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Government Incentives for the Development of Offshore Wind Energy in the United States: A Study of Incentives Needed to Support a New Clean-Energy Industry

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GOVERNMENT INCENTIVES FOR THE DEVELOPMENT OF OFFSHORE WIND ENERGY IN THE UNITED STATES: A STUDY OF INCENTIVES NEEDED TO SUPPORT A NEW CLEAN-ENERGY INDUSTRY

BY

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Abstract

Offshore wind energy is now receiving substantial attention as an alternative commercial energy source. Despite the increased interest in this new technology, and the tremendous energy generating potential off the Northeast/Mid-Atlantic region of the U.S., no projects have been installed. This study addresses three barriers to the offshore wind energy industry: (*i*) high upfront capital costs, (*ii*) extensive, and at times unclear, regulatory/approval process, and (*iii*) competition from conventional energy sources. The effect of current federal and state policies on these barriers was examined to assess how promotional policies and financial incentives within the region have addressed the current challenges facing an emerging offshore wind energy industry. U.S. incentives were also compared to the two leading European countries in installed offshore wind energy capacity, Denmark and the U.K., to determine in what areas U.S. incentives are lacking and how they could be improved.

Overall, it was found that the U.S. utilizes primarily financial incentives at the federal level and promotional policies at the state level, and that changes in federal policy are necessary to advance offshore wind energy. Foremost, political commitment for the industry needs to be solidified and the regulatory process streamlined. Furthermore, the U.S. requires a system for internalizing the environmental damage associated with fossil fuels, a national Renewable Portfolio Standard, and tendering system. While the U.S. has the potential to become an industry leader in offshore wind energy, it remains to be seen if the current government incentives will be sufficient support to advance this new clean energy industry.

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I. Introduction

The oceans have been utilized historically for the exploitation of living resources and fossil fuels, as well as a highway for maritime commerce. In the face of increasing environmental, international and security concerns, the economic role of the oceans has recently expanded to include renewable energy production. In particular, offshore wind energy is now receiving substantial attention as an alternative commercial energy source.[1] This study examines emerging offshore wind energy in the United States and how current policies are encouraging or deterring its development.

Proposals for new offshore wind farms began increasing in the past decade because of a number of factors: offshore wind turbines can generate power close to coastal load centers where demand for energy is high but space for power facilities can often be limited, offshore wind turbines produce a large amount of power per unit area without relying on expensive fossil fuels, and offshore wind farms in Europe have shown themselves to be a viable alternative to conventional power sources.[2] The Northeast and Mid-Atlantic United States have been suggested as ideal areas for offshore wind farms due to the expansive continental shelf of the East Coast, combined with favorable average wind speeds, expanding energy needs and high

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[1] Offshore Wind Collaborative Organizing Group, 2005. *A Framework for Offshore Wind Energy Development in the United States.* Available online at: http://masstech.org/renewableenergy/owec.htm. Last accessed March, 2009. *See also* A.L. Rogers, J.F. Manwell and J.G. McGowan, 2003. "A year 2000 summary of offshore wind development in the United States," *Energy Conversion and Management* 44 (2003): 215-219.

[2] Mineral Management Service (MMS), 2006. "Technology White Paper on Wind Energy Potential on the U.S. Outer Continental Shelf." Available online at: http://ocsenergy.anl.gov (last accessed April, 2008).

electricity rates.[3] However, construction and operation of these sites is costly and businesses will not invest in renewable projects if the risk associated with the project is too high or the return on investment is too low. Long-term regulatory certainty and financial incentives have been found to be two of the most important criteria in developing green power markets.[4] Therefore, as the interest in offshore wind projects grows, the need for a clear and comprehensive regulatory framework regarding this new use also mounts.[5]

Wind farm installations on the outer continental shelf are expensive. Estimates of the total investment needed to develop one mega-watt (MW)[6] of offshore wind power are in the range of $2-5 million.[7] The total cost of the turbines and support structures for a wind farm represent approximately 57% of the total cost of a project, with operations and maintenance accounting for roughly 23% of the project (grid connection, management and the decommissioning of the facility account for the

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[3] A.L. Rogers, J.F. Manwell and J.G. McGowan, 2003. *Supra* note 1. *See also* A.L. Rogers, J.F. Manwell and J.G. McGowan, A.F., Ellis, U. Abdulwahid and A., LaCroix, 2000. "A Fresh Look at Offshore Wind Opportunities in Massachusetts," Proc. Windpower 2000, AWEA. *See also* J.F. Manwell, A.L. Rogers, J.G. McGowan and B.H. Bailey, 2002. . "An Offshore Wind Resource Assessment Study for New England." *Renewable Energy* 27(2): 175-187.

[4] L. Gan, G. S. Eskeland, and H. H. Kolshus, 2007. "Green Electricity Market Development: Lessons Learned From Europe and the U.S." *Energy Policy* 35(2007): 144-155.

[5] G.R. Martin and O. A. Smith (2004). "The World's Largest Wind Energy Facility in Nantucket Sound? Deficiencies in the Current Regulatory Process for Offshore Wind Energy Development." *Boston College Environmental Affairs Law Review* **31**(2004): 285-323.

[6] Megawatt (MW) is a standard unit of electrical power equal to 1,000 kilowatts, or 1 million watts. This term is used as a standard measure of electric power plant generating capacity.

[7] Department of Trade and Industry (DTI), 2007. "Study of the costs of offshore wind generation." A report to the Renewables Advisory Board & DTI. URN Number 07/779. Available online at: www.berr.gov.uk/files/file38125.pdf. Last accessed December, 2008. This amount can vary depending on the water depth and location of the wind farm, number and size of turbines, as well as the cost of supplies and labor. Tunø Knob Wind Farm in Denmark installed in 1997 cost $12 million for 10 turbines totaling 5 MW, located 6 km offshore in 3.1-4.7 m water depth. *See also* R., Redlinger, P.D., Andersen and P.E. Morthorst, 2002. *Wind energy in the 21st century: economics, policy, technology, and the changing electricity industry.* Palgrave Publishing, New York, NY.

remaining 20%, see Figure 1).[8] As a result, energy companies need a large amount of capital investment upfront. If energy rates of coastal areas remain high enough to ensure a profit from this investment, the project is feasible. However, high capital costs have been cited as reasons for a number of canceled offshore wind projects in the U.S.[9]

Governmental policies play an important role in the development of this industry.[10] Granting tax credits to developers, funding research and technology advancement, and committing to renewable portfolio standards can all encourage industry growth.[11] Conversely, unclear jurisdictional authority and extensive permitting requirements that add expense to a project deter investment and hinder growth.[12]

Emerging industries with sizable initial capital investments, such as offshore wind, rely even more heavily on government incentives for success.[13] With such a high risk associated with this type of investment and the level of uncertainty that a return on investment will be produced from the project, governmental support for the

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[8] W. Musial and S. Butterfield, 2006. "Energy from Offshore Wind." NREL/CP-500-39450 Conference paper presented at Offshore Technology Conference, Houston, TX. May 1-4, 2006.

[9] R. Pospisil, 2007. "LIPA open to wind power in Master Plan despite killing offshore project on cost." *Electric Utility Week*: December 10, 2007. *See also* B. Riner, 2007. "LIPA Unplugs Plan for Long Island Wind Farm." *Natural Gas Week*: August, 27, 2007. *See also* J. Porretto, (2007). "Developer cites cost in nixing offshore wind farm in South Texas." *Mexia Daily News*: June 13, 2007.

[10] W. Musial and S. Butterfield, 2006. *Supra* note 8. *See also* J.I. Lewis and R.H. Wiser, 2006. "Fostering a renewable energy technology industry: An international comparison of wind industry policy support mechanisms." *Energy Policy* 35: 1844-1857. *See also* P. Astolfi, S. Baron and M. J. Small, 2008. "Financing Renewable Energy." *Commercial Lending Review* Mar/Apr 2008: 3-8.

[11] L. Bird, M. Bolinger, T. Gagliano, R. Wiser, M., Brown, B. Parsons, 2005. "Policies and Market Factors Driving Wind Power Development in the United States." *Energy Policy* 33: 1397-1407.

[12] U.S. Commission on Ocean Policy, 2004. *An Ocean Blueprint for the 21st Century.* Final Report. (Washington, D.C.)

[13] P. Astolfi, S. Baron and M. J. Small, 2008. *Supra* note 10. *See also* L. Bird, M. Bolinger, T. Gagliano, R. Wiser, M., Brown, B. Parsons, 2005. *Supra* note 10. *See also* R. Redlinger, P.D. Andersen and P.E. Morthorst, 2002. *Supra* note 7.

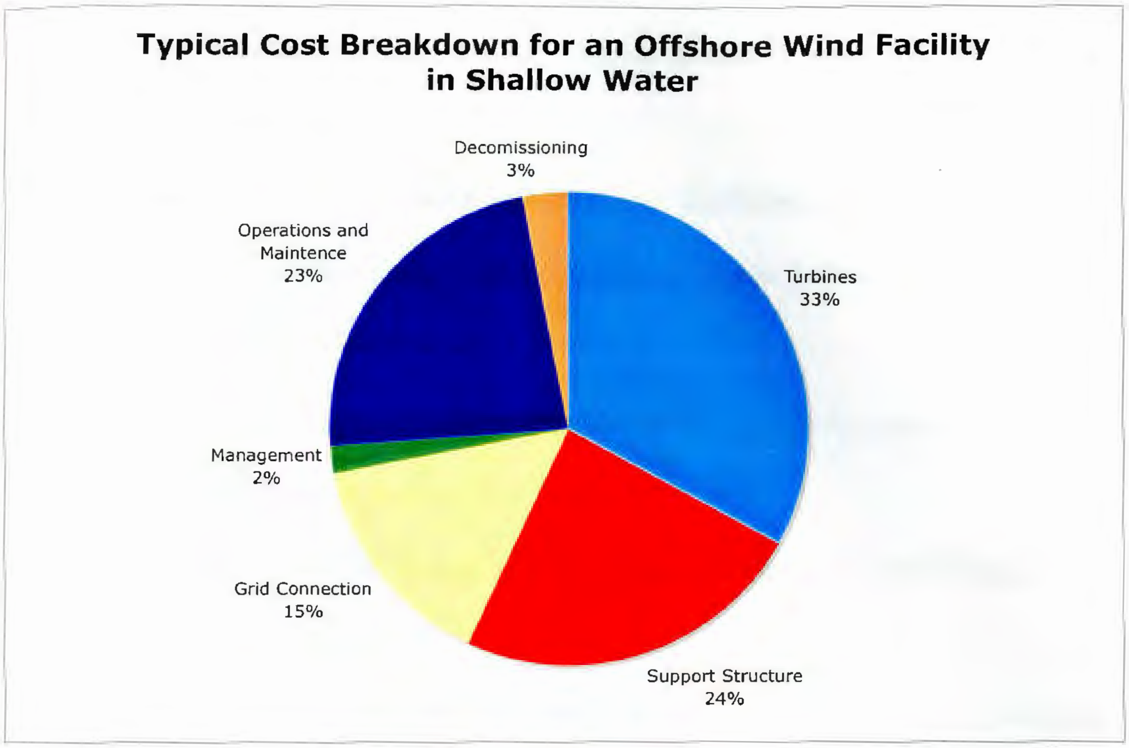

Figure 1. Typical cost breakdown for an offshore wind facility in shallow water. *Adapted from* W. Musial, S. Butterfield, and B. Ram, 2006. "Energy from Offshore Wind." NREL/CP-500-39450.

industry is needed in the development stages.[14] To encourage investment, governments can create policies to:

- Subsidize the new industry directly or indirectly through the use of tax credits,
- Invest in the research and development of new technology,
- Provide financing instruments such as grants and loans to encourage private investment, or
- Create regulation that reduces developer uncertainty and streamlines the approval process.

These types of incentives can be employed at either, or both, the state or federal level to promote offshore wind.

Federal incentives for renewable energy in the U.S. have focused primarily on subsidizing the industry, mainly through the Renewable Electricity Production Tax Credit (PTC) enacted in the Energy Policy Act of 1992.[15] Under this legislation, a tax credit of 2.1 cents/kWh (adjusted for inflation) is granted to all qualified renewable energy producers (including wind, biomass, hydroelectric, methane, and geothermal) for the first 10 years of operation. The PTC plays such a central role in renewable energy proposals that many land-based wind projects have been financed to a large extent based on these tax savings.[16] However, in spite of the importance of the PTC to the renewable industry as a whole, this tax credit has expired three times before being

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[14] P. Astolfi, S. Baron and M. J. Small, 2008. *Supra* note 10. *See also* European Wind Energy Association (EWEA). 2004. "Wind Energy- The Facts." Accessed online at: www.ewea.org/fileadmin/ewea_documents/documents/publications/WETF.pdf. Last accessed March, 2008. *See also* C. Brown and P. Cassidy, 2002. "Paying for the wind: Financing issues facing the wind energy industry." *Refocus* 3(4): 60-61.

[15] 26 U.S.C § 45

[16] P. Astolfi, S. Baron and M. J. Small, 2008. *Supra* note 10.

renewed or retroactively reinstated by Congress.[17] Legislation for the PTC has never implemented the credit for more than two years at a time, making it unpredictable and unreliable to developers. Most recently the PTC was renewed through December 31, 2009 as an amendment to the urgently passed Economic Stabilization Act of 2008. [18] Prior to this amendment, the fate of the PTC beyond the end of 2008 was very unclear, as Congress was repeatedly unable to pass an extension bill.[19] Some argue that the irregularity of the PTC has been causing a 'boom-bust' cycle in the wind industry, ultimately hurting its expansion.[20]

Congress recognized the need for clearer regulation relating to offshore alternative energy with the passage of the Energy Policy Act of 2005[21], which amended the Outer Continental Submerged Lands Act[22] to include renewable energy production. The amendments grant regulatory authority over offshore wind energy on the outer continental shelf to the Department of the Interior, and subsequently to the Mineral Management Services, that also regulates offshore oil drilling.[23] This piece of legislation is a step forward in creating a clear federal management scheme over offshore renewable energy. The Mineral Management Service is still finalizing rules

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[17] J.W. Moeller, 2004. "Of Credits and Quotas: Federal Tax Incentives for Renewable Resources, State Renewable Portfolio Standards, and the Evolution of Proposals for a Federal Renewable Energy Portfolio Standard." 15 *Fordham Environmental Law Review* 69. Winter 2004.

[18] Economic Stabilization Act of 2008, H.R. 1424. Pub. L. 110-343. § 102.

[19] Energy Improvement and Extension Act of 2008, 110th Congress 2nd Session, H.R. 7201

[20] American Wind Energy Association (AWEA). 2008. "Fair Transmission Access for Wind: A Breif Discussion of Priority Issues." Accessed online at: http://www.awea.org/resources/ . Last accessed March, 2008. *See also* J.I. Lewis and R.H. Wiser, 2006. *Supra note* 10. *See also* Union of Concerned Scientists, 2007. "Renewable Energy Tax Credit Extended Again, but Risk of Boom-Bust Cycle in Wind Industry Continues." Accessed online at: http://www.ucsusa.org/clean_energy/clean_energy_policies/production-tax-credit-for-renewable-energy.html . Last accessed April, 2008. *See also* L. Bird, M. Bolinger, T. Gagliano, R. Wiser, M., Brown, B. Parsons, 2005. *Supra* note 11.

[21] Energy Policy Act of 2005, Pub.L. 109-058.

[22] Outer Continental Shelf Lands Act, 1953. Pub.L. 83-212, 67 Stat. 462.

[23] Energy Policy Act of 2005, Pub.L. 109-058 § 388.

and policies regarding lease, bidding and payment procedures; formal adoption of these regulations will resolve many financial unknowns for firms proposing offshore wind energy facilities.

