000. But storage imposes a high cost: about half the energy put into the system is lost.

The Electric Power Research Institute said that existing hydroelectric dams could be used as storage; they can increase and decrease their generation quickly, and each watt generated in a wind machine means water need not be run through the dam's turbines; it can be kept in storage, ready for use later, when it is most needed.

The institute listed another possibility, still in the exploratory stage: using surplus electricity made from wind to pump air, under pressure, into underground caverns. At peak hours, the compressed air could be withdrawn and injected into generators fired by natural gas. Natural-gas turbines usually compress their own air; compression from wind would cut gas consumption by 40 percent, the institute said.

That would help with an important goal, reducing consumption of natural gas, which is increasingly scarce and costly in North America. But not everyone is so sanguine that wind will do that.

Paul Wilkinson, vice president for policy analysis at the American Gas Association, the trade group for the utilities that deliver natural gas, said that wind, while helpful in making more gas available for home heating and industrial use, would still need a gas generator to back it up. And the units used as backup are generally chosen for low purchase price, not efficient

use of fuel.

At the American Wind Energy Association, Robert E. Gramlich, the policy director, said that one solution would be to organize control of the electric grid into bigger geographic areas, so that a drop-off in wind in one place would be balanced by an increase somewhere else, reducing the need for conventional backup. That is among several changes the wind industry would like in the electric system; another is easier construction of new power lines, because many of the best wind sites are in prairies or mountain ranges far from where the electricity is needed.

A problem for new power lines is that they would be fully loaded for only some of the year, since the amount of energy that the average wind turbine produces over 12 months is equal to just 30 to 40 percent of the amount that would result from year-round operation at capacity. That number runs closer to 90 percent at a nuclear or coal plant.

Thus a 1,000-megawatt nuclear plant will produce nearly three times as much electricity as 1,000 megawatts of wind turbines. But operating costs at the wind farm are lower, and the fuel is, of course, free.

Correction: December 29, 2006

An article in Business Day yesterday about the difficulties of relying on the wind to provide electricity included an outdated reference to the company led by James E. Rogers, who expressed some concern about wind energy. It is Duke Energy, not Cinergy, which was acquired by Duke. The article also misstated the size of the wind turbines produced by General Electric. They are 1.5 megawatts, not gigawatts.

Appendix L

CUYAHOGA COUNTY
REQUEST FOR QUALIFICATIONS

Issue date:	**Friday, March 9, 2007**
RFQ:	**REQUEST FOR QUALIFICATIONS OF PROJECT MANAGER SERVICES FOR A FEASIBILITY STUDY CONCERNING THE LAKE ERIE WIND ENERGY CENTER**
Issuing department: **Address:**	Department of Development 112 Hamilton Ave., Fourth Floor Cleveland, Ohio 44114
Using department: **Address:**	Board of Cuyahoga County Commissioners Cuyahoga County Administration Building 1219 Ontario Street, Fourth Floor Cleveland, Ohio 44113
Sealed qualifications will be received until:	**Monday, April 23, 2007 at 12:00 Noon**
All inquiries should be directed to:	Paul Oyaski, Director Cuyahoga County Department of Development 112 Hamilton Ave., Fourth Floor Cleveland, Ohio 44114
Phone:	(216) 443-7535

QUALIFICATIONS ARE TO BE MAILED OR HAND-DELIVERED DIRECTLY TO THE ISSUING DEPARTMENT SHOWN ABOVE. ANY QUALIFICATION RECEIVED AFTER THE TIME AND DATE SPECIFIED ABOVE WILL BE RETURNED UNOPENED TO THE SENDER.

THE ENERGY DEVELOPMENT TASK FORCE
OF CUYAHOGA COUNTY
and
THE BOARD OF COUNTY COMMISSIONERS OF CUYAHOGA COUNTY

REQUEST FOR STATEMENTS OF QUALIFICATION (RFQ) FOR
A FEASIBILITY STUDY CONCERNING
THE LAKE ERIE WIND ENERGY CENTER

Notice is hereby given in accordance with the resolution adopted by the Board of County Commissioners of Cuyahoga County, Ohio, under date of March 8, 2007, that Statements of Qualification from consulting teams will be accepted at the Offices of the Cuyahoga County Cuyahoga County Department of Development, 112 Hamilton Ave., Fourth Floor, Cleveland, Ohio 44114 until 12:00 noon (local time) on April 23, 2007 for the provision of PROJECT MANAGEMENT SERVICES required for the following project:

> Overall project management and completion of a feasibility study for the planning, design, financing, construction and operation of a freshwater offshore wind research/development center, including a demonstration wind energy project of between 5 to 20 megawatts located upon Lake Erie in the vicinity of Downtown Cleveland.

