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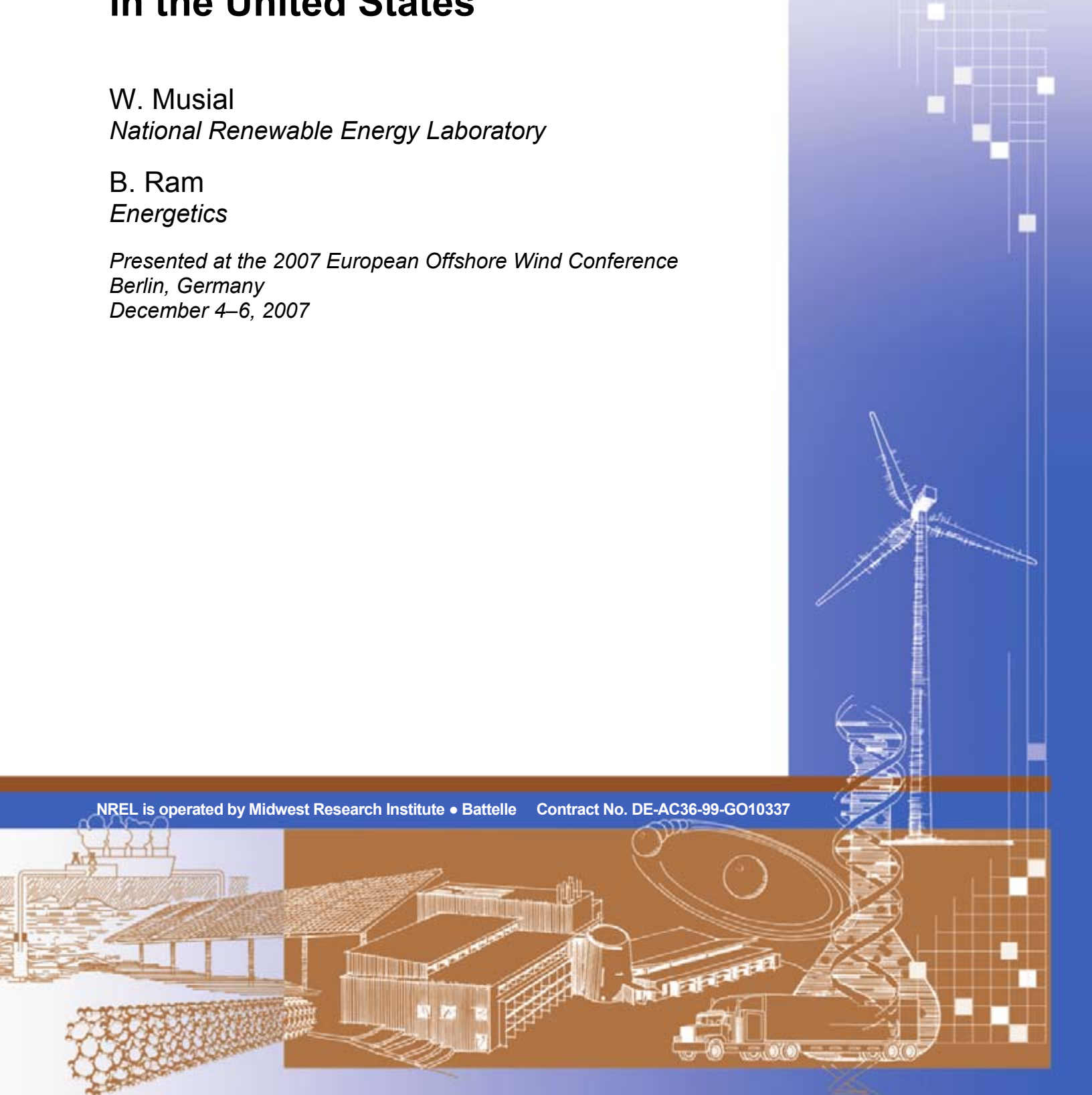

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Status of Offshore Wind Energy Projects, Policies and Programs in the United States*

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Abstract

There are currently no offshore wind energy projects installed in the United States, however, 10 projects ranging from 10 megawatts (MW) to 450 MW and totaling over 1800 MW in rated capacity have been proposed. U.S. policies regarding offshore development and the nascent regulatory approval process are struggling to catch to these commercial interests, and several prospective developers are waiting while government agencies build an approval and management framework. This paper provides the status of the offshore project proposals and describes strategic issues faced by the U.S. industry, such as the inconsistency of the renewable energy production tax credit (PTC), climate change initiatives, transmission constraints, and the evolving permitting requirements between state and federal waters.