In addition to the overarching federal incentives, individual states have created their own incentive programs to promote renewable energy. Nearly all coastal Northeast/Mid-Atlantic states have Renewable Portfolio Standards (RPS) that require a certain percentage of total electricity production within the state to be derived from renewable sources.[24] Many states also offer programs for low interest loans or grants to aid in financing capital costs.[25] These types of standards and programs are seen as instrumental in stimulating wind energy development.[26] System benefit charges, or surcharges imposed on electricity customers by utility companies, which are then reinvested to support renewable energy projects, have also been implemented by states to contribute to renewable energy development.[27]

While the U.S. has just begun to consider offshore wind, Europe has utilized it for decades,[28] with Denmark and the United Kingdom leading global production in offshore wind energy.[29] Through a combination of strict emission standards associated with the Kyoto Protocol and the establishment of economic and regulatory programs, the European Union has supported large-scale efforts to develop wind energy on the continental shelf. Denmark and the United Kingdom have encouraged offshore wind energy through the use of many types of incentives including:

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[24] Database of State Incentives for Renewables and Efficiency (DSIRE). 2008. http://www.dsireusa.org. Last accessed April, 2008.
[25] DSIRE, 2008. *Supra note* 24.
[26] L. Bird, M. Bolinger, T. Gagliano, R. Wiser, M. Brown, B. Parsons, 2005. *Supra* note 11.
[27] *Ibid. See also,* R. Redlinger, P.D. Andersen and P.E. Morthorst, 2002. *Supra note* 7.
[28] T. Wizelius, 2007. *Developing wind power projects: theory and practice.* Sterling, VA, Earthscan Publishing.
[29] EWEA, 2008. *Supra note 14.*

cooperative investment schemes, renewable obligation policies, direct financial support, and per-kilowatt hour production subsidies.[30] The experience of these countries may provide useful guidance as the United States seeks to encourage development of the offshore wind energy industry.

In response to the slow progression of offshore wind in the Northeast/Mid-Atlantic and the role of government incentives in promoting alternative energy, this study will address the following questions:

- What are the economic and regulatory challenges facing businesses proposing to install offshore wind energy facilities in the Northeast/Mid-Atlantic?
- How is the feasibility of offshore wind projects affected by current federal and state policies in the region?
- How do the incentives provided in the United States compare internationally with those provided by Denmark and the United Kingdom, countries with very strong offshore wind energy industries?
- What additional incentives might be needed in the United States to encourage the development of offshore wind power?

To begin, this study will give a brief overview of offshore wind energy potential in the Northeast/Mid-Atlantic regions of the United States, the rationale behind developing offshore wind energy in this region, and examine all currently proposed projects in the area. This overview explains why this region of the country was singled out for this study. Next, an examination of the economics of offshore

[30] R. Redlinger, P.D. Andersen and P.E. Morthorst, 2002. *Supra note* 7.

wind will be presented, describing typical project costs for capital investments, operations and maintenance, environmental assessments, financing and decommissioning. Production rates will also be compared between offshore wind and other conventional sources of energy to measure the competitiveness of this new industry and how production relates to investment costs. While the discussion of the economics of offshore wind cannot be taken directly from U.S. examples since projects are still in preliminary stages, data from European sources and projections from U.S. proposals will be used.[31]

This study will then consider and analyze regulation of offshore wind energy in the U.S. and how the regulatory environment is currently encouraging or hindering investment. The proposed rules of the Minerals Management Service regarding the leasing and bidding procedures, as well as required royalty and fee payments, will be examined to determine what their impact may be on firms aiming to invest in offshore wind. In addition, an assessment of the permitting process and potential legal issues faced by offshore wind projects in the Northeast/Mid-Atlantic will be addressed. Extensive permitting issues or a high probability of lawsuits could act as a disincentive to investment in an offshore wind project.

Lastly, an analysis of the current status of regulatory and financial incentives surrounding offshore renewable energy at both the federal and state level within the Northeast/Mid-Atlantic U.S. will be performed to examine the conditions presently in place for the industry. Attention will be paid to policy instruments used to provide direct and indirect financial assistance to development, incentives based on production output after installation, as well as favorable regulation encouraging investment at

[31] EWEA, 2008. *Supra note 14.*

both state and federal levels of government. The scope of this work will be limited only to state incentives offered by coastal Northeast/Mid-Atlantic states most involved in the offshore debate: Massachusetts, Rhode Island, New Jersey, and Delaware. The degree to which incentives are offered within this region will then be compared to international examples in the European Union (E.U.), specifically Denmark and the United Kingdom, the world's leading offshore wind producers. Qualitative and descriptive comparisons will be used to analyze the similarities between incentives provided by Northeast/Mid-Atlantic states, between Northeast/Mid-Atlantic states and federal incentives, and between U.S. incentives and E.U. policies. Through analysis of the policies created in each country, the goal of this work is to assess how the U.S. compares to other countries that have exploited offshore wind, and what this may suggest for the future of offshore wind energy in the Northeast/Mid-Atlantic.

II. Offshore Wind Energy Potential in the Northeast/Mid-Atlantic United States.

a. Rationale for Offshore Wind Energy in the Northeast/Mid-Atlantic

Demand for electricity in the United States is ever growing. The U.S. Energy Information Agency estimates that U.S. electricity demand will grow by 39% from 2005 to 2030, reaching 5.8 billion megawatt-hours (MWh) by 2030. [32] Further examination shows that coastal states use approximately 78% of the nation's electricity.[33] U.S. population concentration shows that of all coastal regions the Northeast/Mid-Atlantic is one of the most heavily populated, with nearly one-fifth of the national population living on less than 2% of the total land area.[34] The increasing demand for electricity in the Northeast/Mid-Atlantic region of the U.S., and the need to supply enough power to meet that demand has caused these coastal states to make energy policy a top priority.

Rising energy prices, uncertainties surrounding oil supply, and global climate change concerns are together driving States throughout the nation to rethink their energy mix and to encourage the development of alternative energy. The Northeast/Mid-Atlantic is particularly vulnerable to the price volatility of petroleum

[32] A megawatt-hour (MWh) or 1 megawatt acting over a period of 1 hour (equal to 1,000 kilowatt-hours or 1 million watt-hours). The primary difference between a megawatt and a megawatt-hour is that "megawatt" measures the capacity of an electric generator and "megawatt-hour" measures the actual amount of electricity it produces over a certain period of time.

[33] Energy Information Administration (EIA). February 2006. *Annual Energy Outlook 2006*. Report No. DOE/EIA-0383.Washington, DC: EIA.

[34] Offshore Wind Collaborative Organizing Group, 2005. *Supra* note 1.

products because this region has virtually no indigenous supply of oil or gas, which are currently the primary energy generation sources for the region.[35] Renewable energy sources, such as offshore wind, can provide stable prices because they are not affected by the unpredictable price fluctuations of fossil fuels. In addition to price stability, modern offshore wind technology is efficient, reliable and has the potential to produce power at a reasonable cost.[36] As a general rule, the power output of a wind turbine increases by the cube of wind speed, therefore as the turbine technology has advanced, wind power in general has become increasingly cost competitive with traditional energy sources.[37] The proliferation of wind energy onshore, which has grown dramatically from 1,800 megawatts of installed capacity in 1996 to more than 11,600 megawatts in 2006[38], reveals how wind energy is a viable and reliable alternative to traditional power plants. However, even with this substantial growth in onshore wind, the potential of energy generation offshore is much greater.

Generating wind power offshore has a number of advantages compared to its onshore counterpart. First, offshore wind farms allow for production close to coastal load centers, such as Boston, New York or Washington D.C. where electricity rates are high, but also where space for new power facilities is limited. In contrast, the potential for onshore wind power is generally greatest on remote ridgelines or on plains where the wind resource quality is high but populations are low, resulting in the need for extensive transmission systems hundreds of miles long to carry energy to

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[35] *Ibid.*

[36] For a discussion on production costs of offshore wind, *see Ch III Economics of Offshore Wind Energy §c. Production Cost with Traditional Energy Sources.*

[37] T. Wizelius, 2007. *Supra* note 28.

[38] United States Department of Energy (DOE), 2008. Office of Energy Efficiency and Renewable Energy "Wind Power Today." Accessed online at: http://www1.eere.energy.gov/windandhydro/. Last accessed March 2008.

urban areas. Currently, the U.S. electrical grid is not constructed for this type of long-range transmission.[39] Offshore wind farms, on the other hand, may be placed far enough offshore for visual concerns to be less objectionable,[40] while remaining close enough to coastal load centers for energy transmission via underwater cables. Connecting offshore turbines directly to the power grid of densely populated coastal areas can help avoid the need for costly new overland high-voltage transmission lines.

Second, placing wind turbines offshore avoids the constraints on size that onshore turbines face, allowing projects to take advantage of economies of scale and increase production efficiency. Offshore the largest wind turbines can be used, turbines much larger than those used onshore, with a much greater capacity. Turbines used offshore can be transported and delivered to a project site using large carriers and barges and, therefore, are not limited by the physical constraints land-based transportation mechanisms. The largest offshore turbines currently being produced are 5 MW in capacity and over 120 m tall (compared to onshore turbines which are approximately half that size).[41] The ability to use such large turbines means greater amounts of electricity can be produced from fewer installed structures, allowing offshore wind to utilize economies of scale to decrease the cost per kWh.[42]

Third, offshore wind blows faster and more consistently than onshore wind, further increasing the amount of power that can be produced offshore.[43] Since the

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[39] W. Musial, 2008. "Offshore Wind Technology." Presentation at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, DE, September 8-10, 2008.
[40] *Ibid.*
[41] *Ibid. See also* T. Wizelius, 2007. *Supra* note 28. *See also Ch. III Economics of Offshore Wind Energy §c.Production Rate Comparison with Traditional Energy Sources.*
[42] M. C. Robinson and W. Musial, 2006. "Offshore Wind Technology Overview." National Renewable Energy Laboratories (NREL) Report, NREL/PR-500-40462. Accessed online at: http://www.nrel.gov/docs/gen/fy07/40462.pdf. Last accessed September, 2008.
[43] T. Wizelius, 2007. *Supra* note 28.

power output of wind turbines increases by the cube of wind speed, slight increases in wind speed produce exponentially larger amounts of energy.[44] On land, winds can be diverted or slowed down by interference with the landscape, compared to offshore where the amount of turbulence created by the physical environment is much less due to the flat sea surface. Overall, this results in steadier wind resources and overall faster average wind speeds. More consistent, faster blowing winds offshore also means that power generation can better meet peak demand for the energy requirements of load centers compared to onshore wind installations.

Because the potential revenue that can be produced by a wind farm depends directly on the quality and magnitude of the wind resources surrounding a project site, wind resource assessment is the first and most crucial step in developing offshore wind. Wind resource assessment has been conducted throughout the country by the federal government through the National Renewable Energy Laboratories, by individual states interested in diversifying their energy production and by private firms interested in developing offshore wind project.

b. Assessment of Offshore Wind Resources in the Northeast and Mid-Atlantic Area

The term 'wind resource assessment' refers to the calculation of the average wind speed over a specific site or area for a period of 10 to 20 years.[45] Models are created by horizontally and vertically extrapolating data collected at various points, from meteorological stations or buoys, to create a larger map of average wind speed

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[44] *Ibid.*
[45] Redlinger, et al. 2002. *Supra* note 7.

within an area and aid in siting of potential projects. Wind resource assessments have been performed by most coastal states to determine the scale of their offshore wind power potential.

The U.S. has significant onshore wind resources throughout the Great Plains, enough to supply potentially all the nation's energy needs,[46] though there is currently no infrastructure capable of transmitting such large amounts of energy the long distance to coastal population centers. Likewise, wind resource modeling along the east and west coasts, has identified large areas of high average wind speeds (greater than 7.5 meters/second) within 50 nautical miles of the coast. The National Renewable Energy Laboratory (NREL) has determined that the offshore wind resources along the Atlantic and Pacific Coasts between 5 and 50 nautical miles could generate roughly 900 gigawatts (GW) of wind power, an amount roughly equivalent to the amount of electricity used currently by the entire country (see Figure 2).[47] Of course not all of this area is viable for wind energy development, due to competing uses (shipping channels, marine protected areas, naval uses) and technological constraints, which currently limit wind turbine installment to shallow water (less than 30 m depth).[48] However, even with these exclusions the vast potential for offshore wind energy is compelling.

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[46] "[T]he total amount of electricity that could potentially be generated from wind in the United States has been estimated at 10,777 billion kWh annually—more than twice the electricity generated in the U.S. today." American Wind Energy Association, 2007. "Top 20 States with Wind Energy Resource Potential." Accessed online at: http://www.awea.org/newsroom/pdf/Top_20_States_with_Wind_Energy_Potential.pdf. Last accessed October, 2008.

[47] U.S. Department of Energy, Energy Efficiency and Renewable Energy, 2008. "20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply." Accessed online at: http://www.osti.gov/bridge. Last accessed October, 2008.

[48] W.Musial, et al. 2006. *Supra* note 8.

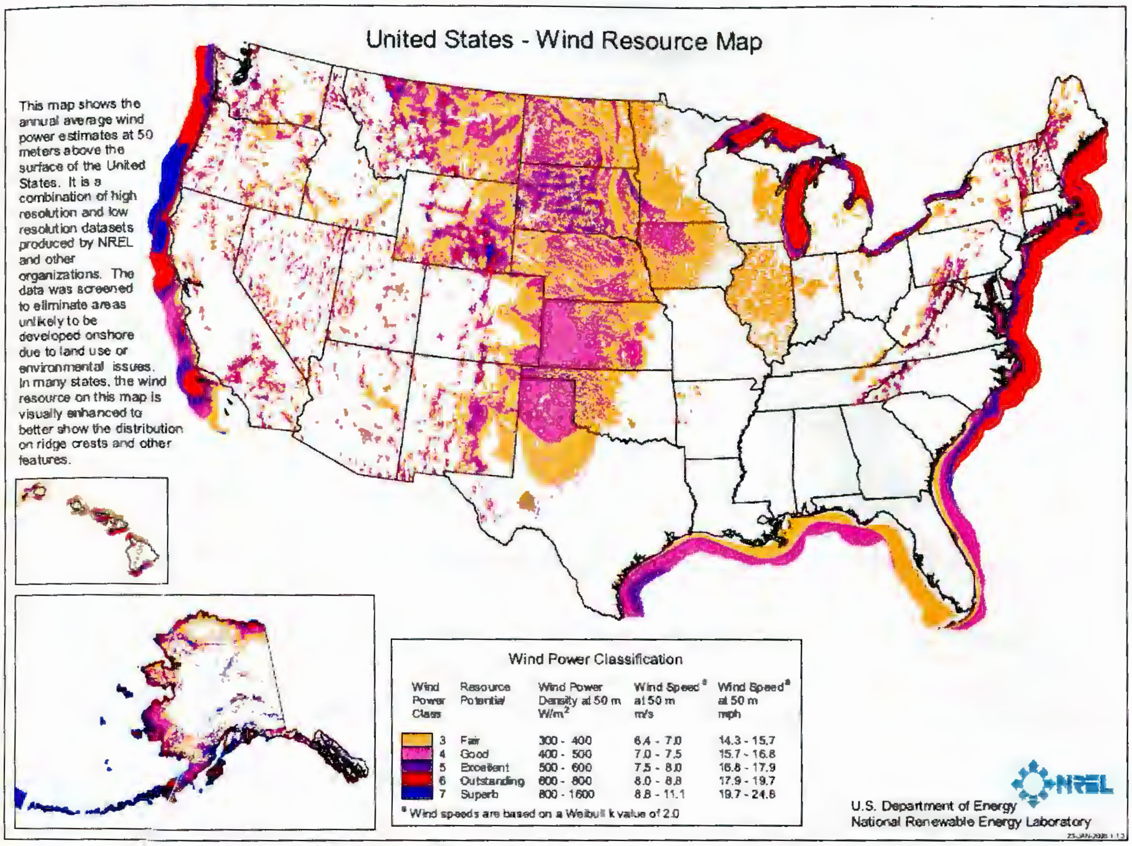

Figure 2. Wind resource assessment of the entire United States using annual average wind power estimates at 50 m height.

Graphic Credit: U.S. Department of Energy, National Renewable Energy Laboratory, 2008. Available online at: http://www.nrel.gov. Last accessed January 2009.