Any proposal received after the closing date will be returned unopened to the respondent. One (1) consulting team will be hired for this project. Information regarding the preparation of Statements of Qualification is available from the Offices of the Cuyahoga County Cuyahoga County Department of Development, 112 Hamilton Ave., Fourth Floor, Cleveland, Ohio 44114 between 8:30 a.m. and 4:30 p.m. The Board of County Commissioners hereby reserves the right to accept any Statement of Qualification, to reject any or all Statements of Qualification, and to waive any formalities should such action be deemed to be in the best interests of the Board to do so.

Background Statement

Cuyahoga County is a political subdivision of the State of the Ohio, headquartered in Cleveland, Ohio. The County employs approximately ten thousand individuals, housed in approximately forty buildings, ten of which are located in downtown Cleveland. Each building consumes electricity generated from coal-fired power plants. Cuyahoga County is seeking to utilize electricity generated from renewable energy sources such as wind-generated power to power its buildings, thereby reducing the County's reliance on coal-fired electricity generation.

Cuyahoga County is bordered to the north by Lake Erie, which is recognized to have substantial wind resources. The County sees the potential for large-scale deployment of wind turbines out in Lake Erie, and the other Great Lakes, to provide

large quantities of renewable energy in the coming decades. Note that President Bush has suggested that the U.S. might obtain 20% of its future electricity needs from wind energy, and the U.S. Department of Energy is developing a roadmap for the wind industry to achieve this vision – including wide scale deployment of wind turbines in the Great Lakes.

Wind projects in the Great Lakes will face different opportunities and challenges than land-based wind projects that are increasingly commonplace in the U.S. The movement towards broad deployment of wind turbines in the Great Lakes is virtually certain to spawn a host of new technologies, products and services to sell to companies that develop Great Lakes based wind projects.

Northern Ohio along Lake Erie collectively possesses many assets and organizations that can serve as the seed for forming an economic cluster for a new freshwater offshore wind industry. Cuyahoga County is pleased to work with its regional partners to bring that cluster into fruition, with the aim of creating substantial employment opportunities and other economic benefits for its citizens.

For this reason, the County seeks to develop a freshwater offshore wind research/development center, including a demonstration wind energy project of between 5 to 20 megawatts roughly 3-5 miles offshore Downtown Cleveland in Lake Erie. This Lake Erie Wind Energy Center ("Center") would achieve a number of objectives simultaneously:

- Demonstrate to all parties the economic and engineering viability of offshore wind generation in Lake Erie and the Great Lakes more generally,
- Reduce the institutional and knowledge barriers, and thereby reduce the costs and time required, to subsequent development of wind projects in Lake Erie (at least the Ohio portion thereof),
- Attract companies to our region, and catalyze the growth of companies in our region, that perform R&D and manufacturing in wind technologies by demonstrating our commitment to advancing the frontiers and possibilities of wind energy – particularly for freshwater offshore application,
- Create a visual icon for the Greater Cleveland area (analogous to the Space Needle in Seattle and the Gateway Arch in St. Louis) for improved public morale and marketing to external audiences

However, no offshore wind energy-generating project has been completed in North America, and no wind project in the world has been installed in freshwater. While the characteristics of Lake Erie are fairly well known, they have never been seriously investigated in connection with a wind project. Because the Lake Erie Wind Energy Center would be innovative on a variety of fronts, the County seeks the assistance of capable professional advisors to assist in its development.

Cuyahoga County, in partnership with the Cleveland Foundation and other stakeholders in our region, intends to retain a PROJECT MANAGER to complete a feasibility study concerning the Lake Erie Wind Energy Center. This Request for Qualifications ("RFQ') is being issued for the purpose of pre-qualifying Project Manager Teams.