Introduction

The United States used 3,548 terawatt-hours of electric energy in 2004 [1]. Seventy-eight percent of this electricity is used in densely populated coastal states. The United States has an abundant supply of both land-based and offshore wind resource and is positioned to become the largest market for wind energy worldwide. The American Wind Energy Association and the U.S. Department of Energy (DOE) will soon publish a report that examines the potential for wind energy to produce 20% of the U.S. electric supply (320 gigawatts) by 2030 [2].

Wind energy deployment in the United States is generally cost driven, which means that the lower-cost, lower-risk, land-based wind energy systems are currently favored by the market. However, as land-based development moves farther from load centers and the pressure to reduce carbon and other green house gas (GHG) emissions intensifies, the added cost and difficulty of transmitting wind generated electricity long distances may sway wind developers and utilities to look offshore for resources to supply electricity to densely populated coastal load centers. Projections show that significant offshore wind energy may be needed to achieve 20% of electricity from wind energy in the United States by 2030 under realistic market scenarios.

Capacity Expansion Potential of Offshore Wind

The first question is whether offshore wind energy can have a major long-term impact on the U.S. energy mix. The answer requires a significant amount of analysis to examine the impact that future cost reductions and other market dynamics could have in expanding the offshore capacity in the

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United States. The Wind Deployment Systems (WinDS) computer model developed by the National Renewable Energy Laboratory (NREL) for DOE [3] was used to analyze the U.S. electricity grid. WinDS is a multi-regional, multi-time-period, geographical information system (GIS) and linear programming model of capacity expansion in the U.S. electricity sector. Although WinDS is designed to address the global market issues, it does not look at a wide variety of local, state, or federal incentives that create a high degree of regionally-dependent economic variability for offshore wind. Nevertheless, two assessments recently conducted by NREL found that offshore wind could contribute significant new capacity to the energy supply by 2030. One study evaluated the potential for wind energy to meet 20% of the U.S. electric supply [4]. In this analysis, offshore wind provided 54 of the more than 300 gigawatts (GW) of total installed wind power capacity. The second assessment looked at specific input assumptions that were found to correlate with high offshore wind energy generation expansion rates [5]. Under one scenario in this study, WinDS predicts that 78 GW of offshore wind will be built. The details of both of these studies are summarized in a recent NREL report on offshore wind energy. [6]

These analyses demonstrated that offshore wind energy can be a major contributor to the future energy mix on the U.S. electricity grid. While these analyses assumed significant cost reductions of 25% to 35% to achieve these levels of expansion, they did not include many of the financial incentives, regulatory requirements or climate change initiatives that might influence project developers and decision makers in moving forward with offshore wind projects. The cost reductions can be achieved through a combined effort of incremental research and development (R&D) innovations and learning curve benefits realized through future deployments planned in both the United States and in Europe. A potentially more difficult side of offshore wind energy development involves public policies, new leasing requirements on the outer continental shelf, assessing potential environmental and health risks and public engagement strategies.

Turbine Supply Shortages

Today, the land-based wind energy market in the United States is providing turbine manufacturers with an outlet for any turbines produced during the next two years. This is resulting in turbine supply shortages both for land-based and offshore projects [7]. With lower risk land-based opportunities, offshore developers are finding it increasingly difficult to obtain serious quotes from offshore turbine suppliers and hence the price for turbines has been inflated and is very speculative. This has obviously had at least a short-term negative impact on the initiation of an offshore wind energy industry in the United States. This problem may be remedied by the possibility of more offshore turbine manufacturers entering the marketplace in Europe during the next few years.

Regulatory Uncertainty

The regulation and permitting of offshore wind turbines were not addressed by federal authorities and legislators in the United States until almost 4 years after the first project was proposed by Cape Wind Associates in 2001. The Energy Policy Act of 2005 (EPAct) granted authority to regulate offshore wind turbines on the outer continental shelf (OCS) to the Minerals Management Service (MMS); the agency that is currently responsible for the regulation of oil and gas [8]. This authority includes any project that extends outside of 3 nautical miles (nm) from the shore. (In the case of Texas and the Florida Gulf coast, this boundary is set at 9-nm.) Projects inside of 3-nm are under the jurisdiction of the individual state governments but must still abide by several federal laws. The two projects that were already in the permitting pipeline (Cape Wind and LIPA) were granted exemptions in EPAct 2005 that allowed them to proceed with their permitting and environmental assessments while new federal rules were being developed. All other project proposals were put on hold until these new rules are issued by MMS. This temporary hold on new projects included not only the permitting process for wind turbine installations, but also the installation of meteorological towers and data collection needed to support site evaluations. In November 2007, MMS announced an interim policy for limited term leases to allow developers or researchers to install anemometer

towers at selected sites for the purpose of data collection. This will allow the start of long-term data collection for new projects [9] without promising rights to the site. A temporary hold remains in effect for any installation of wind turbines, except Cape Wind and LIPA, which are being treated individually. In addition, MMS imposed an informal moratorium on new project applications until the new rules are adopted. MMS recently released a Final Programmatic Environmental Impact Statement (PEIS) that provides a framework to assess the broad, regional environmental issues that all projects will have to consider—each project going forward may be required to produce an EIS document (see: http://ocsenergy.anl.gov/documents/fpeis/index.cfm.) The final rulemaking process on competitive leasing and operational management is still underway and may not be completed until late 2008 or early 2009.