Further examination of the Northeast/Mid-Atlantic shows extensive areas where average wind resources equal or exceed 7.0-7.5 m/s, which is the generally accepted standard of favorable conditions for offshore wind power. In fact, much of the east coast contains 'outstanding' wind resources near densely populated areas (see Figures 2, 3 and 4). The outstanding character of these wind resources is further enhanced by their location over shallow water. Compared to the west coast where the continental shelf drops off quickly, the continental shelf on the east coast deepens much more gradually (see Figure 5). This is beneficial because current wind turbine technology is limited to use in water depths of 30 m or less. As a result, the shallow east coast continental shelf, in combination with high average wind speeds creates an ideal setting for offshore wind farms. In the future, as turbine technology advances to allow for installation in greater depths, more areas on the outer continental shelf will be available for offshore wind energy production.[49]

Due to the advantages of offshore wind in comparison to more conventional energy sources and the vast wind resources present off the Northeast/Mid-Atlantic, many projects have been proposed throughout the region (see Table 1). Though none of the projects has yet been installed, many projects have gained momentum as a result of rising oil prices and increased concern around national energy security. Of the four states examined in this study, each has had a unique approach to its involvement in offshore wind.

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[49] *Ibid.*

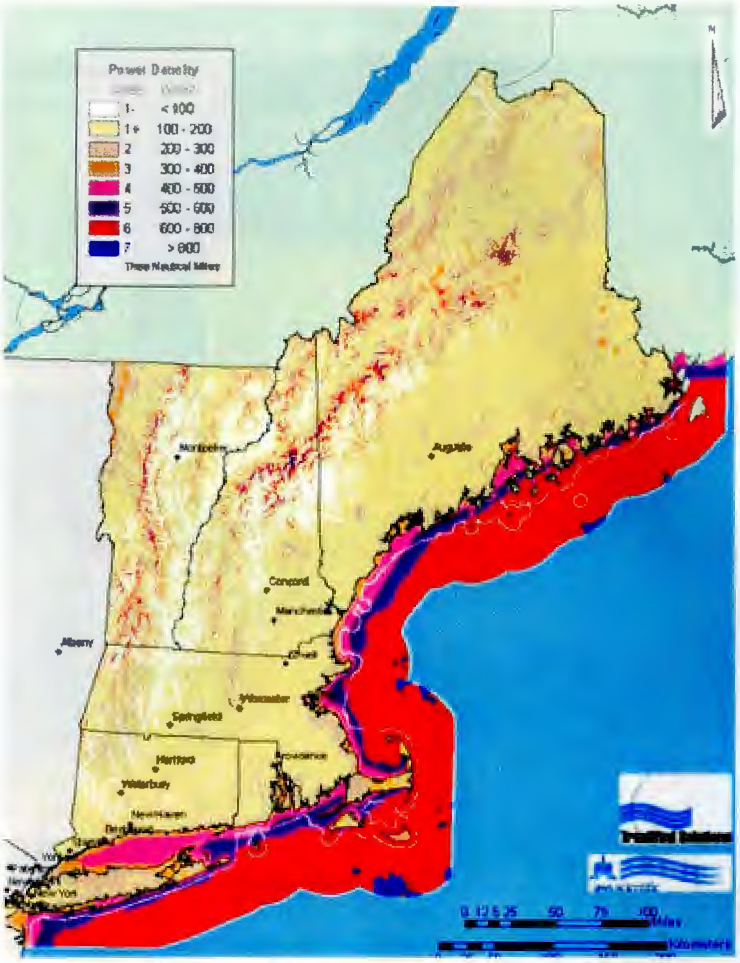

Figure 3. New England wind resource assessment out to 50 nm.
Graphic credit: AWS Truewind. Available online at: http://www.ocean.udel.edu/windpower/ResourceMap/index-wind.html. Last accessed March 2009.

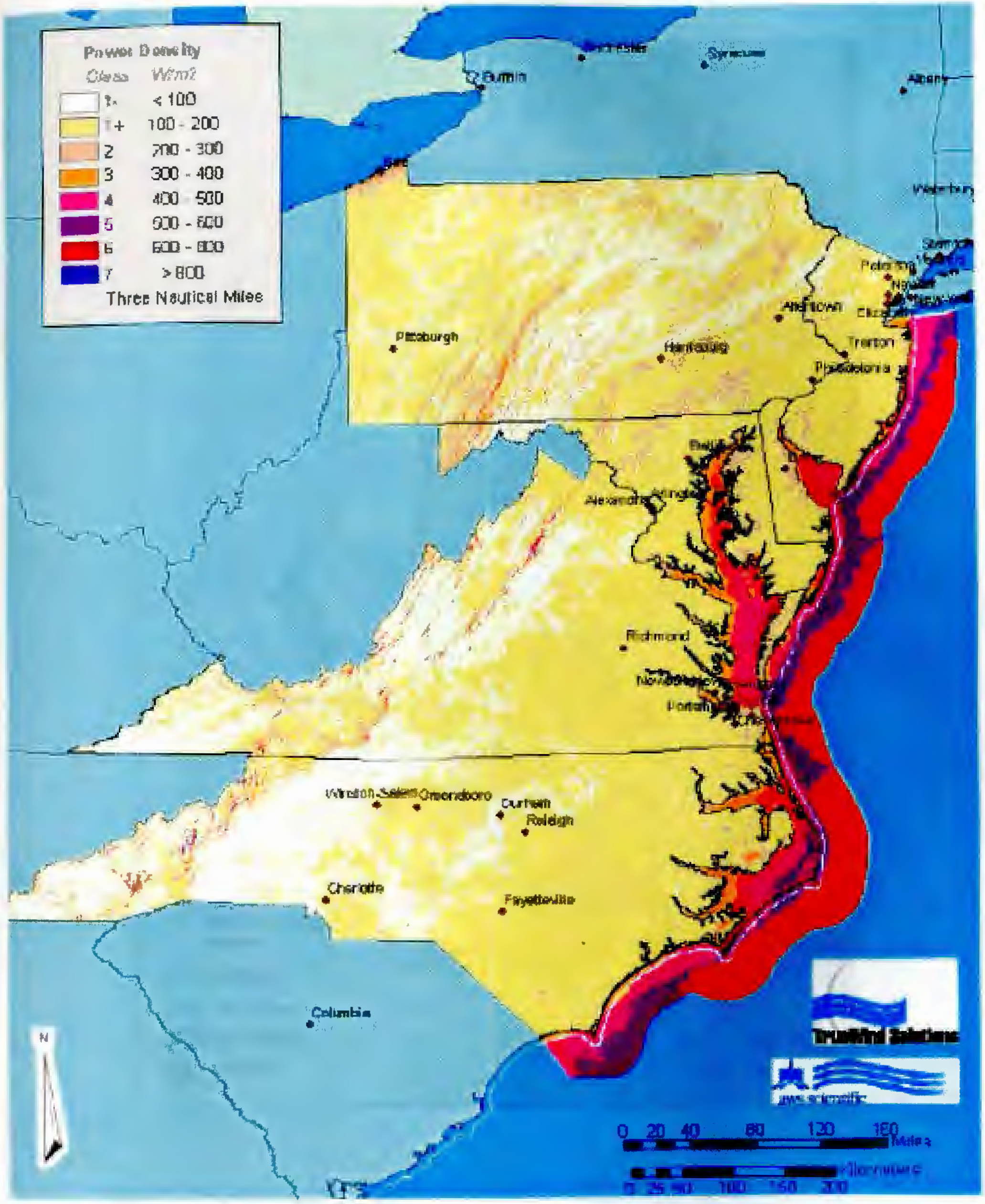

Figure 4. Mid-Atlantic wind resource assessment out to 50 nm.
Graphic credit: AWS Truewind. Available online at: http://www.ocean.udel.edu/windpower/ResourceMap/index-wind.html. Last accessed March 2009.

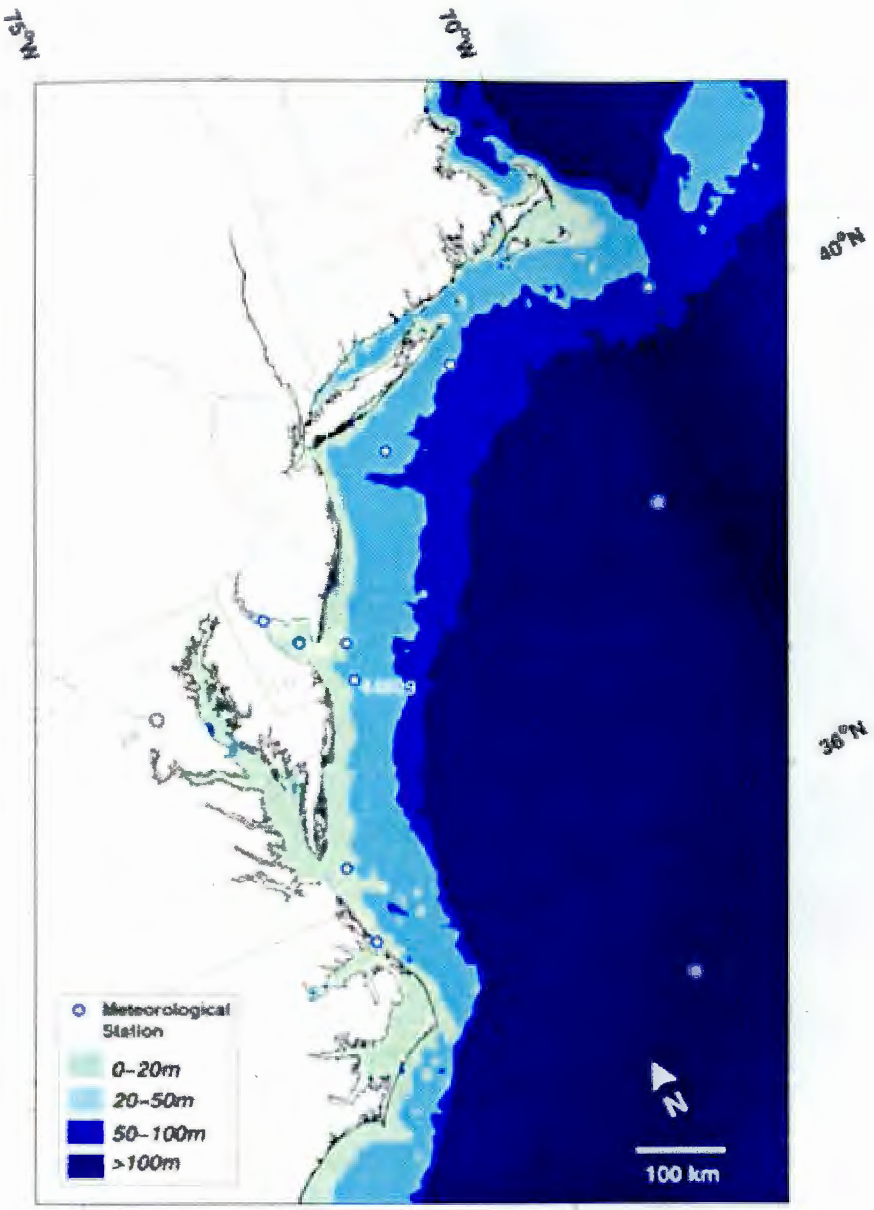

Figure 5. Average offshore depth off the Northeast coast.
Graphic credit: W., Kempton, et al. 2007. "Large CO2 Reductions via Offshore Wind Power Matched to Inherent Storage in Energy End-Uses." *Geophysical Research Letters* 34: L02817-L02817.

Table 1. Overview of Current U.S. Offshore Wind Projects in Northeastern States

State	Project	Water	Size	Status
MA	Cape Wind	Federal Waters- approx. 5 nm from shore, 13 nm from Nantucket	420 MW 130 turbines	waiting for MMS final EIS; has obtained 3 state permits and still needs to acquire approx. 12 more local and state permits
	Patriot Renewables	State waters- 1-3 nm offshore in Buzzards Bay	300 MW 2-3 sites of 40 turbines	environmental testing ongoing; currently waiting for the state legislature to grant the project an exception to the limitations of the Massachusetts Ocean Sanctuaries Act
	Blue H, USA	Federal Waters- 23 miles off Martha's Vineyard	420 MW- 200 floating turbines	failed to obtain a limited term MMS on the OCS; firm continues to test new floating turbine technology
	Town of Hull	State waters- 1.5 nm off Hull, MA	15 MW- 4 turbines	obtained state permission to engage in detailed data collection on wind resources and sea bed characteristics
RI	Deepwater Wind	Federal waters- 20 miles offshore (exact placement not yet determined)	450 MW- 100 turbines	State of RI approved Deepwater Wind's bid and will now partner to do extensive environmental testing; Offshore Special Area Management Plan being developed to determine the best location for the wind farm and to expedite permitting
DE	Bluewater Wind	Federal waters- 12 nm offshore	200-300 MW-	25 year Power Purchase Agreement signed with Delmarva Power and Light; Permitting, environmental testing begun; MMS limited term lease expected

Table 1 Continued. Overview of Current U.S. Offshore Wind Projects in Northeastern States

State	Project	Water	Size	Status
NJ	Garden State Offshore Energy (GSOE), a joint venture of PSEG Renewable Generation and Deepwater Wind	Federal waters- (exact placement not yet determined)	approx. 350 MW	New Jersey Board of Public Utilities sent out a Request for Proposals for a pilot project in January, 2008; Bid was awarded on October 3, 2008; NJ Department of Environmental Protection has begun ecological baseline studies; MMS limited term lease expected

c. Proposed Offshore Wind Energy Projects in the Northeast/Mid-Atlantic

i. Massachusetts

Massachusetts currently has four proposed projects for offshore wind: Cape Wind, Patriot Renewables, Blue H USA, and the Town of Hull, MA. Cape Wind's proposal in the area off the coast of Nantucket, MA is the most established offshore wind project in U.S. federal waters. The project started in 1999 by a private Massachusetts company Energy Management Inc (EMI) interested in diversifying into alternative energy. EMI then formed Cape Wind LLC to manage the project and begin an extensive site and meteorological evaluation period measuring the wind climate, water depth, and seabed substrate. The current Cape Wind proposal calls for the installation of 130 turbines in a 24 square mile area off the coast of Cape Cod, Nantucket and Martha's Vineyard. [50] This placement is unique in that the site is in federal waters while being completely surrounded by state waters, due to the baselines used to measure the territorial seas. The location of the site is ideal for offshore wind due to the shallow water of the shoal, allowing the developer to utilize current turbine technology.[51] In addition, this site is located near a coastal load center (the greater Boston area), where energy demand is high and space is limited to install onshore

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[50] Cape Wind originally proposed the installation of 170 turbines. *See* U.S. Army Corps of Engineers, 2002. "Intent to Prepare a Draft Environmental Impact Statement (DEIS) for Proposed Cape Wind Energy Project, Nantucket Sound and Yarmouth, MA Application for Corps Section 10/404 Individual Permit." *Federal Register* 67: 4414. (Jan. 30; 2002). However, Cape Wind's January 2003, decision to use 3.6MW GE Wind Energy turbines reduced the number to 130. *See also* L. B. Fasig, 2003. "Wind Farmers Plow Ahead—Developers Choose Manufacturer, Reduce Number of Planned Turbines", *Providence Journal*, Jan. 22, 2003.