This pre-qualification process is part of a two-phase selection process. The second phase will begin promptly upon the selection of an appropriate number of qualified responders, at which time more detailed proposals shall be solicited in a Request for Proposals ("RFP") from one or more of the firms selected by the BOCC based upon their qualifications. While the Cuyahoga Regional Energy Development Task Force is leading the efforts to manage the RFQ and RFP process, leading to a recommendation on the selection of a qualified Project Manager, the BOCC will make the final selection of the Project Manager.

The BOCC seeks Statements of Qualifications from professional services teams with knowledge of wind energy R&D and technical issues and experience in wind energy project development, with particular focus on offshore/marine application. Such firms must be capable of providing scientific and technical advice and consultation on the feasibility, design, construction, financing and operation of the Lake Erie Wind Energy Center.

The scope of services generally shall be more fully defined during the second phase of the selection process and shall include coordinating feasibility and scientific studies, contractual coordination of environmental, architectural and engineering studies and contracts.

Problem Statement

The Board of County Commissioners of Cuyahoga County, Ohio, and the Energy Development Task Force of Cuyahoga County are seeking proposals for the provision of project management services to complete a feasibility study in connection with the planning, design, construction, financing and operation of the Lake Erie Wind Energy Center: a freshwater offshore wind research and development center, including a demonstration wind energy project of between 5 to 20 megawatts upon Lake Erie in the vicinity of Downtown Cleveland.

The Center would be connected to an existing electric power grid of an electric utility service provider. Once the Center is constructed, the BOCC intends to enter into long term contracts for the purchase of the electric power generated by the Center. Meanwhile, at least some portion of the Center's facilities would be available for use by parties to perform R&D testing on wind turbine technologies.

Scope of Work

The Project Management services to be performed in connection with the planning, design, financing, construction and operation of the Center and shall include, but not be limited to the following:

- Establishing, in consultation with BOCC and the County's Energy Development Task Force ("EDTF"), a project philosophy including project objectives;
- Preparation of an overall management plan for the completion of the feasibility study;
- Development of procedures and formats for making periodic reports to the BOCC and the EDTF;
- Development and execution of a process to engage the full spectrum of local stakeholders to ensure community acceptance of the Center and the process by which it is developed;
- Determination of customer requirements for a wind technology research center and consequent R&D and testing facility design and equipment needs;
- Evaluation of legal structure options for Center ownership and recommendation on preferred approach;
- Oversight and coordination of wind resource assessment and energy production projections for the wind project at the Center;
- Development of preliminary budget for the Center;
- Preparation of a Center cost model, based on the preliminary Center budget;
- Development of a capital formation plan for the Center, including private sector debt and equity, public sector debt, and grants from various sources;
- Consultation and assistance on a variety of technical and engineering issues that are likely to arise given the novelty of the Center;
- Preparation of a preliminary schedule for completing the Center.

In addition to the foregoing, PROJECT MANAGER shall coordinate the retention and utilization of scientists, engineers, and other advisors and consultants, and shall provide consultation, technical assistance and advice to the BOCC and EDTF on the following issues:

- Overall feasibility of the Center;

- Environmental matters affecting the Center, such as:
    - Securing of environmental assessments (e.g., NEPA environmental impact statements), such as those required by the ODNR, Army Corps of Engineers, Ohio and US EPA;
    - The identification and evaluation of viable site alternatives, addressing such issues as:
        - proximity of facility to transmission substations with available capacity;
        - proximity to and impact upon commercial shipping and recreational boating;

        - archeological considerations;
    - Viewshed issues and developing a process to obtain public approval (minimizing public opposition/resistance) for site/configuration design;
    - Environmental issues such as: underwater habitat (e.g., fish and other aquatic life) and waterfowl/migratory bird issues
    - Access to site for construction and maintenance of towers and transmission lines;
    - Wave depth and geotechnical issues affecting foundation stability of the facility.