In spite of the hold on projects in federal waters, the number of offshore wind projects in the United States has grown steadily since 2005. This phenomenon is due to the increasing pressure on densely populated coastal states that do not have significant land-use space for wind projects to fulfill their renewable energy obligations (see RPS discussion below). Several coastal states have proposed wind energy supply projects in state waters (inside 3-nm) where MMS jurisdiction does not apply.

Summary of Public Policies

Long-term, stable public policies are critical in furthering the growth of offshore wind development in the United States. This section briefly reviews various measures that have affected, and will continue to affect, the development of offshore wind energy and other renewable energy sources. It addresses three principal types of public policy:

- Policies to affect demand
- Policies to reduce the costs of renewables
- Policies to address climate change and control greenhouse gas emissions.

Policies to affect demand include those that encourage utilities and other buyers to increase purchases of renewable energy. They include purchase requirements such as state renewable portfolio standards. Renewable purchase goals for federal government agencies are also common, as established by the Executive Order. Finally, they include voluntary green power purchases, which are often facilitated by the trading of renewable energy certificates (RECs).

Renewable Portfolio Standards: State renewable portfolio standards (RPS) require affected electricity suppliers in the state to include—by some future date—a specified percentage of energy from renewable sources in the electricity they deliver to their retail customers. The types of resources that qualify for the requirement are specified. Once a requirement is set (e.g., that every investor-owned utility provide 10% of its retail energy from specified renewable resources by 2010), the market of developers and buyers determines which renewable technologies to develop and at what price. In many states, an RPS mechanism is accompanied by a renewable energy certificates (RECs) program (covered later). RPS policies are often enforced through penalties on any affected entity that fails to meet its renewables purchase requirement. The net effect of an RPS policy is to increase the demand for wind and other renewable resources by removing the provider's ability to decline those resources based on cost. In the 1990s, several states began enacting RPS programs and, today, more than half of the states have mandatory or voluntary renewable energy targets. RPS requirements have been established in 25 states, plus the District of Columbia. In general, the cost of an RPS program will be determined by the availability of renewable resources, the size of the percentage requirement established for renewables, and how soon utilities must meet the requirement. The design of an RPS program is often a critical factor in whether wind and renewable energy are successfully developed [10].

Renewable Energy Certificates: Renewable energy certificates (RECs) or credits are a mechanism created by a state statute or regulatory action to make it easier to track and trade renewable energy. An REC program establishes a tradable credit for each unit of energy produced from qualified renewable energy facilities, thus separating the renewable energy attribute from its value as a commodity unit of energy, and a single REC with a unique identification number is issued for each unit of renewable energy produced. Under a REC regime, each qualified renewable energy producer has two income streams—one from the sale of the energy produced, and one from the sale of the RECs. The RECs can be sold and traded and their owners can legally claim to have purchased renewable energy. In states that have both RPS and REC programs, a load-serving entity can satisfy its RPS obligation by buying and retiring an amount of RECs equal to that obligation.

Voluntary Markets: Voluntary or "green power" markets provide consumers with the option to purchase or support renewable energy for a portion or all of their electricity needs. Renewable energy purchases are made on a voluntary basis and are largely driven by consumer interest in using cleaner and more sustainable energy sources. Today, more than 50% of U.S. consumers have the option to purchase renewable energy through their utility or electricity provider, generally at a premium above standard electricity rates. More than 600 utilities across the United States—including investor-owned utilities, municipal utilities, and cooperatives—offer a green pricing option with more than 500,000 electricity customers [11]. As of yet, no U.S. offshore developer has used this market incentive.

Production Tax Credits: Production tax credits (PTCs) are tax credits offered by the federal government to a power generator per kilowatt-hour of electricity produced, which encourages electric generation from certain energy sources. In the case of wind energy, the current tax credit is an offset to corporate income taxes and is currently set at 2.0 cents per kWh for the first 10 years (adjusted annually for inflation) of electricity produced. These tax savings reduce the cost of wind energy production and allow the wind producer to reduce the offered price for wind energy. The tax credit is available to entities with a tax liability large enough to take advantage of the tax credit, which generally includes utility-scale wind projects. Most U.S. offshore wind energy developers can benefit from the PTC. The PTC was most recently renewed in the Energy Policy Act of 2005, with an additional extension through January 1, 2008. Historically, the short-term cycles of PTC renewals (typically every 2 years) has contributed to a boom-bust cycle for U.S. wind development and a lack of long-term capital investment [12].