[51] Cape Wind plans to install 3.6 megawatt (MW) monopile turbines that are embedded directly into the sea floor and extend up 420 feet above the sea surface. Cape Wind Associates, 2008. *America's First Offshore Wind Energy on Nantucket Sound.* Accessed online at: www.capewind.org. Last accessed April, 2008.

facilities. This wind farm is projected to cost more than $1 billion[52] and produce enough power to 75% of the needs of Cape Cod households, or 10% of all the electrical needs of Massachusetts.[53]

In addition to the Cape Wind project in federal waters, Patriot Renewables has proposed 300 MW of offshore wind energy within state waters in Buzzards Bay, one to three miles off the coast.[54] The project originally proposed three sites of 40 turbines each in 2005, however, the project has been downsized due to limitations imposed by the Massachusetts Ocean Sanctuaries Act, which prohibits certain activities within marine sanctuaries within state waters.[55] The sites proposed by Patriot Renewables lie within the Cape and Island Ocean Sanctuary. For this project to advance, the state legislature will need to amend this act to allow offshore wind activities. Meanwhile, ongoing environmental studies by Patriot Renewable have found significant avian impact and boat traffic issues for one of the proposed sites and in May, 2008 the company reduced the project to only two sites.[56]

More recently, Blue H USA has been developing floating platform turbines that would allow for installation in deeper waters, farther offshore. A proposed 420 MW project, 23 miles off the coast of Martha's Vineyard using 200 floating turbines

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[52] Associated Press, 2008. "State-by-state summary of offshore wind proposals." *The Northwest Herald,* September 9, 2008. Accessed online at: http://www.nwherald.com/articles/2008/09/09/news/nation_and_world/doc48c6439e07991495096395.txt. Last accessed September, 2008.
[53] *Ibid.*
[54] Patriot Renewables, 2008. South Coast Offshore Wind Project. Accessed online at: http://www.southcoastwind.org/. Last accessed September 2008.
[55] Massachusetts Code, Title XIX, Ch. 132A §12A.
[56] J. Cohen, 2008. "Buzzards Bay Wind Farm Plan Changed." *Cape Cod Times,* May 06, 2008. Accessed online at: http://www.capecodonline.com/apps/pbcs.dll/article?AID=/20080506/NEWS11/80506009/-1/SPECIAL01. Last accessed September, 2008. The Ocean Sanctuaries Act was amended by the Oceans Act of 2008, to allow for the siting of "appropriate scale" offshore renewable energy facilities in state waters, except for the Cape Cod Ocean Sanctuary (offshore from the Cape Cod National Seashore on the Outer Cape), provided that facilities are consistent with the state's comprehensive ocean plan.

was initiated in March, 2008 when it filed for a Nomination for Lease with the Mineral Management Service (MMS).[57] The project was delayed when it failed to obtain one of the sixteen limited leases administered by the MMS for data collection and technology testing.[58] The company continues to test its technology in Europe.[59]

A fourth project proposed in Massachusetts is off the coast of the town of Hull, MA. Hull has experience in onshore wind, generating 12% of the town's electricity through the use of two coastal turbines. The town's municipal electric company would like to expand its generation capacity by 15 MW, installing four turbines 1.5 miles off the shore of its town beach.[60] There has been little local opposition because of satisfaction with the onshore wind installations. The proposed offshore four-turbine farm could potentially meet 100 percent of the town's energy needs. The state recently gave Hull approval to conduct a detailed environmental and wind resource assessment to determine the precise wind and seabed conditions at the proposed site and give planners a better sense of construction costs. Early estimates for the project are as high as $40 million, roughly ten times as much as the cost of the first two turbines combined.[61]

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[57] Blue H, 2008. "Submits Deepwater Wind Energy - NOMINATION FOR LEASE." Accessed online at: http://www.bluehgroup.com/company-newsandpress-080310.php. Last accessed September, 2008. *See also Ch. IV Regulation of Offshore Wind Energy §Federal Regulation §§Leases and Payments.*

[58] MMS, 2008. Notice of Nominations Received and Proposed Limited Alternative Energy Leases on the Outer Continental Shelf (OCS) and Initiation of Coordination and Consultation. *Federal Register,* Friday, April 18, 2008, 73(76): 21152-21155.

[59] *Ibid.*

[60] J. Manwell, 2007. Hull Offshore Wind. Renewable Energy Research Laboratory, University of Massachusetts. Accessed online at: www.mtpc.org/rebates/Owec_pdfs/HullOffshore2_24_07.pdf. Last accessed September, 2008.

[61] R. Tomsho, 2008. "Currents: Winds Shift in Energy Debate." *Wall Street Journal,* June 19, 2008, pg. A11.

ii. *Rhode Island*

The RIWINDS program was established in 2006 following the Governor's initiative to meet 15% of Rhode Island's annual electric energy demand from wind energy.[62] The first phase of the program was a feasibility study assessing the technical and economic feasibility to produce the 1.3 million MWh of wind energy in Rhode Island. Findings showed it would be cost competitive and technically feasible to obtain the 15% goal using primarily wind resources off the coasts of the state.[63]

In July 2008, the Rhode Island Renewable Energy Fund Board of Trustees approved funding for the development of a Special Area Management Plan (SAMP) covering Rhode Island's offshore waters, executed by a joint partnership between the Coastal Resources Management Council (CRMC) and the University of Rhode Island (URI). URI will provide data to the CRMC, which will develop the regulatory framework of the SAMP. The offshore SAMP will define use zones for Rhode Island's offshore waters, taking into account existing uses, critical resources and transportation lanes of offshore areas. The result of this SAMP will be pre-selected sites that will be more easily permitted and developed by the project developer. Under the federal Coastal Zone Management Act, preparation of a SAMP enables permitting of projects within the area covered by the SAMP to proceed on the basis of an

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[62] ATM, 2007. "Final Report RIWINDS Phase I: Wind Energy Siting Study." Accessed online at: http://www.energy.ri.gov/documents/independence1/RIWINDSReport.pdf. Last access September, 2008.
[63] *Ibid.*

Environmental Assessment in lieu of an Environmental Impact Statement.[64] The completion of the ocean SAMP is expected within two years.[65]

A Request for Proposals was issued in April, 2008 for bids from private companies to construct and operate an offshore wind farm in the state. A multi-disciplinary Wind Energy Proposal Evaluation Team was then established to evaluate the bids based on the total cost of the project to Rhode Island ratepayers, the qualification and experience of the bidder in constructing wind projects, and the number of jobs and the amount of tax dollars to be created. Independent consultants in the area of energy economics and engineering technology, including the National Renewable Energy Laboratory, assisted the Evaluation Team.

From the seven bids filed, the evaluation team selected DeepwaterWind LLC on September 25, 2008, with project cost estimated in excess of $1 billion[66] and using approximately 100 turbines 20 miles off the coast.[67] DeepwaterWind has also pledged to establish in-state manufacturing facilities for turbines and other infrastructure, with the potential to create 800 new jobs.[68] The state and Deepwater Wind will now negotiate a formal development agreement regarding the total commitment of Deepwater Wind to the state, including the establishment of a manufacturing headquarters in the State and the reimbursement of the cost of the SAMP to the state's

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[64] Rhode Island Coastal Resources Management Council, 2008. "RI Ocean SAMP." Accessed online at: http://www.crmc.ri.gov/samp/ocean.html. Last accessed October, 2008.
[65] State of Rhode Island, Office of the Governor, 2008. Press Release: Carcieri Names Deepwater Wind as Developer for Rhode Island's Off-Shore Wind Farm. September 25, 2008. Accessed online at: http://www.ri.gov/press/view.php?id=7202. Last accessed September, 2008.
[66] *Ibid.*
[67] R. Henry, 2008. "RI awards offshore wind farm rights to NJ firm." *The Boston Globe.* September 25, 2008. Accessed online at: http://www.boston.com/news/local/rhode_island/articles/2008/09/25/ri_awards_offshore_wind_farm_rights_to_nj_firm/. Last accessed September, 2008.
[68] State of Rhode Island, Office of the Governor, 2008. *Supra* note 65.

Renewable Energy Fund. In addition, the agreement will outline the preferred developer status for Deepwater Wind in the permitting process.[69]

The Governor and RI General Assembly are now working on legislation requiring the state's dominant power company, National Grid, to buy electricity from renewable energy projects for at least ten years at a time. That requirement would give assurance to prospective developers that there would be a buyer for the electricity produced by the project. The state legislature was able to pass a bill that would have required National Grid to enter into "commercially reasonable" long-term contracts to purchase electricity from renewable-energy developers, in return for a payment equal to three percent of the renewable energy purchased.[70] However, Governor Carcieri vetoed the bill, calling the three percent payment overly generous to the utility. The Governor was quoted as saying "Normally, regulated returns are earned by companies as either a return for investing capital or taking a risk ... In this case, National Grid does neither, thus rendering any bonus unnecessary and unearned."[71] Instead, he has asked the state Public Utilities Commission to force National Grid to enter into long-term contracts to purchase renewable energy but without compensation.[72] The Governor also wanted provisions within the bill to require the renewable energy purchased be produced in Rhode Island.[73]

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[69] *Ibid.* Preferred developer status refers to the recognition by the state for a particular developer following a competitive bidding process. This type of status will likely reduce any permitting issues since the state has acknowledged their support for the developers proposal.

[70] State of Rhode Island Act Relating to Public Utilities and Carriers, 2008-S 2849Aaa and 2008 - H 7916A.

[71] S. Baird, 2008. "Carcieri vetoes key renewable-energy measure." *Providence Business News,* June 27, 2008. Accessed online at: http://www.pbn.com/stories/33132.html.

[72] T.C. Barmann, 2008. "Carcieri vetoes renewable-energy bill." *The Providence Journal.* Saturday, June 28, 2008.

[73] S. Baird, 2008. *Supra* note 71.

iii. *New Jersey*

A 2004 study by the New Jersey Board of Public Utilities (NJ BPU) estimated that there are 24,000 megawatts (MW) of potential wind power off the New Jersey coast.[74] As a result the governor created a panel to study the feasibility of offshore wind energy in the state. The New Jersey Governor's 2006 Blue Ribbon Panel on Offshore Wind recommended a 350 MW pilot project to study offshore wind.[75] As a result of the Blue Ribbon Panel the NJ BPU issued a Request for Proposals for the offshore wind pilot project in January, 2008 and the Department of Environmental Protection began a $4.5 million Ocean/Wind Power Ecological Baseline Study of the waters out to 20 miles. The baseline study will include acoustical, oceanographic, radar and thermal imaging out to the 100-ft contour helping to determine the best areas for offshore wind development.[76] The NJ BPU is currently reviewing five proposals ranging in location from Atlantic City to Cape May. The MMS has selected six sites off New Jersey for limited leases on the outer continental shelf, authorizing data collection.[77] Issuances of these MMS leases are expected in the near future.

[74] B. Bailey, 2008. "Defining the Offshore Resource." Presentation at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, Delaware, September 8-10, 2008.
[75] State of New Jersey, Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters, 2006. Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters- Final Report to Governor Jon S. Corzine. *Available online at:* http://www.state.nj.us/njwindpanel/. Last accessed December, 2008.
[76] US Offshore Wind Collaborative, 2008. *Supra* note 78.
[77] MMS, 2008. *Supra* note 80.

iv. *Delaware*

The University of Delaware, under the direction of Dr. Willet Kempton and Dr. Jeremy Firestone, first conducted an assessment of offshore wind resources in Delaware. Their findings estimated that the amount of power that could be produced off the Mid-Atlantic Bight (Massachusetts to North Carolina) could produce 330 GW average electrical power and that Delaware could potentially benefit from utilizing this resource off their coast.[78] The prospect of producing energy from offshore wind in Delaware gained attention after the state experienced large spikes in electricity rates.

In 2006, price caps, that were keeping rates for electricity artificially low in the state of Delaware, were removed. Without these caps, the average electricity rate for utility consumers increased by 50-100%.[79] In response to this spike, the state's General Assembly responded by passing an energy bill that called for more in-state generation of electricity.[80] Under the new state law, the state's Public Service Commission solicited proposals for the construction of a new electric-power plant.[81] In addition to proposals for coal and natural gas plants, Bluewater Wind LLC proposed an offshore wind farm 12 nm off the coast of Rehoboth Beach, DE. Bluewater Wind held numerous town hall meetings and public information sessions to help educate and gain support from the general public. After extensive review of all

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[78] W. Kempton, C.L., Archer, A. Dhanju, R.W. Garvine, 2007. "Large CO2 reductions via offshore wind power matched to inherent storage in energy end-uses." *Geophysical Research Letters* 34: L02817.

[79] P. Cherry, Delaware Department of Natural Resources and Environmental Control, 2008. "U.S. Offshore Wind Collaborative: A Conversation Among States Advancing Offshore Wind." Presented at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, Delaware, September 8-10, 2008.

[80] Electric Utility Retail Customer Supply Act of 2006, Delaware State House Bill 6.

[81] *Ibid.*

proposals, the Public Service Commission unanimously chose Bluewater Wind's proposal. Subsequently, the commission directed Delaware's primary utility provider, Delmarva Power and Light, to negotiate a long-term power purchase agreement with Bluewater Wind to purchase at least 200 MW of power from the offshore wind farm.[82] This power purchase agreement is the first in the nation for an offshore wind project and guarantees that Bluewater Wind will be able to sell at least a portion of the power it produces. The Bluewater Wind project will now be assessed for environmental impacts and begins work on obtaining the 27 state and local permits needed for installation and operation of the project.[83] Bluewater Wind will also likely be granted a limited term lease by the MMS to collect wind data on the outer continental shelf.[84]

Each of the four Northeastern/Mid-Atlantic states most involved in offshore wind has approached the development of this industry differently. In Massachusetts, efforts have been driven by private firms attempting to expand into the new clean energy market, in contrast to Rhode Island, Delaware and New Jersey whose state governments have encouraged offshore wind development.[85] The potential energy production from offshore wind on the east coast is high and could provide large

[82] US Offshore Wind Collaborative, 2008. "Status of U.S. Offshore Wind Development Activity by State: Public sector initiatives and responses to development proposals." Presented at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, Delaware, September 8-10, 2008.

[83] H. Armistead, 2008. "Offshore Wind- Its time has come." Presentation at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, Delaware, September 8-10, 2008.

[84] MMS, 2008. "MMS Moving Forward With Alternative Energy Leases on the Outer Continental Shelf." Press Release, July, 23, 2008. Accessed online at: http://www.mms.gov/ooc/press/2008/press0723.htm. Last accessed September, 2008.

[85] The difference in the development of an offshore wind energy industry within Northeastern/Mid-Atlantic states is likely due to the lessons learned from the Cape Wind experience in Massachusetts. Rhode Island, Delaware and New Jersey want to encourage industry development and are working to create a favorable regulatory system. See Chapter 3- Regulation of Offshore Wind Energy.

coastal load centers with much needed energy at stable prices. However, in addition to the quality and quantity of the wind resources offshore, the development of offshore wind is also controlled by the economics of building such an industry.

There have been a number of proposed offshore wind farms in the U.S. that have been canceled prior to installation because of the large capital investment required and the uncertainty over the project's return on investment.[86] Therefore, an understanding of the economics associated with offshore wind farms is necessary to determine if current government incentives are effective. The total cost of an offshore wind project can be broken down into:

- Meteorological and environmental assessment
- Capital costs
- Operations and maintenance, and
- Decommissioning.

Each type of expense is examined below, followed by an examination of the cost of financing an offshore wind project and consideration of how competitive the rates of offshore wind-generated electricity are to more conventional forms of power such as coal, gas or nuclear.

a. Project Costs

The viability of an offshore wind energy industry in the Northeast/Mid-Atlantic rests on the establishment of a cohort of successful endeavors to demonstrate profitability. Economic feasibility relies on developers being able to limit costs, while

86 R. Pospisil, 2007. *Supra note 9*. *See also* B. Riner, 2007. *Supra note* 9. *See also* J. Porretto, 2007. *Supra note* 9.

at the same time maximizing revenue. The cost to install and operate offshore wind farms varies widely depending on the project, however, all projects are influenced by physical parameters such as: the number of turbines, the size of the turbines, the reliability and maintenance requirements of the technology used, the distance the site is from shore, the water depth at the site, and the accessibility of site (See Table 2).[87]

i. Meteorological and Environmental Assessments

The first step required when a developer is interested in constructing an offshore wind farm is extensive pre-testing of the proposed site. Meteorological and environmental assessments are performed to accurately design and plan for a project and assure compliance with state and local regulations. Meteorological towers are installed to collect continuous data on wind speed and direction, along with other weather related information to be used in modeling the potential energy output.[88] Assessment of the wind resources and overall microclimate of a site provides vital information on potential revenue, projected installation and operation costs, which are ultimately used to support financing agreements.[89]

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[87] T. Roark, 2008. "Offshore Wind An International Perspective." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

[88] In the case of Cape Wind, the meteorological tower has been collecting data for over 5 years while permitting has been delayed.