- **Other Regulatory Matters:**

    - Consultation and advice regarding other regulatory matters impacting the Center such as:
        - FAA review
        - Ohio Power Siting Board issues
        - Transmission interconnection
        - Permitting, zoning and other regulatory clearances

- **Advice regarding of site selection and acquisition such as:**
    - Criteria for selecting preferred site, and Center configuration at the Site
    - Method of Procurement of Site (i.e., purchase or lease).
    - Assistance in acquisition of submerged land lease rights through coordination and negotiations with the Ohio Department of Natural Resources and the Cleveland-Cuyahoga County Port Authority

- **Economic Assessment**
    - Wind resource assessment
    - Interviews with wind turbine manufacturers and R&D organizations to determine their needs and preferred relationship with the Center
    - Development of a revenue strategy and associated staffing for the research facilities at the Center
    - Development of financing/partnering strategy for the Center
    - Evaluation of opportunities for public/tax incentives
    - Estimation of site-specific engineering and construction costs
    - Estimation of O&M costs for the wind project at the Center
    - Performance of market study for potential power sales price for the wind energy generated by the Center
    - Assistance in the evaluation and negotiation of power sales agreements

- **Engineering/Technical Assessment Regarding Issues such as:**
    - Power plant design, engineering and construction specifications
    - Interconnection and substation design
    - Power project configuration upon chosen site
    - Research and development facility requirements and design
    - Installation/maintenance access to/from site

- Foundation (accounting for icing issues)
- Turbines (accounting for icing issues and other offshore considerations)
- Equipment procurement
- Operation and maintenance

Minimum Project Manager Qualifications and Experience

The BOCC recognizes that, because of the novelty of the envisioned Center, few if any firms would on their own possess the required competencies to provide the desired PROJECT MANAGER services. Because of this, the BOCC encourages the formation of teams of firms with complementary skills/experience to respond to this RFQ and the subsequent RFP. The BOCC especially encourages the formation of proposal teams that include qualified contributing firms from Northeast Ohio, or firms that intend to establish a business presence in Cuyahoga County, but will not select an unqualified team comprised solely of local firms. The project manager ultimately chosen will be required to establish a business office within Cuyahoga County.

Respondents will be evaluated based upon their qualifications and experience. In order for proposals to be considered responsive, Project Manager Teams must meet possess strong qualifications and experience in the following domains and disciplines:

- Wind turbines and similar large scope wind energy facilities
- Design, construction and operation of research and development facilities
- Offshore/marine EPC management
- Public-private partnerships
- Community engagement with the full spectrum of local stakeholders

As a minimum requirement, respondents must carry insurance coverage, at its own expense, of Professional Liability Insurance (including contractual liability coverage of One Million Dollars ($1,000,000) covering the professional services contemplated by this Request for Qualifications.

Qualification Submission Information

Deliverables

The County discourages overly lengthy and costly statements of qualifications. In order for the County to evaluate qualifications fairly and completely, Project Management teams should follow the format set forth herein and provide all of the information requested.

Qualifications that do not adhere to these formatting requirements may be considered non-responsive. Qualifications should be submitted in a sealed envelope with the name of the primary Project Manager and the relevant RFQ name and number on the front.

Provide **ten (10)** copies of the ***Qualifications Statement***. All submittals will become the property of the Cuyahoga County Board of Commissioners and will not be returned.

SECTION I - INTRODUCTION

Cover page

This must include the title and the complete Project Manager name and mailing address.

Cover letter

Qualifications must include the telephone number of the person the County should contact regarding the qualification.

Qualifications must confirm that the organization will comply with all the provisions of this RFQ, and include a conflict of interest statement. The Project Manager team must provide a brief description of the primary Project Manager and all sub-consultants and disclose the business relationship between the members of the Project Manager team. A primary Project Manager representative authorized to make contractual obligations must sign the cover letter.

Table of Contents

Provide sufficient detail so reviewers can locate all the important elements of your document readily. Identify each section of your response as outlined in the qualification package.

Executive Summary

Provide a high-level overview of your approach, the distinguishing characteristics of your qualification, and the importance of this project to your overall operation.

Team Introduction

The Project Manager team must provide a description of the primary consultant's and any sub-consultant's organizations, including history; number of years your organization has been in business; number of employees and professional status, type of services you provide; legal status of each Project Manager organization, i.e. corporation, partnership, sole proprietor; place of incorporation or formation; and Federal Tax ID number.