Clean Renewable Energy Bonds (CREBs): EPAct 2005 provided electric cooperatives and public power systems with the ability to issue clean renewable energy bonds (CREBs). CREBs deliver an incentive comparable to the PTC that is available to private developers and investor-owned utilities (IOU) that are not eligible for the PTC. A CREB is a special type of bond that is equivalent to an interest-free loan for financing qualified energy projects for a limited term. Entities qualified to issue CREBs include governmental bodies, Indian tribal governments, mutual or cooperative electric companies, and clean energy bond lenders.

Public Benefits Funds: Public benefits funds (PBFs) are public trusts dedicated primarily to supporting energy-efficiency and renewable-energy projects. The funds are collected either through a surcharge on retail electric bills or through specified contributions from utilities on a statewide basis. Twelve states with publicly managed clean energy funds have formed a Clean Energy States Alliance (CESA) to coordinate PBF investments in renewable energy resources. PBF investments can include direct funding for experimental technologies or purchases of renewable energy for targeted public purposes (e.g., the Hull Municipal demonstration project received a forgivable loan from the Massachusetts Renewable Energy Trust Fund, a PBF).

Climate Change Policies: Because electricity generation contributes almost 40% of the total GHG emissions and creates other air, water, and waste pollutants, policies to address climate change and GHG emissions are central to the deployment of offshore wind. Current regulations address conventional pollutants that impact local and regional air quality and human health, but national limits on GHG emissions have not been implemented. Recently, the U.S. Supreme Court ruled that carbon emissions from vehicles can be regulated as a pollutant—a decision that is likely to have long-term impacts on GHG policy. Many state governments are forming regional alliances to commit to GHG reductions, and industries are calling on the U.S. Congress to enact a national carbon policy. Policy options being considered to reduce GHG emissions include implementing strict limits on the amount of total emissions or rate of emissions from each source, or market-based approaches that impose a market price on emissions, such as carbon fees or a "cap and trade" carbon trading system.

An increasing number of state legislatures are mandating significant GHG reductions through market-based policy reforms. For example, the Regional Greenhouse Gas Initiative (RGGI) was formed as an agreement among 11 Northeastern and Mid-Atlantic States to reduce carbon dioxide emissions, and all but one of these states has a coastal or lake-front border. Through the RGGI initiative, the states will develop a regional strategy to control greenhouse gases.

All told, U.S. policy is trending toward stricter control of carbon emissions and greater incentives for renewable energy. Offshore wind projects tend to be in the geographic center of this activity and stand to benefit as the U.S regulatory and policy environments mature.

Project Highlights

Today, offshore wind in the United States may already be able to compete in high-priced electric markets where unique combinations of economic incentives at the state and local levels have spawned a variety of offshore project development proposals. The picture for offshore development is continually changing and will likely be different by the time this paper is published, but a quick assessment of each project will illustrate the various market drivers and the complexity of the current situation. Each project is listed in Table 1 and shown geographically in Figure 1. A text description of each project is also given below (projects are listed in geographic order from North to South except Cuyahoga which is located inland on Lake Erie).

Hull Municipal: Hull Municipal Power Company proposed a 12-turbine, 20-MW wind farm located approximately 2 miles off shore from Nantasket Beach in Hull, Massachusetts. The proposed project, located near Harding Ledge, will comprise approximately 4 turbines with a rated capacity of 3 MW to 5 MW, depending on availability, in water depths of 6 to12 meters just outside of Boston Harbor. The project was proposed in 2005 and received $1.7 million in the form of a forgivable loan from the Massachusetts Technology Collaborative to perform the preliminary site assessments. Because it is located in Massachusetts state waters, the project has been allowed to progress without regulatory interruption imposed by the federal rulemaking that is underway with MMS. The project is being conducted by Hull Municipal Power Company partnering with the University of Massachusetts, Massachusetts Technology Collaborative, and ESS Inc. The project is expected to deliver an amount of energy that exceeds the demand of the town of Hull, Massachusetts. The project has begun collecting wind-speed data from a 10-m meteorological station on a small island adjacent to the project in conjunction with a LIDAR system to collect additional long-term wind-speed records. The project is also collecting wave and current data with an acoustic doppler profiler. Sub-bottom acoustic profiling and side scan sonar studies have already been completed. Offshore borings (for the foundation design) and vibracores (for the cable route) are expected to be completed in January 2008.