[89] C. Brown, 2008. "Deepwater Wind: Clean Energy is Just Over the Horizon." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

Table 2. Historic Offshore Wind Farm Construction Costs.
Adapted from T. Roark, 2008. "Offshore Wind An International Perspective." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

Project	Year of Operation	Size (MW)	Water Depth (m)	Distance from Shore (km)	Cost/MW ($ mil)	Total Cost ($ mil)
Horns Rev, Denmark	2002	160	14	20	1.78	284.8
North Hoyle, UK	2003	60	12	8	1.94	116.4
Scroby Sands, UK	2003	60	12	2	1.98	118.8
Burbo Bank, UK	2006	90	8	10	2.39	215.1
Q7, Holland	2007	120	25	23	4.34	520.8
Robin Rigg, UK	2008	180	20	8	3.51	631.8
Rhyl Flats, UK	2009	90	17	8	4.11	369.9
Greater Gabbard, UK	2009	504	30	30	5.1	2570.4

Developers must also investigate the seabed topography and substrate composition of a proposed site to engineer the appropriate foundation and installation techniques for the turbines and transmission lines.[90]

Project permitting on the federal, state and local levels involves substantial review to assess environmental impacts and compliance with applicable environmental legislation.[91] In the United States, the National Environmental Policy Act (NEPA)[92] mandates that an Environmental Impact Statement be prepared for "major federal actions significantly affecting the quality of the human environment,"[93] including actions requiring federal permits for offshore wind farms. The review process includes: an analysis of alternatives, an assessment of all environmental impacts (i.e. ecological, navigational, economic, community-related, etc.), a review for regulatory consistency with other applicable federal laws and the implementation of mitigation measures. Multiple physical and biological factors are studied to predict the overall impact of a proposed project (see Table 3). In addition to a NEPA review, most states require an additional environmental review process for projects developed within state waters.[94] These reviews can be time intensive, especially for the first pilot projects proposed. For example, Tunø Knob, located off the coast of Denmark spent

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[90] J. Hammond, 2008. "ACCIONA Energía, A Leader in Renewable Energy. *A Viable Marine Renewable Energy Industry: Pursuing Innovation and Reducing Lifecycle Costs.*" Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.
[91] Permitting requirements for offshore wind farms in the United States are discussed in further detail in *Chapter IV: Regulation of Offshore Wind §ii: Permitting.*
[92] 42 U.S.C. §4332
[93] NEPA § 102(2)(C), 42 U.S.C. § 4332(2)(C); 40 C.F.R. § 1500 *et seq.* (2007).
[94] The Massachusetts Environmental Policy Act (MEPA) (G.L.c.30 §§ 61 through 62H, 301 CMR 11.00) governs the state environmental review process over projects proposed within Massachusetts state waters. As a result of this review, an Environmental Impact Report (EIR) is created, which in many cases is very similar to the EIS produced under NEPA. *See also Chapter IV: Regulation of Offshore Wind §ii: Permitting.*

Table 3. Areas Assessed in the Cape Wind Draft EIS, that were later incorporated into the final EIS prepared by MMS.

Source: MMS, 2008. Cape Wind Draft Environmental Impact Statement (DEIS). Accessed online at: http://www.mms.gov/offshore/alternativeenergy/CapeWindDEIS.htm. Last accessed December, 2008.

Environmental Impacts Assessed in the Cape Wind Draft EIS
• Geology and Sediment Conditions • Physical Oceanographic Conditions • Benthic and Shellfish Resources • Finfish Resources and Commercial/Recreational Fisheries • Protected Marine Species • Terrestrial Ecology, Wildlife, and Protected Species • Avian Species • Coastal and Freshwater Wetland Resources • Water Quality • Cultural and Recreational Resources/ Visual • Noise

10% of its investment cost on environmental assessments[95] and the Cape Wind Project off the coast of Massachusetts has already spent $30 million in pre-construction costs related to permitting, reviews and legal fees.[96] With an increased number of completed projects and as a more streamlined permitting and review process is established these preliminary costs will likely be reduced.

ii. Capital Costs

The capital cost of an offshore wind farm constitutes the largest portion of the total cost and includes the cost and installation of the turbines, foundations, sub-stations and transmission cables (See Table 4). Offshore wind turbines are substantially more expensive than onshore turbines. The increased expense is the result of additional defense mechanisms needed by offshore structures against harsh offshore conditions, and augmented engineering to improve reliability.[97] Adding further to the expense, many turbine manufacturers are choosing to focus on the fast-growing onshore wind market rather than offshore, causing the supply of offshore turbines to be limited and more costly.[98] These supply chain issues, however, will likely change once offshore wind projects become more common, and can support a more robust industry.

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[95] R. Redlinger, P.D. Andersen and P.E. Morthorst, 2002. *Supra note 7.*
[96] P.Cassidy, 2008. "Wind farm caught up in legal swirl." *Cape Cod Times,* October 12, 2008.
[97] Department of Trade and Industry (DTI), 2007. *Supra note* 7.
[98] *Ibid.*

Table 4. Cost estimates for an offshore wind facility.

These estimates can vary widely depending on the project. Based off a study performed by Department of Trade and Industry (DTI), 2007. "Study of the costs of offshore wind generation." A report to the Renewables Advisory Board & DTI. URN Number 07/779. Available online at: www.berr.gov.uk/files/file38125.pdf. Last accessed December, 2008. (Using a conversion factor of $1.48/£1)

	Estimate	Comments
Environmental Review	n/a	Varies widely based on location
Installation of a meteorological tower	$2.66 mil each	
Turbines (3.6 MW)	$2.96 - 4.44 mil each	
Foundations	$1.48 mil each	
Transmission Cables	$399,600/km	
Cable Laying	$288,600/km	
Substations: Onshore Offshore	 $4.44 mil $11.1 mil	
Installation Vessels	$177,600 per day	
Operations and Maintenance: First 5 years (under warranty) Mid-life Last 5 years	 $1.94 mil/year $1.77 mil/year $2.22 mil/year	Estimate based off of a 30 turbine facility
Decommissioning	$407,000 per turbine	

In addition to the actual turbine, the costs of the underwater foundations are significantly more expensive offshore than onshore. Driven monopiles are the most often used foundations for offshore wind farms and essentially extend the superstructure of the tower beneath the sea surface 10-30 meters.[99] Foundations for offshore turbines are usually 2-3.5 times the cost of onshore foundations as they are much larger in order to accommodate the force of the spinning turbine and hydrological forces, and require additional installation costs.[100] Typically, the cost to secure a 3.6MW wind turbine generator onshore equals $592K (£400K), compared to an offshore turbine which approximately $1.48M (£1M).[101] As wind farms are sited further offshore, in deeper waters and harsher environments, increased transportation time and risk of logistical downtime during installation are much more extensive. Foundations located on mobile sediments also require scour protection, or large rocks placed at the base of a turbine to protect against the movement of sediments, which can potentially be detrimental to the stability of the structure and its operational life.[102]

To install these massive turbines offshore 'heavy lift vessels' are required to transport and erect the infrastructure. These vessels are not only expensive, but need to be booked well in advance which adds to the financial risk of the developer, since weather and sea conditions are so unpredictable offshore. Most developers anticipate

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[99] Danish Wind Industry Association, 2008. "Monopile Foundations." Available online at: http://www.windpower.org/en/tour/rd/monopile.htm. Last accessed December, 2008. Other forms of foundations being tested are the gravity base, suction bucket, tripod towers, jackets which would allow for installations in much greater water depths. *See* W. Musial, S. Butterfield and B. Ram, 2006. *Supra note 6.*

[100] Department of Trade and Industry (DTI), 2007. *Supra note* 7.

[101] *Ibid.* Based on a $1.48/ £1 conversion rate.

[102] K. Black, 2008. "Offshore Wind Farm Developments and Scouring Effects." *Hydro International* 12(8). Accessed online at: http://www.hydro-international.com/issues/id71-October_,_Volume_,_number.html. Last accessed December, 2008.

between 20% and 25% downtime during the installation phase, in which contracted vessels remain tied up at the dock.[103] In addition to weather challenges, the large number of planned offshore wind farms worldwide and the high demand for the limited number of heavy lift vessels is expected to cause a shortage of installation vessels, increasing project delays.[104] An expanding offshore wind industry in the United States will likely require a greater investment in domestic ship-builders, suppliers and trained personnel specialized in heavy lift vessels. In response to ship shortages, suppliers are also testing advancements in the preconstruction of turbines so that the turbines are fully assembled onshore and transported out to the project site, ultimately allowing for 'turn key' installation. This type of construction decreases the number of weather related delays, however, it also complicates transportation logistics.[105]

To collect the energy produced from the turbines and transport it back to the coastal grid, transmission lines and offshore substations are required. Both onshore and offshore substations are required to step-up and down the voltage before and after transmission. Because offshore wind energy is one of the first technologies to *produce* energy offshore, underwater transmission cables will need to be installed for all proposed projects. Perhaps in the future, a more extensive transmission grid will exist offshore, therefore, not requiring as much capital investment on the part of the

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[103] Department of Trade and Industry (DTI), 2007. *Supra note* 7.
[104] *Ibid.*
[105] A. MacAskill, 2008. "SeaEnergy Renewables." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

developer.[106] Furthermore, it is likely that onshore utility grids will also require upgrading to handle the increased capacity.[107] The total cost of these two elements can be very large, depending on the distance of the wind farm from the nearest coastal grid connection (see Table 4).

To date, European developers have been challenged by the rising costs of raw materials (i.e. steel and copper) used in the construction of turbines and transmission cables and the large production lag time for turbines.[108] These bottlenecks with the turbine supply chain are likely caused by the large increase in demand for this technology from a number of world markets (both on and offshore) and too few manufacturing plants. Turbine suppliers have responded to this issue with plans to increase their production lines, however, the impact of this expansion will not be felt for years, as such growth requires major investment.[109]

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[106] In Germany, the 2006 Infrastructure Planning Acceleration Act obligates the nearest utility operator to connect the offshore wind park to the grid. This regulation affects any wind park whose construction will commence before the end of 2011. The cost of grid connection will be carried by the network operator, not the developer, and can also be distributed across all transmission network operators. German Energy Agency (DENA), 2006. "Offshore networks: The connection of offshore wind parks to the national grid." Accessed online at: www.offshorewind.de/page/fileadmin/offshore/documents/dena-Material__Factsheets_usw._/02_eng_Offshore_Grids.pdf. Last accessed December, 2008.

[107] R. Amerkhail, 2008. "Grid Modernization and the Integration of Renewables." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

[108] DTI, 2007. *Supra* note 7. See *also* M. I. Blanco, 2008. "The Economics of Wind Energy." *Renewable and Sustainable Energy Reviews,* In Press, doi:10.1016/j.rser.2008.09.004. Fast-growing economies such as China are pushing the cost of raw materials upwards, including the cost of steel, copper, lead, cement, and aluminum, all used in the production of wind turbines. Since 2004 copper prices have risen by over 200%; lead prices have increased by 367%; steel prices have doubled; and aluminum prices have increased by 67%.

[109] *Ibid.*

iii. Operation and Maintenance Costs

A third principal cost element in generating electricity from offshore wind is the operation and maintenance (O&M) of the turbines, substations and transmission lines. These costs include regular maintenance, repairs, insurance, management, royalty and lease payments.[110] For a newer machine, O&M costs might have an average share over the lifetime of the turbine of about 20-25% of total cost per kWh produced. However, because current offshore turbines are not more than 20 years old, long-term O&M data is not available, or comparable for cost estimations. Manufacturers, however, are continuously aiming to shrink these costs through the development of new turbine designs requiring less regular service visits and, therefore, reduced downtime.[111] During the initial years of operation, manufacturers offer warranties to cover malfunctions and part replacements, but after the warranty period those costs become the burden of the developer (See Table 3-2). For current offshore wind installations in the U.K. where the turbines are 5-7 years old, operational costs are in the range £1.1-£1.3M ($1.63- $1.93 M) annually for a 30 turbine development.[112] Relatively speaking, the operation and maintenance costs of offshore wind farms is a fairly low (23%) compared to a natural gas power plant where O&M can constitute as much as 40-60% of the total investment cost.[113] Additionally, the

[110] See *Ch. IV Regulation of Offshore Wind Energy. §i. Federal Regulation* for further discussion of regulations regarding royalty and lease payments in the United States.
[111] M. I. Blanco, 2008. *Supra note* 108.
[112] DTI, 2007. *Supra note 7.* Currency conversion based on December 2008 rates: £1=$1.48.
[113] M. I. Blanco, 2008. *Supra note* 108.

trend towards larger wind turbines will continue to lower O&M costs per kWh over time.[114]

iv. Decommissioning Costs

Decommissioning costs relate to the removal of the superstructure (i.e. turbine blades, nacelle, and towers), the foundation, any scour protection installed and possibly the offshore transmission cables at the end of the wind farms life.[115] Current offshore wind farms are predicted to last 20-25 years before they need to be removed or replaced. Removal is fairly straightforward, taking only days to tear down structures that took months to install, however, heavy lift vessels and transport barges would be required to dredge, detach and dispose of the unwanted assembly. The current draft of MMS regulations concerning alternative energy production on the OCS requires the project developer to submit a decommissioning plan with the application for a lease agreement, and to "clear the seafloor of all obstructions" within one year of lease termination.[116] MMS discusses the possibility of requiring developers to designate funds to meet the decommissioning costs and site clearance obligations prior to installment. This regulatory requirement would guarantee that

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[114] European Wind Energy Association (EWEA), 2004. " Wind Power Economics." Available online at: www.ewea.org/fileadmin/ewea_documents/documents/press_releases/factsheet_economy2.pdf. Last accessed December, 2008.

[115] Transmission cable removal may not be required if the site is being reused or updated with newer turbines, or if they will feed additional offshore facilities.

[116] MMS, 2008. "Alternative Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf." *Federal Register* 73(132): 39376-39504. MMS is considering delaying regulations on decommissioning since there are no structures in place and decommissioning operations will likely not occur for another 25 years.

offshore wind farms were not left indefinitely, to disintegrate, but would also add to the already large initial investment needed by developers.

b. Financing Project Costs

With such a large investment needed for environmental testing, capital, installation, operation and maintenance, financing plays an important role in the feasibility of a project. Financing can originate from three main sources: (i) private equity, (ii) commercial debt and/or (iii) bonds. Privately owned wind projects use primarily the first two sources, in contrast to publicly owned projects which rely more heavily on bond financing.[117] In an all-equity financing scenario, the developer provides all capital funding for the offshore facility, usually generated from the company's other operational activities. This type of financing, therefore, is only used by private entities with balance sheets large enough to orchestrate such large up-front investments.

Developers who use credit to finance a project must convince lenders of the quality of the project, its projected net cash flow, technology warranties and the tax incentives provided by federal legislation.[118] Project owners benefit from two significant Federal tax incentives: (i) accelerated depreciation of capital investments

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[117] ATM, 2008. *Supra note* 62. Because all current U.S. offshore wind projects are proposed by private entities, they will be the focus of this section.

[118] *Ibid. See also* P. Astolfi, S. Baron and M.J. Small, 2008. *Supra note* 10. Most current wind projects use project financing rather than corporate financing. Project financing differs from corporate financing in that, the project is treated as a stand-alone entity with limited recourse to the parent company. Therefore, only the project's revenue stream can be used to pay the project's debt obligations and the parent company's assets are not at risk. *See* R. Y. Redlinger, P.D. Andersen and P.E. Morthorst, 2002. *Supra note 7.*

over the first 5 years of the project[119] and (ii) the production tax credit (PTC) which reduced federal tax liability dollar for dollar based on the sale of project electricity during the first 10 years of operation.[120] These tax incentives can provide additional leverage to a project when negotiating with banks, though uncertainty over the long-term availability of tax credits reduces their bargaining power.[121] In fact, these tax incentives are so valuable that developers will often partner with another company, known as a 'tax equity investor', who can provide capital in exchange for tax credits.[122] As a result of the impact of these tax incentives, federal legislation regarding these credits has a considerable effect on the cost to finance, and the ultimate economic feasibility of a project.