SECTION II – PROJECT UNDERSTANDING

Provide the Following Information:

- What do you understand to be the purpose and scope of this project?
- What are the pertinent issues and potential problems related to the project?

Scope of Work/Solution/Project Narrative

- What is your proposed solution to the needs identified by the County?

Deliverables

- Describe the deliverables in specific, and to the extent possible, measurable terms.

SECTION III – METHODOLOGY AND PROJECT MANAGEMENT

Describe the methodology you would use to carry out this project, and the reason for selecting this methodology. Detail the tasks to be undertaken.

Project Schedule

Provide a chart showing project activities that includes the achievement milestones upon which progress payment will be claimed and the approximate dates by which those milestones will be completed.

Evaluation Plan

How will you assess the progress of the project while it is underway?

Describe your project management approach including:

- The method used in managing the project
- The project management organizational structure including reporting levels and lines of authority.

Project Control

Describe your approach to project control, including details of the methods used in controlling project activities.

Project Reporting

Describe your status reporting methodology including details of written and oral progress reporting.

Interface with the County

Describe your contact points with the County including types of communications, and level of interface.

Risk Management

Identify the potential risks and problems which, in your experience, occur on projects of this type. Identify steps that can be taken to avoid or mitigate these problems and steps to be taken should the problem occur. Incorporate activities in the project plan to reduce the occurrence, severity and impact of events or situations that can compromise the attainment of any project objective.

SECTION IV – QUALIFICATIONS AND EXPERIENCE

Team Qualifications

Identify the qualifications that your team brings to this project. Explain what differentiates your team's services from others in the market.

Similar Project Experience

Describe the expertise and experience of your Project Management team providing the proposed services on projects of similar size and construction. Identify key contributions to their success. Provide client contact name, title, address, phone number, and email address for each.

Identify and describe **three** (3) projects in which your Project Management team has participated in the last ten years that have similarities and relevance to this proposed project.

Describe performance record demonstrating experience in completing similar projects on quality control, ability to conform to time schedules, cost estimation and control. Provide examples of systems employed and results obtained. What individuals assigned to the project had responsibilities on the project?

Proposed Personnel & Organization

All proposed key project personnel, including subcontractor staff, must be identified in the qualification. Each person's role is to be identified and documented in the following format:

- Name
- Position with company
- Role in the project
- Experience with the specific tasks being proposed
- Work history on similar projects
- Legal relationship with the Prime or Sub-Project Manager

The BOCC reserves the right to approve or disapprove any change in the successful consultant's project team members whose participation is specifically offered

in the qualification. This is to assure that persons with vital experience and skill are not arbitrarily removed from the project.

Provide an organizational chart including all the personnel assigned to accomplish the work described in your qualification. Designate the person responsible and accountable for the completion of each component and deliverable of the qualification.

Customer References

Include letters of reference from at least three (3) previous clients on projects with similar scope of work. Include contact persons and telephone numbers including area codes.

Contract Performance

If a firm has had a contract terminated due to the consultant's non-performance or poor performance or if a firm has been a party to litigation alleging poor performance or errors on the part of the firm unresolved finding for recovery during the past five (5) years, all such incidents must be described, including the other party's name, address, and telephone number including area code, and the status or disposition of the litigation.

If no such terminations have been experienced by any members of the proposed team in the past five (5) years, so indicate.

Subcontractors

Subcontractors may be used to perform work under this contract. The substitution of one subcontractor for another may be made only at the discretion of the County project manager, and with prior written approval from the project manager. Consultants will be responsible for the subcontractors meeting all terms and conditions of the specifications.

Unresolved Finding for Recovery.

Each team shall include a statement indicating whether an unresolved finding for recovery has been issued by the State Auditor against any member of any firm in the team in accordance with Section 9.24 of the Ohio Revised Code. In the event an unresolved finding for recovery has been issued, the County reserves the right to reject the statement of qualifications or cancel the award for the proposing team.

SECTION VI – REQUIRED FORMS

- Each respondent must complete and submit a Non-Collusion Affidavit **(requires notarization)**

Original signatures required as indicated on form. Copies of the qualification documents will be acceptable only if they contain original signatures and required notarization on all documents.

Blank copies of the above are included in **Appendix A** of this RFQ.