Patriot Renewables LLC: Patriot Renewables, LLC, is studying the feasibility of siting an offshore wind farm project in Buzzards Bay located in Southern Massachusetts. The proposed project has a 300-MW installed capacity provided by 90 – 120 turbines that may be rated at 2.3 – 3.6 MW each depending on the model selected. They will be spaced approximately ¼ – ½ miles apart. The project is located in Massachusetts state waters approximately 1 to 3 miles offshore. The final turbine locations will depend on equipment selection, environmental factors and wind regime. Currently three different sites in Buzzards Bay are being evaluated. The sites are in relatively shallow waters and protected from the heavy seas found in open waters. The south coast offers several locations near existing lines and transmission stations that make it affordable to connect to the existing power grid.

Patriot Renewables submitted an Environmental Notification Form (ENF) to the Commonwealth's Secretary of Environmental Affairs in May 2006, indicating their interest in pursuing the 300-MW offshore wind project. The secretary returned a certificate specifying the required environmental studies and permitting needed to realize the project. Avian concerns are at the top of the list. Therefore avian field studies have been conducted for the past 1.5 years and specialists are analyzing the data to estimate the potential impact of a wind project in Buzzards Bay. From this analysis they will determine the best of three general areas and produce a final project design. A design based on this field work is expected in mid 2008. In addition, a meteorological campaign is underway between a land-based met tower on Cuttyhunk Island and an experimental barge-mounted MET tower in Buzzard's Bay.

Table 1 – Summary of Offshore Wind Energy Projects in the United States – Dec 2007

Developer	Project Location	Number of Turbines Proposed	Project Size (MW)
Hull Municipal	Off Nantasket Beach, outside Boston Harbor, Hull, Massachusetts	4	15
Patriot Renewables LLC	Buzzards Bay, Massachusetts	90–120	300
Cape Wind Associates	5.2 miles off South Yarmouth, Nantucket Sound, Massachusetts	130	468
Winergy Power LLC	Off Plum Island, New York	2-3	10
LIPA & Florida Power and Light	5 miles off Jones Beach, Long Island, New York	40	150
State of New Jersey	New Jersey Shore - TBD	TBD	350
Delmarva Power and Light / Bluewater Wind LLC	11 miles off Rehoboth, Delaware	150	450
Southern Company	Off Savanna, Georgia	3-5	10
Wind Energy Systems Technologies (W.E.S.T.)	Galveston, Texas	50–60	150
Superior Renewable Energy (Cancelled)	Off South Padre Island, Texas	100+	500
Cuyahoga County, Ohio	Cleveland, Ohio	4-6	20