In addition to the tax benefits available to new offshore wind developments, financing is also based on a project's production of: (i) Renewable Energy Certificates (REC) and (ii) Power Purchase Agreements (PPA) with utility companies, which together impact potential revenue. RECs are tradable credits, representing 1MWh of renewable energy production, that can be sold by renewable energy facilities to utility companies which must comply with state renewable energy requirements.[123] The price that a REC sells for on an open market can vary depending on the level of supply

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[119] Accelerated depreciation of long-term assets (i.e. turbines) decreases the net taxable income and subsequently the tax liability of a company during those first 5 years.
[120] ATM, 2008. *Supra* note 62. *See also* P. Astolfi, S. Baron and M.J. Small, 2008. *Supra* note 10.The PTC provides a 2.1 cent credit for every kWh produced.
[121] C. Stolarski, 2008. Presentation at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.
[122] P. Astolfi, S. Baron and M.J. Small, 2008. *Supra* note 10.
[123] These state requirements, commonly referred to as Renewable Portfolio Standards, are discussed in greater detail in *Ch. V Government Incentives §i Types of Incentives.*

and demand, but can range from $2-$49 per MWh.[124] These credits represent an additional flow of cash for an offshore wind farm and can be used to further strengthen a financing agreement. PPAs are long-term agreements between a producer of renewable energy and a utility company for the purchase of a certain amount of electricity at a particular price level. These agreements lessen the risk associated with an offshore proposal by guaranteeing that the power produced by a project will be purchased at a stated price. Not every offshore wind project has a PPA prior to construction, but the existence of one is advantageous.

c. Production Cost Comparison With Traditional Energy Sources

While offshore renewable energy produces clean energy, advances energy independence and strengthens national security, in the end, the emergence of an offshore renewable energy industry will only occur if it is competitively priced compared to other current energy sources (i.e. coal, natural gas, nuclear, etc.) The cost of production from natural gas equals $0.04 to $0:05kWh, hydropower from $0.03 to $0.04/kWh and coal from $0.02 to $0.03kWh.[125] Offshore wind power, however, currently in its infancy, is being generated at between $0.08 and $0.15/kWh making it much less competitive with conventional power sources. Even compared to onshore wind energy, which range from $0.04 to $0.06 per kilowatt-hour, offshore wind

[124] E. Holt and L. Bird, 2005. *Emerging Markets for Renewable Energy Certificates: Opportunities and Challenges.* Technical Report by the National Renewable Energy Laboratory, NREL/TP-620-37388. Available online at: http://www.epa.gov/greenpower/gpmarket/rec.htm#rec_chart. Last accessed January, 2009.

[125] MMS, 2006. *Supra* note 2. In the last 20 years, the cost of creating energy from onshore wind has dropped significantly from $0.40/kWh to $0.04 to $0.06/kWh due to technological advancements.

projects are considerably more expensive.[126] Cost analysis between onshore and offshore wind farms shows the relatively large expense of turbines in onshore projects, compared to offshore projects which require a much larger portion of the budget to be spent on foundations and support structures (See Figure 6). Onshore wind energy over time was able to reduce production costs to a competitive level and offshore installations are projected to show a similar decline. The U.S. Department of Energy predicts prices will decrease to $0.05/kWh by 2012 as technology improves, turbines grow larger and the number of installations also increases.[127] Without continued interest in the industry, however, these advancements and cost reductions will not come to fruition.

Despite the fact that offshore wind energy is expensive, the distinct advantage of wind energy is that after the installation process, provided that wind predictions and energy output have been accurately calculated, the generation cost of this technology is predictable and stable. This reduces the overall risk to a developer over the amount of revenue that is likely to be produced from the facility, and also produces stable electricity prices for consumers. During times when costs of conventional power are volatile, the price stability provided in the long-run by offshore wind may offset the

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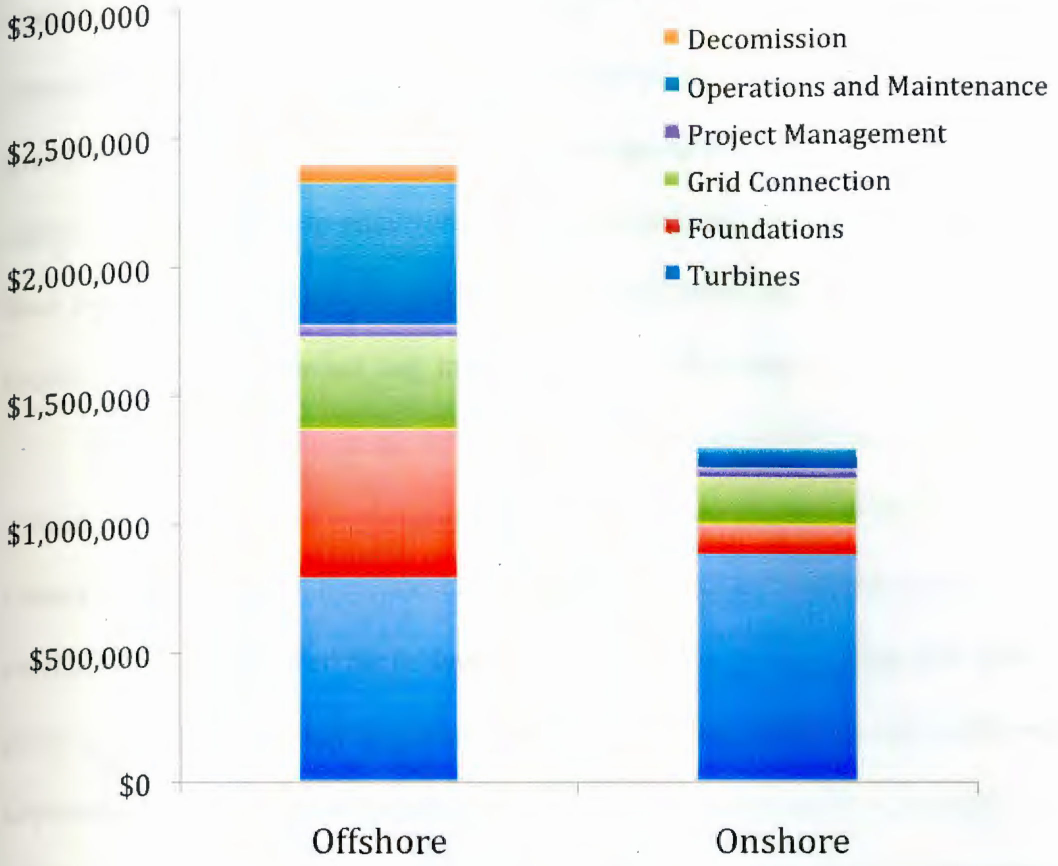
[126] U.S. Department of Energy (DOE), 2006. "Technology White Paper on Wind Energy Potential on the U.S. Outer Continental Shelf." Available online at: http://ocsenergy.anl.gov. Last accessed November, 2008. *See also* Offshore Wind Collaborative Organizing Group, 2005. *Supra* note 1.

[127] U.S. Department of Energy (DOE), 2006, "U.S. Department of Energy to Develop Multi-megawatt Offshore Wind Turbine with General Electric," News Release, Office of Energy Efficiency and Renewable Energy, March 9. Available online at: http://www.energy.gov/news/3309.htm. Last accessed January, 2009.



	Offshore Wind Farm		Onshore Wind Farm	
Turbines	33%	$792,000	68%	$884,000
Foundations	24%	$576,000	9%	$117,000
Grid Connection	15%	$360,000	14%	$182,000
Project Management	2%	$48,000	3%	$39,000
Operations and Maintenance	23%	$552,000	6%	$78,000
Decommission	3%	$72,000	n/a	
Total		$2,400,000		$1,300,000

Figure 6. Cost Comparison Between Offshore and Onshore Wind Farms. *Adapted from* W. Musial, S. Butterfield and B. Ram, 2006. "Energy from Offshore Wind." Presented at the Offshore Technology Conference, Houston, TX, May 1-4. Concerted Action on Offshore Wind Energy in Europe (CAOWEE) and the European Commission, 2001. "Offshore Wind Energy Ready to Power a Sustainable Europe." Final Report NNE5-1999-562. Available online at: http://www.offshorewindenergy.org/ca-owee/indexpages/Download_Reports.php. Last accessed December, 2008. Department of Trade and Industry (DTI), 2007. "Study of the costs of offshore wind generation." A report to the Renewables Advisory Board & DTI. URN Number 07/779. Available online at: www.berr.gov.uk/files/file38125.pdf. Last accessed December, 2008.

relatively higher cost per kWh in the short-run.[128] In addition to price stability, offshore wind energy can also offer more accurate price forecasting. Conventional power sources fuel and O&M costs, represent a significant portion (40-60%) of the production costs adding to price variability, compared with offshore wind where the fixed capital costs represent the principal factor in determining production cost.[129] As a result, prices can be pre-set long in advance and not fluctuate.

In addition to comparing prices over a long-term time horizon, a fair comparison of the different energy production rates must include all internal and external costs to society. Coal and natural gas plants produce multiple environmental externalities not accounted for in their prices. Air pollution from fossil fuel fired power plants adds, not only to global warming issues, but also to human health related expenses and environmental degradation. A European Commission study that quantified the cost of externalities associated with energy production found on average an additional charge of € 0.04-0.07 per kWh ($0.04-$0.07) should be added to coal power and € 0.01-0.03 per kWh ($0.01-$0.03) to natural gas, compared to less than € 0.01 per kWh (<$0.01) for wind energy.[130] While it is often difficult to quantify environmental impacts, it is believed that these issues should be considered when comparing production costs.

Conventional energy rates are also somewhat under inflated because of the effects of past government subsidies that helped to lower their production rates. For example, in the mid-1990s, global fossil fuel and nuclear power subsidies equaled

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[128] EWEA, 2004. *Supra* note 14.
[129] *Ibid.*
[130] European Commission (EUROPA), 2003. External Costs: Research results on socio-environmental damages due to electricity and transport. Available online at: http://ec.europa.eu/research/energy/pdf/externe_en.pdf. Last accessed January, 2009.

approximately $250-300 billion annually.[131] Since then several countries, including the United States, have reduced subsidies to these traditional energy sources, however, the impact of these subsidies now presents an obstacle to the entrance of renewable energy into the global energy market.[132] The redistribution of energy subsidies to cleaner technologies should help level the playing field and help make offshore wind energy a more competitive option.

In conclusion, the costs to install and operate an offshore wind farm are large and require a substantial amount of investment upfront. Together, these add to the risk of a project, and ultimately slow the growth of an industry. Compared to conventional sources of energy, offshore wind still appears to be too expensive, however, by not internalizing externalities or factoring in the long-term effects of past subsidies, the comparison is not fully accurate. European studies have shown that when externalities are factored into the cost of convention energy generation, offshore wind energy becomes much more economically competitive.[133] If a country such as the United States, or the individual states within a region such as the Northeast/Mid-Atlantic want to encourage clean energy development and offshore wind, policies need to be created

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[131] United Nations Development Programme (UNDP), 2000. *World Energy Assessment: Energy and the Challenge of Sustainability*, J. Goldemberg (Editor), World Energy Council Publication, New York.
[132] J. Pershing and J. Mackenzie, 2006. "Chapter 6, Removing Subsidies: Leveling the Playing Field for Renewable Energy Technologies." *Renewable Energy: A global review of technologies, policies and markets.* D. Abmann, U. Laumanns and D. Uh (Editors). Earthscan Publishing, London and Sterling, VA. *See also* J. L. Sawin, 2006. "Chapter 4, National Policy Instruments: Policy Lessons for the Advancement and Diffusion of Renewable Energy Technologies Around the World." *Renewable Energy: A global review of technologies, policies and markets.* D. Abmann, U. Laumanns and D. Uh (Editors). Earthscan Publishing, London and Sterling, VA. *See also* Energy Information Administration (EIA), 2008. "Federal Financial Interventions and Subsidies in Energy Markets 2007." Available online at: http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/index.html. Last accessed January, 2009.
[133] EUROPA, 2003. *Supra* note 130.

to lower the risk and uncertainty to developers and to increase the cost competitiveness of the technology.

Beginning in 2001 with the Cape Wind proposal, the growing interest in offshore wind energy by developers in the U.S. has highlighted the regulatory void concerning this type of use on the Outer Continental Shelf (OCS).[134] The lack of a comprehensive planning or management framework, and unclear agency jurisdiction during the early proposals led executive agencies to apply former laws that were not intended to regulate this use.[135] In this way the development of offshore wind energy technology has outpaced the development of a comprehensive regulatory framework for this new offshore activity. The deficiency in offshore wind energy policy, some have argued, is impeding the growth of this new industry and ultimately undermining U.S. attempts at energy independence.[136]

The U.S. Commission on Ocean Policy in 2004 recognized the regulatory uncertainty facing offshore renewable energy in its report *An Ocean Blueprint for the 21st Century.* The Commission identified potential consequences of the absence of a clear policy stating "the nation runs the risk of unresolved conflicts, unnecessary delays, and uncertain procedures,"[137] as well as confusion in the development of this new industry. Others argued the lack of appropriate policy discourages investment, stunts industry growth and inhibits further technological innovation.[138] In response to this shortfall, the Commission's recommendation concerning offshore renewable

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[134] U.S. Commission on Ocean Policy, 2004. *Supra* note 12. *See also*, G. R. Martin and O. A. Smith, 2004. *Supra* note 5.

[135] J. Firestone, K. Willet, A. Krueger and C. Loper, 2004. "Regulating Offshore Wind Power and Aquaculture: Messages from Land and Sea," *Cornell Journal of Law and Public Policy* 14(2004): 71-111.

[136] U.S. Commission on Ocean Policy, 2004. *Supra* note 12.

[137] *Ibid.*

[138] W. Musial, S. Butterfield and B. Ram, 2005. *Supra* note 8.

energy development was as follows:

> What is urgently needed is … a comprehensive offshore management regime … that considers all offshore uses within a larger planning context. A coherent and predictable federal management process for offshore renewable resources that weighs the benefits to the nation's energy future against the potential adverse effects on other ocean users, marine life, and the ocean's natural processes, should be fully integrated into the broader management regime.[139]

The Commission further specified that the legislation needed to provide for: a streamlined process for the licensing, leasing, and permitting of all renewable energy facilities sited in United States waters; consideration of the public nature of oceans and their resources; ensuring that the general public share in the financial returns from the private use and development of a public resource; and providing for a transparent decision-making process that considers interests and concerns at the state and local level.[140]

Following the U.S. Ocean Commission's report, several advances have been made in the regulation of offshore wind energy. In 2005, Congress and the President stated their support of alternative energy production on the OCS in passing the Energy Policy Act of 2005.[141] This legislation made the lead agency the Department of the Interior, in charge of offshore wind energy on the OCS, allowing for formal regulations to be developed. Since the passage of this legislation, draft regulations have been circulated, however, a comprehensive federal framework and solid guidelines are still not complete. The aim of this chapter is to examine the evolution of federal regulatory policy pertinent to offshore wind energy, using Cape Wind as a case study. Leasing and permitting schemes will also be discussed, followed by an

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[139] U.S. Commission on Ocean Policy, 2004. *Supra* note 12.
[140] *Ibid.*

analysis of what lessons can be learned from the experiences of Cape Wind and how the approval process might be improved.

a. Federal Regulations

i. Evolving Offshore Wind Energy Regulation

The regulatory uncertainty surrounding Cape Wind first began with ambiguity over which statutes pertained to offshore wind energy installations. Due to the fact that there was no legislation that directly dealt with offshore renewable energy, federal agencies pieced together prior legislation regarding other uses and installations on the OCS. At first consideration, the installation of 130 turbines offshore raised the issue of impaired navigation, a matter which falls under the jurisdiction of the USACE under two pieces of legislation: the Rivers and Harbors Act (RHA) of 1890 (and subsequent amendments of 1899) [142] and the Outer Continental Shelf Lands Act (OCSLA).[143] Together, the RHA and the OCSLA grant authority to the USACE to protect navigation in the nation's navigable waters. First, Section 10 of the RHA prohibits obstructing navigation through waters of the United States without authorization by Congress or the Secretary of the Army.[144] Second, the Outer

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[142] 33 U.S.C. 403

[143] Outer Continental Shelf Lands Act, 1953. Public Law No. 83-212, 67 Statute 462.