RFQ PROCESS - ADMINISTRATIVE INFORMATION

RFQ Contact

All communications concerning the RFQ must be directed to the contact person listed below. Any oral communication will be considered unofficial and non-binding on the County. Questions may be addressed by fax to: Paul Oyaski, Director of the Cuyahoga County Department of Development, 112 Hamilton Ave., Fourth Floor, Cleveland, Ohio 44114 at (216) 443-7258.

A pre-qualification conference will be held at 2:30 p.m., Wednesday, March 28, 2007 in the First Floor Conference Room at the former Chicago Title Building, 1275 Ontario Street, Cleveland, Ohio 44114. The entrance is on the side of the building.

RFQ/RFP Process

Responses will also be reviewed for qualifications based on RFQ responsiveness, expertise and experience. After the County receives responses to this RFQ, a review committee comprised of members of the EDTF will examine qualifications requiring clarification, and may invite qualified Project Management teams for interviews in April or May of 2007.

The EDTF will draft and issue an RFP to the teams responding to the RFQ that are deemed by the EDTF to be qualified. The proposals will be reviewed by the EDTF and a recommendation will be made to the BOCC to enter into negotiations with a preferred Project Manager team. Subject to BOCC approval, the EDTF would then negotiate final terms and conditions of a consulting contract with the selected Project Manager team.

RFQ Addenda

The County reserves the right to issue addenda to the RFQ at any time. The County also reserves the right to cancel or reissue the RFQ. However, if an addendum is issued less than seventy-two hours prior to the qualification due date, the closing date will be modified accordingly.

Qualification Receipt Deadline

Qualifications will be accepted until 12:00 noon on Wednesday, April 23, 2007 at the Offices of the Cuyahoga County Department of Development, 112 Hamilton

Ave., Fourth Floor, Cleveland, Ohio 44114. Late qualifications will not be accepted, nor will additional time be granted to any particular consultant or team. Qualifications may not be delivered by facsimile transmission or other telecommunication or electronic means. Hand-delivered qualifications must be delivered between the hours of 8:30 a.m. and 4:30 p.m., Monday through Friday, excluding holidays observed by the County.

Qualification Rejection

The County reserves the right to reject any or all qualifications at any time without penalty. The County reserves the right to refrain from contracting with any consultant. The release of this RFQ does not compel the County to award or enter into a contract. The County is not bound to accept the lowest priced qualification or any of the qualifications submitted. The County is not liable for any costs incurred by consultants in the preparation and presentation of qualifications submitted in response to this RFQ.

Appendix A - Blank forms will be added
Appendix B – Contract will be issued & added