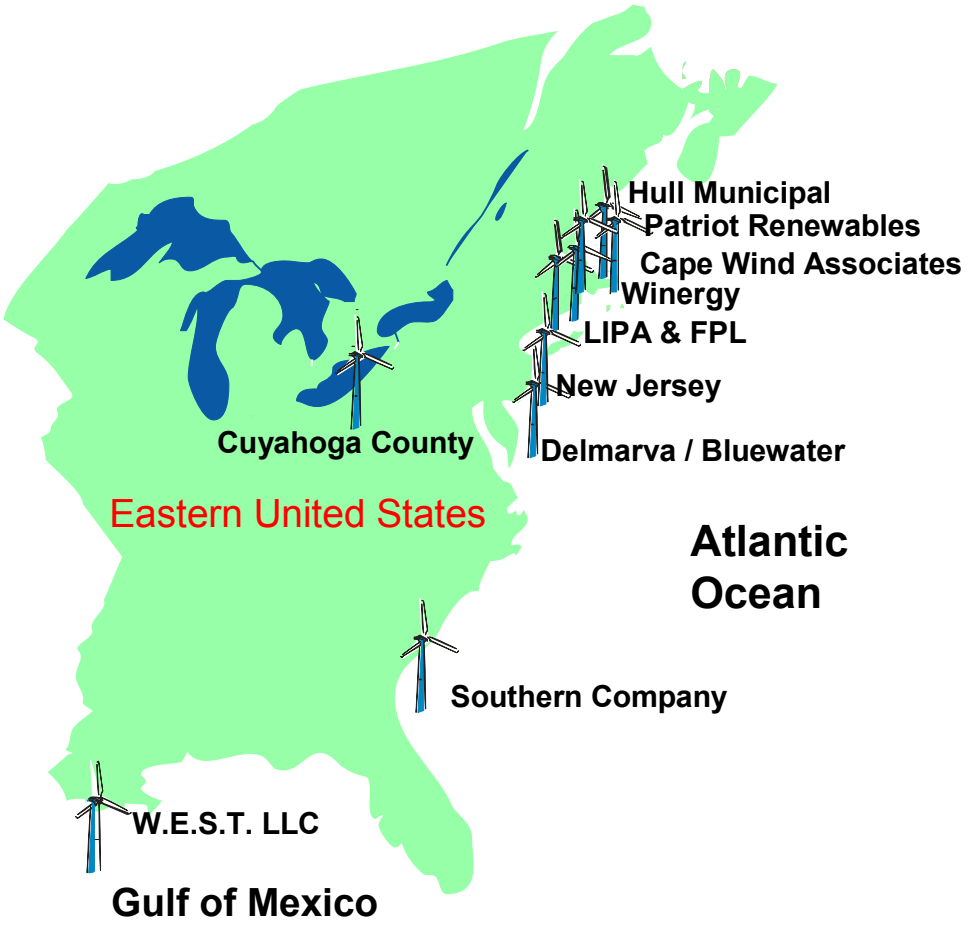

Figure 1 – Map of U.S. Offshore Wind Projects, December 2007

Cape Wind Associates: Cape Wind Associates proposed America's first offshore wind farm on Horseshoe Shoal in Nantucket Sound in 2001. The project will consist of 130 wind turbines with a total rated capacity of 468 MW. The electricity produced by the project will be delivered to Cape Cod via a submarine cable. In average winds, the Cape Wind project is expected to provide three quarters of the electricity needs for the Cape and Islands. Cape Wind will be 5.2 miles from Point Gammon, a private island in South Yarmouth, 5.6 miles from Cotuit, 6.5 miles from Craigville Beach on Cape Cod. Cape Wind will be 9.3 miles from Oak Bluffs and 13.8 miles from the town of Nantucket.

At the time the Cape Wind permitting process began there was no specific national jurisdiction and oversight for offshore wind projects in federal waters. Acting in its authority under Section 10 of the Rivers and Harbors Act of 1899, the U.S. Army Corp of Engineers (USACE) assumed the lead in coordinating the permitting process. The USACE required the preparation of an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA). Cape Wind Associates, initially applied for two Section 10 permits to install a meteorological tower and turbine array within federal waters. Approval to install the 198-foot (60-m) tower was granted in 2002 after some legal challenges were overcome. Three years after the application was submitted, in November 2004, the USACE released the 3800-page Cape Wind Energy Project DEIS for public comment. In general, the project has public support based on several regional and local polls that

have been taken, and is supported by the region's leading environmental groups including Conservation Law Foundation, Union of Concerned Scientists, the Natural Resources Defense Counsel, and others. However, some well-funded local opposition groups have fought the project from its onset, claiming that a wind energy project in Nantucket Sound will disturb the natural beauty of the region.

In August 2005, MMS assumed authority as the lead agency overseeing the permitting process of offshore wind developments in federal waters. MMS recognized that Cape Wind had already progressed through a significant portion of the required permitting process and allowed this project and the LIPA project in New York to proceed as special cases. However, MMS required additional information and requested a new DEIS to address the new aspects of its jurisdictional authority, which will include a "cradle to grave" approach. The MMS DEIS is projected to be reissued for public comment in December 2007, and issuance of the final document is expected in 2008.

Winergy Power LLC: Winergy Power LLC is proposing a 10-MW offshore demonstration project near Plum Island, New York, consisting of 2 or 3 turbines that may range from 3.6 MW to 5.0 MW in rated capacity. The Plum Island Wind Park will be located in waters 2.1 miles east of Orient Point off the northeastern tip of Long Island, New York, and 457 m from Plum Island. According to Winergy, the site was selected because of its relatively remote, yet accessible location, its relatively strong winds, and the accessibility of transmission lines and a nearby substation. The Plum Island Wind Park is a privately funded research, development, and demonstration project that Winergy expects to serve as a proving ground for a new technology that will enable the company to locate offshore wind energy farms in deeper water, considerably farther from land than is currently possible. As such, they have proposed that the foundation may vary from standard monopole foundations to jack-up barge type foundations in water depths that vary from 3.3 m to 13.7 m. In June 2007, Winergy filed an application with the New York district of the Army Corp of Engineers that was closed to public comment in August 2007. They are now in the process of responding to comments submitted. A copy of the public notice may be viewed at http://www.nan.usace.army.mil/business/buslinks/regulat/pnotices/200500367.pdf

LIPA & Florida Power and Light (FPL): Discussions began in Long Island, New York, to build a 140-MW offshore wind farm among the Long Island Offshore Wind Initiative (LIOWI), involving numerous stakeholder organizations. In early 2003, the Long Island Power Authority (LIPA) issued a Request for Proposals to develop, construct, own, and maintain a 100 MW to 140 MW offshore wind park. The LIPA Board of Trustees approved negotiations for a power purchase agreement with proposed developer FPL Energy in June 2004. The offshore wind park proposal consists of 40 turbines with an installed capacity of 140-MW located 3.7 miles southwest of Robert Moses State Park. The project, which would cover an 8-square-mile area, would be one of the largest renewable projects in New York State. On April 26, 2005, the LIPA and FPL Energy filed a joint application with the U.S. Army Corps of Engineers seeking authorization to install the 140-MW offshore wind energy park off the south shore of Long Island.