[144] 33 U.S.C. 403 §10 reads as follows: "That the creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor of refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water of the

Continental Shelf Lands Act (OCSLA)[145] applies federal law and jurisdiction to the seabed, subsoil, and permanently or temporarily fixed artificial islands and installations on the outer continental shelf.[146] The purpose of this act is to establish a regulatory framework for the extraction of minerals, primarily oil and gas from this area of the ocean, while taking into account environmental impacts, multiple user groups and equitable returns for the use of a public good. Later amendments to the OCSLA gave the USACE the authority to prevent obstruction to navigation in navigable waters from artificial islands, installations, and other devices beyond 3 nautical miles.[147] This amendment extended the RHA § 10 authority out to the OCS, however, the exact meaning and jurisdiction of this extension has been controversial.[148]

Under the umbrella of these two laws, the first permit was granted to Cape Wind by the USACE to install the data tower. This permit started a long line of litigation against the developer that would continue throughout the permitting process. In *Alliance to Protect Nantucket Sound et al. v. U.S. Department of the Army et al.*[149] the plaintiff argued that the USACE did not have the authority to grant a permit for offshore meteorological data tower and that the agency acted arbitrarily and

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United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to beginning the same."

145 Outer Continental Shelf Lands Act, 1953. *Supra* note 142.

146 43 U.S.C. §1333(a)(1)

147 *Ibid.* §1333(e)

148 The controversial language, is the meaning of the phrase "which may be erected [for the purposes of resource extraction]" in §1333(a)(1). Opponents to Cape Wind argue that the use of "may be" excludes projects not related to resource extraction. Conversely, proponents argue that the language only gives examples of some types of structures that are covered. Depending upon one's reading of "may be" in §1333(a)(1), the USACE RHA §10 authority may be to only those structures used for resource extraction. *See also*, T.A Utzinger, 2004. "Federal Permitting Issues Relating to Offshore Wind Energy, Using the Cape Wind Project in Massachusetts as an Illustration." *Environmental Law Reporter* 34 (2004): 10794-808. See also G.R., Martin and O.A. Smith, 2004. *Supra* note 5.

149 *Alliance to Protect Nantucket Sound v. Department of the Army*, 288 F. Supp. 2d 64 (D. Mass. 2003).

capriciously in deciding that an EIS was not required. The First Circuit Court held that although Section 10 authority under the OCSLA was ambiguous as to the USACE authority to issue this type of permit, the legislative history showed that Congress intended to the USACE to have jurisdictional authority over all structures, not just those related to mineral extraction. The court also ruled that the USACE did not act in a manner that was arbitrary or capricious in not requiring an EIS for the tower. During this litigation questioning USACE authority to permit offshore wind projects on the OCS, the Energy Policy Act of 2005 was enacted and greatly clarified jurisdictional authority over this new industry.

ii. Energy Policy Act of 2005

The Energy Policy Act of 2005, was the first updated energy policy legislation for the nation since The Energy Policy Act of 1992.[150] In recognition of the need for an offshore renewable energy policy, Congress included a section in the Energy Policy Act of 2005 entitled "Alternate Energy-Related Uses on the Outer Continental Shelf," clearly addressing jurisdiction and outlining regulatory oversight. Section 388 of this act amended the Outer Continental Shelf Lands Act (OCSLA) and gave the Department of Interior (DOI) new authority to regulate alternative energy on the OCS.[151] The Act added subsection 8(p), authorizing the Secretary of the Interior to grant a lease, easement or right-of way on the OCS for activities that are not otherwise

[150] Energy Policy Act of 1992, Pub.L. 102-486.
[151] This new regulatory authority granted to DOI under the Energy Policy Act of 2005 does not supercede or modify existing authority of any other federal agency, nor does it apply to areas designated as National Marine Sanctuaries, National Parks, National Wildlife Refuges or any National Monuments. The project siting process will have to take into account these exclusion zones.

authorized by the OCSLA or other existing law and: (1) produce or support production, transportation, or transmission of energy from sources other than oil or gas; or (2) use for energy-related purposes or for other authorized marine-related purposes, facilities currently or previously used for activities authorized under the OCSLA.[152]

The DOI delegated this new authority to the MMS, which also has authority over oil and gas exploration on the OCS. This new authority under OCSLA provides that MMS will, among other things:

- Issue leases, easements or rights-of-way on the OCS for alternate energy and alternate use activities on a competitive basis, unless it is determined through bid solicitation that no competitive interest exist;
- Coordinate and consult with affected state and local governments;
- Pursue appropriate enforcement actions in the event violations occur;
- Require appropriate financial surety to ensure that facilities constructed are properly removed at the end of their economic life;
- Regulate and monitor alternate energy and alternate use activities; and
- Determine a fair return to the Nation for private use of this public good.[153]

By amending the OCSLA to include offshore renewable energy, now energy uses on the OCS fall under the jurisdiction of one agency rather than having different uses regulated by many agencies. This type of collective oversight over energy production

[152] Energy Policy Act of 2005, Pub.L. 109-058, §388(a).
[153] MMS, 2008. Press Release:"Alternate Energy-Related Uses on the Outer Continental Shelf." Accessed online at: www.mms.gov/ooc/PDFs/FactSheet-AEAUBackgrounder2008.pdf. Last Accessed April, 2008.

on the OCS by one agency is one approach to achieving a more comprehensive offshore management regime, managing the OCS as a whole rather than managing uses individually.

To facilitate the Secretary of the Interior's ability to determine which sites may or may not be appropriate for alternative energy development, the act also mandated an interagency digital mapping initiative. Together with the Secretary of Commerce, the Commandant of the Coast Guard, and the Secretary of Defense the mapping initiative shall include an indication of the locations on the outer Continental Shelf of--

> (A) Federally-permitted activities;
> (B) Obstructions to navigation;
> (C) Submerged cultural resources;
> (D) Undersea cables;
> (E) Offshore aquaculture projects; and
> (F) Any area designated for the purpose of safety, national security, environmental protection, or conservation and management of living marine resources.[154]

Beyond the mapping initiative, MMS has begun to sign memoranda of understanding (MOU) with other agencies to clarify the roles of each department throughout the review process. MMS has collaborated with the USCG to develop the USCG's role in assisting in the NEPA review with respect to impacts of the project on navigation.[155] In addition, due to the fact that the DOE has a greater understanding of wind resources and the wind energy industry through the work of the National Renewable Energy Laboratory (NREL), MMS and DOE will also be signing an MOU to:

> facilitate cooperation between the two government entities for exchanging technical information relating to offshore wind energy R&D activities,

[154] Energy Policy Act of 2005. *Supra* note 151, §388(b).
[155] USCG, 2007. Guidance on the Coast Guard's Roles and Responsibilities for Offshore Renewable Energy Installations. Navigation and Inspection Circular No. 02-07.

engineering principles of wind turbines and their components, and certification procedures for the turbines and the entire structure.[156]

These types of interagency MOUs are not required by law to be published publicly and, therefore, their existence can often be unclear. However, it can be expected that additional MOUs are likely as MMS finalizes its regulations.[157] These types of agreements will not only help clarify roles but will also draw on the expertise of each agency to produce the most effective regulatory scheme for offshore renewable energy.

As a result of the Energy Policy Act of 2005, the MMS now has the authority to structure a balance between the development of offshore wind resources with environmental, economic and public interests. However, the agency has taken a considerable amount of time to adopt formal regulations despite Congress including provisions in the act that

> [N]o later than 270 days after the date of enactment of the Energy Policy Act of 2005, the Secretary, in consultation with the … heads of other relevant departments and agencies of the Federal Government, and the Governor of any affected State, shall issue any necessary regulations.[158]

It was not until the spring of 2009, almost four years after the Energy Policy Act of 2005, that MMS finalized its regulations.[159] This delay in the final regulatory scheme for offshore wind energy has impeded the industry's development by continuing an environment of uncertainty. Without firm procedures in place, industry development

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[156] W. Musial et al., 2006. *Supra* note 8.
[157] DOI and the Federal Energy Regulatory Commission just recently signed an MOU regarding jurisdictional authority concerning offshore wave, tidal and current projects. *Senate Energy and Natural Resources Committee Oversight Hearing on Energy Development*, March 17,2009. Available online at: http://energy.senate.gov/. See also http://www.ferc.gov/legal/maj-ord-reg/mou/mou-doi.pdf.
[158] Energy Policy Act of 2005, *Supra* note 151, §388(p)(8).
[159] MMS, 2009. "President Obama, Secretary Salazar Announce Framework for Renewable Energy Development on the U.S. Outer Continental Shelf." Press Release. Available online at: http://www.mms.gov/ooc/press/2009/press0422.htm. Last accessed May 2009.

was essentially on hold as developers are unable to secure leases, or to begin project planning and design.

iii. Mineral Management Service Proposed Regulations

The agency first drafted a Programmatic Environmental Impact Statement (EIS) to address the general impacts offshore renewable energy production could have on the OCS and best management practices that should be implemented. The MMS chose to prepare this programmatic EIS to assist its efforts to develop a comprehensive management scheme and to establish the Alternative Energy and Alternate Use Program (AEAUP) for the OCS. The AEAUP will approve and manage permitting for all offshore renewable projects. The aim of this program is to "provide a road map for developers to follow during the permitting process, allowing developers to more adequately estimate the resources required for a proposed project" and, ultimately, to facilitate faster development of the alternative energy industry on the OCS.[160] In addition to the guidelines specifically outlined, the programmatic EIS also acknowledges the agency's authority to consider, as appropriate, individual projects on a case-by-case basis before final regulations are completed.[161] By combining case-by-case analysis with more general AEAUP policies and guidelines, the MMS has greater flexibility in managing and approving projects offshore based on the specific

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[160] MMS, 2007. *Alternative Energy Programmatic Environmental Impact Statement*- Executive Summary. Available online at: http://www.mms.gov. Last accessed April, 2008.

[161] MMS, 2008. Press Release:"MMS Issues Record of Decision on Offshore Alternative Energy and Alternate Use Program." Accessed online at: http://www.mms.gov/ooc/press/2008/press0110.htm. Last accessed April, 2008.

details of a proposal.[162] The AEAUP acted as the MMS interim policy and is in effect until the MMS final rules take effect, which will then regulate all program activities from that point forward.[163]

1. Leases, Bidding Procedures and Fees

Within the final rules developed for alternative energy on the OCS, the MMS identifies two types of leases that can be awarded to developers: (1) commercial leases for 25 years of full-scale commercial energy production, and (2) limited leases equaling 5 years in length for site assessment and technology testing.[164] Because final rules regarding commercial leases have just been released, MMS has only begun to grant limited leases under the AEAUP. Since offshore wind turbine technology has been extensively tested in Europe, limited leases for technology testing were not awarded to offshore wind applicants.[165] Following its call for lease applications in 2008,[166] MMS received 43 nominations for limited leases but ultimately awarded only 16.[167] Limited leases include specific provisions regarding the construction and installation of structures on the OCS and confer no priority rights to subsequently develop a facility on the lease site. Further development of a site requires a commercial lease.

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[162] MMS, 2007. *Supra* note 157.
[163] Final rules will take effect in June 2009.
[164] MMS, 2008. *Supra* note 116.
[165] MMS, 2008. Press Release:"MMS Announces Preliminary Nominations for Limited Alternative Energy Leases on the Outer Continental Shelf." Accessed online at: http://www.mms.gov/ooc/press/2008/press0122.htm. Last accessed April, 2008.
[166] *Ibid.*
[167] Five limited leases were awarded off the coast of New Jersey, five off Florida, 3 off Georgia, 2 off California and 1 off Delaware. *See* MMS, 2008. *Supra* note 58.

The commercial leasing process for offshore renewable energy is designed after the leasing system used with OCS oil and gas exploration and development. Commercial leases can be obtained in two ways: through a competitive bidding process or a non-competitive bidding process (See Figure 7). The main difference between the two is with a competitive process MMS identifies a particular area on the OCS and then places a call for bids from all interested parties. Alternatively, a non-competitive bidding process is initiated when a developer submits a lease request to MMS, afterward confirms through a lack of response to a proposed sale notice, that there is no competitive interest in that area by any other developer.[168] In cases involving a competitive bid, MMS is proposing the use of a cash bonus system as the basis for determining the winning bidder. Where no competitive interest exists in a lease area, a marginal acquisition fee is being considered by MMS.[169]

The Energy Policy Act of 2005 mandates that 'the Secretary shall establish royalties, fees, rentals, bonuses, or other payments to ensure a fair return to the United States for any lease, easement, or right-of-way granted.'[170] Therefore, once a lease is obtained the lessee will be responsible for annual rental fees based on the acreage amount leased. MMS is proposing rental rates of $3 to $5 per acre for commercial leases, project easements and rights-of-way.

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[168] *Ibid.*
[169] *Ibid.*
[170] Energy Policy Act of 1992. *Supra* note 149. §388(p)(2).

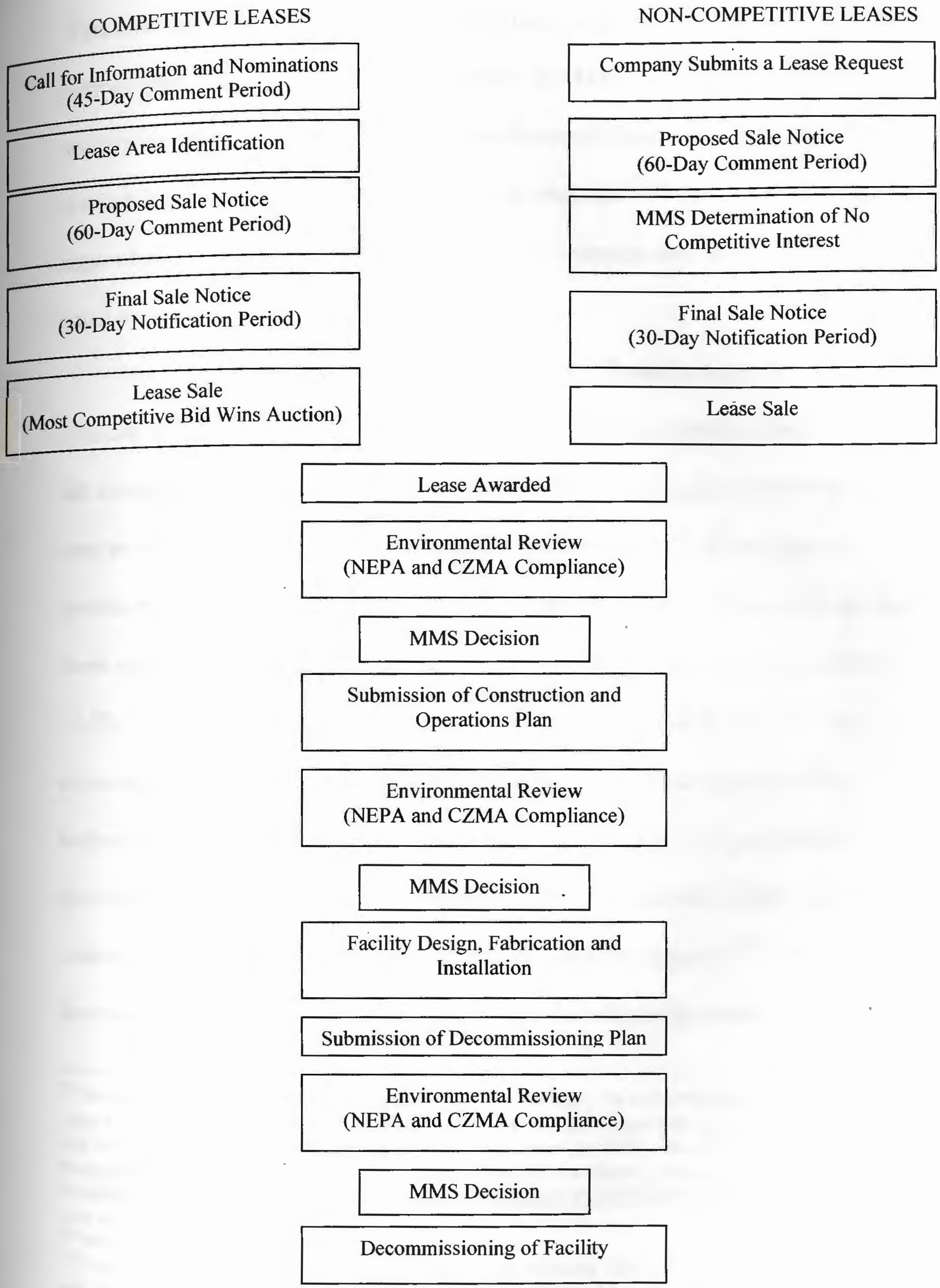

Figure 7. Federal regulatory review for alternative energy leases on the outer continental shelf. *Adapted from* MMS, 2008. "Alternative Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf; Proposed Rule." *Federal Register*, July 9, 2008, 73(132): 39376-39504.