[i] Spacing based on an 80 meter rotor diameter.
[ii] The 3 mile guide assures that the project will exceed Burke Lakefront Airport approach zones, not interfere with coastal bird flyways, and avoid recreational boating routes.
[iii] See "*Wind Turbine Development: Location of Manufacturing Activity*, Executive Summary" online at www.repp.org and reprinted in the Appendix. (last visited Feb 6 2007.)
[iv] According to Bruce Bailey, President "Ohio's Offshore Wind Energy Development Potential: A Preliminary Feasibility Study" AWS TRuewind, LLC, Albany, NY. June 24, 2005 – Utility Scale Wind Seminar. Downloaded from http://www.greenenergyohio.org/page.cfm?pageID=709.
[v] See http://www.infozine.com/news/images/articles/07/01/st_bush_energy.jpg. (last visited Jan, 25, 2007).
[vi] See onshore wind maps and analysis of opportunities in the Appendix.
[vii] Options for connecting individual turbines to each other and an onshore power station are outlined in "Options Considered for Connecting Offshore Turbines to the Grid," Appendix: Site Evaluation.
[viii] New American Dream, Renewable Energy Purchases by State and Local Governments, http://www.newdream.org/procure/products/Energy_Purchases.pdf (last visited Jan. 4, 2007).
[ix] *Id*.
[x] Mick Shutt, News Release, Clark Public Utilities, http://www.clarkpublicutilities.com/AboutUs/newsRoom/Archives/2002news/Archives/9-25-02news (last visited Jan. 4, 2007).
[xi] New American Dream, Renewable Energy Purchases by State and Local Governments, http://www.newdream.org/procure/products/Energy_Purchases.pdf (last visited Jan. 4, 2007).
[xii] Mick Shutt, News Release, Clark Public Utilities, http://www.clarkpublicutilities.com/AboutUs/newsRoom/Archives/2002news/Archives/9-25-02news (last visited Jan. 4, 2007).
[xiii] New American Dream, Renewable Energy Purchases by State and Local Governments, http://www.newdream.org/procure/products/Energy_Purchases.pdf (last visited Jan. 4, 2007).
[xiv] *Id*.
[xv] U.S. Department of Energy, Energy Efficiency and Renewable Energy, The Green Power Network, Large Purchasers of Green Power: Montgomery County (MD), http://www.eere.energy.gov/greenpower/buying/customers.shtml?page=1&companyid=327 (last visited Jan. 4, 2007).
[xvi] New American Dream, Renewable Energy Purchases by State and Local Governments, http://www.newdream.org/procure/products/Energy_Purchases.pdf (last visited Jan. 4, 2007).
[xvii] *Id*.
[xviii] *Id*.
[xix] *Id*.
[xx] DSIRE: Incentives by State: Incentives in Colorado, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CO19R&state=CO&CurrentPageID=1 (last visited Jan. 4, 2007).
[xxi] New American Dream, Renewable Energy Purchases by State and Local Governments, http://www.newdream.org/procure/products/Energy_Purchases.pdf (last visited Jan. 4, 2007).
[xxii] City of Boulder, Colorado, *Energy & Climate Change Portal*, http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=1124&Itemid=2150 (last visited Dec. 29, 2006).
[xxiii] *Id*.
[xxiv] New American Dream, Renewable Energy Purchases by State and Local Governments, http://www.newdream.org/procure/products/Energy_Purchases.pdf (last visited Jan. 4, 2007).
[xxv] New American Dream, Renewable Energy Purchases by State and Local Governments, http://www.newdream.org/procure/products/Energy_Purchases.pdf (last visited Jan. 4, 2007).
[xxvi] DSIRE: Incentives by State: Incentives in South Carolina, Conway – Green Power Purchasing, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=SC03R&state=SC&CurrentPageID=1&RE=1&EE=0 (last visited Jan. 4, 2007).
[xxvii] DSIRE: Incentives in California, Davis – Green Power Purchasing, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA26R&Search=Type&type=Purchase&CurrentPageID=2 (last visited Jan. 4, 2007).
[xxviii] DSIRE: Incentives by State: Incentives in Colorado, Fort Collins - Electric Energy Supply Policy, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CO15R&state=CO&CurrentPageID=1&RE=1&EE=0 (last visited Jan. 4, 2007).
[xxix] City of Portland, Oregon, Office of Sustainable Development, *What is Local Government Doing?* http://www.portlandonline.com/osd/index.cfm?&a=111834&c=32927 (last visited Dec. 29, 2006).
[xxx] DSIRE: Incentives in Oregon, Portland – Green Power Purchasing & Generation, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=OR17R&state=OR&CurrentPageID=1 (Jan. 4, 2007).
[xxxi] DSIRE: Incentives in Utah, Salt Lake City – Green Power Purchasing, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=UT06R&state=UT&CurrentPageID=1&RE=1&EE=0 (last visited Jan. 4, 2007).
[xxxii] DSIRE: Incentives in California, San Diego – Green Power Purchasing, http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA41R&state=CA&CurrentPageID=1 (last visited Jan. 4, 2006).
[xxxiii] EPA, Green Power Partnership, http://www.epa.gov/greenpower/index.htm (last visited Jan. 4, 2007).
[xxxiv] EPA Green Power Partnership, Green Power Communities: EPA's Newest Green Power Partners, http://www.epa.gov/greenpower/pdf/GreenPowerCommunities.pdf (last visited Jan. 4, 2007).
[xxxv] EPA, Green Power Partnership, Top Partners: Top 10 Local Government Partners, http://www.epa.gov/greenpower/partners/top10localgov.htm (last visited Jan. 4, 2007).
[xxxvi] *Wind Energy Resource Maps of Ohio*, Prepared for Ohio Department of Development, Office of Energy Efficiency by AWS TruWind, July 13, 2004.