In August 2005, MMS assumed authority as the lead agency overseeing the permitting process of offshore wind developments in federal waters. MMS recognized that LIPA had already progressed through a significant portion of the required permitting process and allowed this project, like Cape Wind, to proceed as a special case, allowing LIPA to submit their DEIS under a customized set of rules. Recently, a management change at LIPA and speculation about rising offshore wind power costs prompted LIPA to commission a study confirming LIPA concerns about cost. As a result, the project is now in jeopardy of being cancelled. A final decision has not yet been made.

New Jersey: In October 2007, the New Jersey Board of Public Utilities announced plans to offer up to $19 million in funding for a demonstration offshore wind project. The state is looking for a company that can build a project with a total installed capacity of up to 350 MW. Ten percent of the $19 million incentive would be provided up front to help companies conduct the needed studies and

prepare permit applications. Companies must be able to show an ability to finance construction through market sources, which may include tax exempt bond financing through the U.S. Economic Development Administration. Wind developers have until Jan. 16, 2008 to file their proposals. The grant is expected to be awarded in March 2008. An area 20 miles offshore from Seaside Park to Stone Harbor has been identified as a possible site for the demonstration project.

Delmarva Power & Light/Bluewater Wind LLC: In response to state legislation to address energy prices, Delaware's largest electric power utility, Delmarva Power & Light, issued a Request for Proposals (RFP) in December 2006 for the construction of a new power plant in Delaware. Bluewater Wind, a prospective offshore wind developer, submitted a proposal to build a 600-MW offshore wind project at one of three possible sites. After reviewing the proposals submitted (including coal and natural gas), the state of Delaware ordered Delmarva to negotiate with Bluewater Wind. In its current configuration, the Delmarva/Bluewater wind farm has a total capacity of 450 MW consisting of 150 3-MW turbines, is located 11 miles from shore, and is estimated by Bluewater to cost $1.6 billion. Visualization studies have shown minimal aesthetic impact from shore, and the project has very strong public support [13]. In late September 2007, Bluewater Wind was acquired by Babcock and Brown, which has bolstered the company's viability and ability to follow-through with the project. Delmarva and Bluewater are required to complete negotiations by December 10, 2007, with Delaware State agencies passing on the power purchase agreement before the end of 2007.

Southern Company: Southern Company is the largest wholesale provider of electricity to the southeastern United States. In 2004, they began a study with Georgia Tech that proposed a 10-MW demonstration project off the coast of Savannah, Georgia. Although the project's original concept included installation of 3 to 5 turbines, depending on availability and size, that could be located several miles offshore, a commercial-scale farm was included for consideration during the course of the study. If built, this project would mark the most significant step toward renewable energy for Southern Company, which, to date, has been rooted in fossil and nuclear generation. The most attractive geographic feature for offshore wind in Georgia is the extensive shallow water shelf, known as the South Atlantic Bight, which could allow the installation of wind turbines many miles offshore using shallow water technology that has been proven in Europe. This project would be installed beyond the 3-nm state boundary because near-shore wind speeds are considered too low for an economically viable offshore project. Therefore, it is subject to MMS rulemaking due to be complete in late 2008. The initial study was completed in March 2007, but additional work toward potential project development has been on put hold until MMS completes its rulemaking. Wind speed data have been collected from platforms located at intervals of approximately 40 miles and 10 miles out to sea. Using this data and other economic variables, potential sites for the project were identified in the study report.

Wind Energy Systems Technologies (W.E.S.T.): Wind Energy Systems Technology (W.E.S.T.), founded by experienced offshore oil and gas people, is planning several offshore wind projects along the Texas coast. The primary project with Galveston-Offshore Wind, a division of W.E.S.T., involves an offshore lease for 11,355 acres approximately 7 miles off the coast of Galveston, Texas. This project is being promoted in Texas state waters with full support from the State of Texas and the Texas Land Office. This allowed work to begin on construction of two meteorological towers during the summer of 2007. The project is expected to be 150-MW in capacity and will comprise approximately 50 wind turbines. Recently, W.E.S.T. acquired 4 additional leases from the Texas State Land Office and is authorized to proceed with development on these tracks as well.

Superior Renewable Energy: In May 2006, the Texas Land Office granted Superior Renewable Energy the rights to construct a 500-MW wind farm on a 39,900-acre tract of submerged land in the Gulf of Mexico just off the coast of Padre Island and south of Baffin Bay. The project was cancelled in 2007 after Superior Renewables deemed the costs for offshore wind to be too high.

Cuyahoga County, Ohio: Cuyahoga County in Ohio set up an energy task force to look at various forms of sustainable energy for the region that has focused on offshore wind as a major component of their plan. The task force has commissioned a study in 2007 that will investigate the feasibility of a 20-MW wind farm to be located approximately 3.5 -miles off the coast of Cleveland, Ohio, in the shallow waters of Lake Erie. The project is unique because it is the only fresh water project underway in the United States at this time. Because it is in the Great Lakes, it is not subject to the regulations being developed by MMS. Wind-speed data is currently being collected at this site from a 50-m MET tower that is located on the Cleveland Crib—the intake for the fresh water supply that serves the city of Cleveland.

Summary of U.S. Activity

There are at least 10 active offshore wind energy projects in the United States as of December 2007, ranging in size from 450-MW to 10-MW. None of the projects have made it past the planning stage yet. Regulatory delays, turbine supply shortages, uncertainty about true costs, and public acceptance issues are hampering progress. However, at the same time, enhanced renewable energy policy incentives, increased environmental concerns, looming energy supply shortages, and rising fossil fuel prices are making the economic viability of offshore wind seem more attractive. Although all of this makes the short-term national trend difficult to define, in the long term, offshore wind must be considered as a serious part of the electric energy portfolio as the United States comes to terms with major energy issues.

References

1. Energy Information Agency Web site http://www.eia.doe.gov/cneaf/electricity/epa/sales_state.xls, accessed May 23, 2006
2. Advanced Energy Initiative, White House Economic Counsel, February 2006. http://www.whitehouse.gov/stateoftheunion/2006/energy/energy_booklet.pdf
3. Short, W., Blair, N., Heimiller, D., and Singh, V., *Modeling the Long-Term Market Penetration of Wind in the United States*, 15 pp., NREL Report No. CP-620-34469, 2003.
4. National Renewable Energy Laboratory, Department of Energy, and American Wind Energy Association. 2008. *20% Wind Energy by 2030* (to be published in Jan. 2008), NREL, Golden, CO.
5. Short, W. and Sullivan, P., "Modeling the National Potential for Offshore Wind," Proceedings of Windpower 2007, Presented in Los Angeles, June 2007.
6. Musial, W.D. and Ram, B., "*Large-Scale Offshore Wind Power in the United States: Assessment of Opportunities and Barriers*", NREL Report - NREL/TP-500-40745 – 175pp, Expected Dec 2007.
7. Johnson, K., "Alternative Energy Hurt by a Windmill Shortage: While Projects in U.S. Stall, Europe's Utilities Expand Their Reach", *Wall Street Journal*, July 9, 2007.
8. EPAct 2005 section 388. Available at http://energy.senate.gov/public/_files/ConferenceReport0.pdf or http://www.mms.gov/offshore/RenewableEnergy/EPAct2005Sec388.pdf
9. DEPARTMENT OF THE INTERIOR Minerals Management Service Request for Information and Nominations of Areas for Leases Authorizing Alternative Energy Resource Assessment and Technology Testing Activities Pursuant to Subsection 8(p) of the Outer Continental Shelf Lands Act, as Amended. Federal Register, Vol. 72, No. 214 / Tuesday, November 6, 2007 / Notices.
10. Wiser, R., K. Porter, and R. Grace. 2004. *Evaluating Experience with Renewable Portfolio Standards in the United States*. Berkeley, CA: Lawrence Berkeley National Laboratory. LBNL-54439. http://eetd.lbl.gov/EA/EMP/reports/54439.pdf

11. Bird, L. and B. Swezey. 2006 *Green Power Marketing in the United States: A Status Report*. Golden, CO: National Renewable Energy Laboratory. NREL/TP-640-40904 http://www.eere.energy.gov/greenpower/resources/pdfs/40904.pdf.
12. Chen, C., R. Wiser, M. Bolinger. 2007. *Weighing the Costs and Benefits of Renewables Portfolio Standards: A Comparative Analysis of State-Level Policy Impact Projections*. Berkeley, CA: Lawrence Berkeley National Lab. Report No. LBNL-61580. http://eetd.lbl.gov/EA/EMP/reports/61580.pdf
13. Firestone, J., Kempton, W., and Krueger, A. "Delaware Opinion on Offshore Wind Power", University of Delaware College of Marine and Earth Studies, Interim Report, January 2007. http://www.ocean.udel.edu/windpower/docs/DE-survey-InterimReport-16Jan2007.pdf

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