This rate was set below the current rates for oil and gas leases (which equal on average approximately $5.26/ acre[171]) because the MMS recognizes that the underlying value of the leased acreage used for an offshore renewable energy facility is much less impacted compared to oil and gas projects.[172] While these lease payments appear low, it is estimated that Cape Wind lease payments over the first 20 years will equal approximately $5.6 million.[173]

In addition to rental fees, royalty payments will also be required once an offshore wind project starts to produce revenues. While the royalty scheme has been left somewhat ambiguous in the proposed rules, MMS has suggested that royalty rates may be set at approximately 1% of gross revenue during the first two years of operation, increasing to 2% thereafter. Comparably these rates are much lower than those currently used for oil and gas leases, which are currently at approximately 12.5%.[174] Keeping lease rates and royalty payments low, decreases operational expenses for an offshore wind farm, adding to the cost competitiveness of the technology. Royalty payments are shared between the state (27%) and federal government (73%) when projects 'are located wholly or partially within the area extending three nautical miles seaward of State submerged lands.'[175] Therefore, depending on how lucrative a particular offshore wind farm is, coastal states could

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[171] Rental fees vary depending on the lease year for oil and gas. In a recent proposal notice of an OCS lease sale, the rates started out at $2.50 per hectare per year ($1.01 per acre per year) for the first year and increased to $20.00 per hectare per year ($8.09 per acre per year). *See* MMS, 2008. "Final Proposed Notice Outer Continental Shelf (OCS) Chukchi Sea Alaska, Oil and Gas Lease Sale 193." Available online at: www.mms.gov/alaska/cproject/Chukchi193/PNOS193/FinalProposedNotice.pdf. Last accessed January, 2009.

[172] MMS, 2008. *Supra* note 116.

[173] National Oceanic and Atmospheric Administration (NOAA), 2007. "Offshore Wind Energy: Texas and Massachusetts Rush to be First." *Coastal Services Center,* May/June 2007. Accessed online at http://www.csc.noaa.gov/magazine/2007/03/article2.html. Last accessed March, 2008.

[174] MMS, 2008. *Supra* note 116.

[175] Energy Policy Act of 2005, *Supra* note 151, §388(p)(2b).

benefit from substantial royalty payments, in addition to the other benefits provided by offshore wind energy.

The design of the leasing and payment scheme not only satisfies provisions set forth in the Energy Policy Act of 2005, it also conveys rights to a developer for the exclusive privileges to occupy and use federal lands. Previously under the tenuous authority of the USACE under the RHA and OCSLA, no such rights were provided.[176] Only congressional authorization, through legislation such as the Energy Policy Act, gives federal agencies the authority to grant exclusive rights to private entities to develop public lands.[177] Without conceding exclusivity to a lease area, it would be very difficult for a developer to finance or install a wind farm on the OCS.

b. Permitting and Review Process

i. Federal Permitting and Review

While leases provide developers with property rights, permits provide permission to utilize a lease for a particular activity. Throughout the leasing process, multiple federal environmental reviews are required before the project will be allowed to continue. During these reviews, MMS will serve as the lead agency and, therefore, is responsible for making a final approval on the proposal, however, other agencies such as the United States Army Corps of Engineers (USACE) will retain some

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[176] Under the RHA "A [USACE] permit does not convey any property rights, either in real estate or material, or any exclusive privileges" *See* 33 C.F.R. 320.4 (g)(6).
[177] U.S. Constitution, Article IV, §3 Clause 2.

permitting authority for offshore wind projects[178] under RHA Section 10 and under the Clean Water Act Section 404.[179]

1. National Environmental Protection Act

Under the National Environmental Protection Act (NEPA)[180], federal agencies are required to consider the environmental impacts of "major federal actions significantly affecting the quality of the human environment."[181] Granting federal permits for offshore wind farms constitutes a federal action and, therefore, requires the preparation of an Environmental Impact Statement (EIS) to review all potential environmental impacts of an offshore wind project.[182] During this review process conducted by MMS, input from many other agencies regarding the impact of a wind farm is taken into account (see Table 5). While none of these agencies has the authority to deny the issuance of a permit, agency comments are incorporated into the final EIS, which is subsequently used in the approval of a permit. Once MMS has reviewed and approved all aspects of the EIS, the agency may then grant a lease, easement or right-of-way to an offshore wind energy project on the OCS.

Because the Energy Policy Act of 2005 was enacted in the middle of USACE's EIS review of Cape Wind, the act contained specific provisions regarding its status. The 'Savings Provision' of Section 388[183] states that:

Nothing in the amendment made by subsection (a) requires the re-submittal of any

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178 43 U.S.C. § 1337(p)(9).
179 33 U.S.C. §1344.
180 42 U.S.C. § 4321.
181 NEPA §102 (2)(C), 42 U.S.C. § 4332 (2)(C); 40 C.F.R. §1500 *et seq.* (2007).
182 40 C.F.R. §1508.18 (b)(4).
183 *Ibid. §388(d).*

document that was previously submitted or the reauthorization of any action that was previously authorized with respect to a project for which, before the date of enactment of this Act --
(1) an offshore test facility has been constructed; or
(2) a request for a proposal has been issued by a public authority.

This exception allowed Cape Wind to continue on with its review without having to start over from the beginning, which would have subjected the project to competitive bidding and an even more extended permitting and review process. As a result, the MMS re-drafted the EIS in conjunction with USACE which created the first statement.[184] The EIS was then subjected to an extended public comment period and the final EIS is expected in early 2009, after which time the project's development is expected to accelerate.[185]

[184] MMS, 2008. Cape Wind Draft Environmental Impact Statement. Accessed online at: http://www.mms.gov/offshore/AlternativeEnergy/CapeWind.htm. Last accessed April, 2008.
[185] MMS, 2008. "MMS Extends Comment Period on Cape Wind Energy Project." Accessed online at: http://www.mms.gov/ooc/press/2008/press0305a.htm. Last Accessed April, 2008.

Table 5. Federal Agencies and Jurisdiction Applicable to Offshore Wind Power. *Adapted from* J. Firestone, K. Willet, A. Krueger and C. Loper. 2004. "Regulating Offshore Wind Power and Aquaculture: Messages from Land and Sea." *Cornell Journal of Law and Public Policy* 14:71-111. *See also*, U.S. Commission on Ocean Policy, 2004. *An Ocean Blueprint for the 21st Century.* Final Report. (Washington, D.C.).

Federal Agency	Subject Jurisdiction Under
United States Fish and Wildlife Service (USFWS)	• May review projects for potential impacts on endangered species or marine mammals under its jurisdiction pursuant to the Endangered Species Act or the Marine Mammal Protection Act • The Fish and Wildlife Coordination Act (16 U.S.C. 661-667e; 48 Stat. 401), as amended, provides authority for the U.S. Fish and Wildlife Service to review and comment on the effects on fish and wildlife of activities proposed to be undertaken or permitted by the Corps of Engineers. • Review of activities pertaining to the Migratory Bird Treaty Act & Migratory Bird Conservation Act
United States Coast Guard (USCG)	• Regulates navigation under several federal statutes • Regulates waterway safety under the Ports and Waterways Safety Act
Federal Aviation Administration (FAA)	• Regulates objects that may affect navigable airspace pursuant to the Federal Aviation Act
Environmental Protection Agency (EPA)	• Conducts reviews for potential environmental impacts of projects pursuant to the Clean Water Act and the Clean Air Act
National Marine Fisheries Service (NMFS)	• Formal consultation and review of potential impacts to fishery resources pursuant to the Magnuson-Stevens Fishery Conservation and Management Act • Assesses potential impacts to endangered or threatened species under the Endangered Species Act or the Marine Mammal Protection Act
National Oceanic and Atmospheric Administration (NOAA)	• Formal consultation and review of projects for potential impacts to fishery resources pursuant to the Magnuson-Stevens Fishery Conservation and Management Act • Formal consultation and review of potential impacts to marine sanctuaries in the area pursuant to the Marine Protection, Research and Sanctuaries Act
* In addition, depending on its location, a wind energy project Section 10 Permit may be subject to review by one or more state coastal zone management programs in accordance	

2. *Section 10/404 Permit*

In addition to a NEPA review, an offshore wind project must also obtain a Section 10/404 Permit from the USACE. The USACE issues one permit encompassing all statutory authority of the agency under the Rivers and Harbors Act (RHA)[186] and the Clean Water Act (CWA).[187] Section 10 of the RHA prohibits obstructing navigation through waters of the United States without authorization by Congress or the Secretary of the Army.[188] A Section 10 RHA permit, regulates projects and structures such as artificial islands, installations, and other devices that are located in, or that affect navigable waters of the United States.[189] A Section 404 under the CWA, regulates the discharge of dredged or fill material below the High Tide Line within state waters and is under the shared jurisdiction of the USACE and the Environmental Protection Agency (EPA).[190] This permit pertains primarily to the

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[186] 33 U.S.C. 403

[187] 33 U.S.C. §1344. *See also* R. J. DeSista, 2008. "Marine Renewable Energy: The Current State of Regulatory Affairs." Presented at the Roger Williams University School of Law, 7th Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions for Legal, Economic, and Policy Challenges. October 23-24, 2008, Bristol, Rhode Island.

[188] 33 U.S.C. 403 §10 reads as follows: "That the creation of any obstruction not affirmatively authorized by Congress, to the navigable capacity of any of the waters of the United States is hereby prohibited; and it shall not be lawful to build or commence the building of any wharf, pier, dolphin, boom, weir, breakwater, bulkhead, jetty, or other structures in any port, roadstead, haven, harbor, canal, navigable river, or other water of the United States, outside established harbor lines, or where no harbor lines have been established, except on plans recommended by the Chief of Engineers and authorized by the Secretary of War; and it shall not be lawful to excavate or fill, or in any manner to alter or modify the course, location, condition, or capacity of, any port, roadstead, haven, harbor, canal, lake, harbor of refuge, or enclosure within the limits of any breakwater, or of the channel of any navigable water of the United States, unless the work has been recommended by the Chief of Engineers and authorized by the Secretary of War prior to beginning the same."

[189] *Ibid.* §1333(e)

[190] 33 CFR § 320-330.

installation of a wind farm and undersea transmission cables connecting the wind farm to the utility grid.

ii. State Permitting and Review

Even if the actual wind farm is located in federal waters, as is the case with Cape Wind, transmission lines must run through state waters to connect the project to the grid. As a result, numerous state and local permits apply. While each state's permitting requirements are unique and dependent upon the specific project site, there are some universal certifications and reviews to which all proposed offshore wind projects will be subject. Two of these common state reviews are: (1) state water quality certifications under the CWA and (2) federal consistency review under the Coastal Zone Management Act.

1. *State Water Quality Certification, Clean Water Act*

Under the CWA, a project requiring a federal permit to conduct any activities, including the construction and operation of facilities that may result in a discharge into navigable waters of a state, must comply with the state's water quality standards.[191] A State Water Quality Certification may include discharge limitations and other conditions necessary to ensure compliance with the CWA and "any other appropriate requirement of state law."[192] If a project does not meet these certification standards, the state can deny certification, and impede the issuance of a USACE Section 404

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[191] CWA § 401(a)(1), 33 U.S.C. § 1342(a)(1); 40 C.F.R. § 121.1(g) (defining "water quality standard").
[192] 33 U.S.C. § 1342(d).

permit.[193] This certification process provides substantial state oversight over federal permitting, granting states' "the power to block, for environmental reasons, local water projects that might otherwise win federal approval."[194]

2. *Coastal Zone Management Act (CZMA)- Federal and Interstate Consistency Review*

Under the Coastal Zone Management Act (CZMA)[195], applicants for federal licenses or permits to conduct activities affecting a state's coastal zone are required to be reviewed by the state's coastal zone management program to ensure that the project will be conducted in a manner consistent with a states' coastal zone management plan.[196] A MMS or USACE permit can only be granted if the adjacent state(s) provide concurrence with the proposed project or the Secretary of Commerce concludes that the proposed activities are either consistent with the CZMA or necessary in the interest of national security.[197] This consistency review adds to state authority over offshore wind development in federal waters. Presumably, any offshore wind farm in federal waters would still require transmission lines to cross through state waters to reach onshore utility grids.

In addition to CWA certification and the consistency review under the CZMA, various state and local reviews are necessary for offshore wind farms. The processes followed will vary depending on the applicable legislation within the coastal state and

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193 33 U.S.C. § 1341(a)(1).
194 *Keating v. FERC, 927 F.2d 616, 622* (D.C. Cir. 1991) (*citing United States v. Marathon Dev. Corp., 867 F.2d 96, 99-100* (1st Cir. 1989).
195 16 U.S.C. 1451 et seq.
196 16 U.S.C. § 1451 *and* § 1456(c)(3)(A).
197 *Id.* § 1456(c)(3)(B)(i), (iii).

town, and also on the specific details of that project, however, all projects will require some additional evaluation.

iii. Permitting Case Study: Cape Wind

Since Cape Wind is the only offshore wind project that has advanced into the permitting phase, it is examined here to illustrate the additional state and local review process to which potential offshore wind projects may be subject (See Table 6). In all, Cape Wind requires 13 official permits and reviews, not including the additional agency approvals required during the NEPA review process. Despite the fact that this permitting process was initiated eight years ago, many permits are still pending or under litigation. Two main opposition groups, the *Alliance to Protect Nantucket Sound* and the *Ten Tax Payer Citizen Group* have staged an ongoing offensive against the project, adding to the delay and expense of the project. In response to the extensive permitting requirements and legal challenges, Cape Wind has requested that the Energy Facilities Siting Board (EFSB) issue a composite certificate, or so-called "super permit," that would encompass eight local and state permits necessary for the project to proceed.[198] If this composite certificate were granted by EFSB, Cape Wind's permitting process would be greatly expedited and the pending litigation regarding other local and state permits would be dismissed.

[198] Cassidy, P. 2008. "State siting board hears wind farm dispute." *Cape Cod Times*, November 13, 2008.

Table 6: Permitting Scheme Followed by the Cape Wind Project.
Adapted from: MMS, 2008. Cape Wind Draft Environmental Impact Statement. Section 1, Introduction. Available online at: http://www.mms.gov/offshore/AlternativeEnergy/CapeWind . Last accessed November, 2008. pg 1-11.

	Issuing Agency	**Application Date/ Date Issued**	**Description**
METEROLOGICAL TOWER Federal Permits/Reviews • Section 10/404 Permit	USACE	2001/2002*	Section 10 permit required for the installation of a structure that may has the potential to impede navigation. Section 404 permit required when dumping dredge material into navigable waterways.
WIND FARM FACILITY Federal Permits/Reviews • NEPA Reviews	MMS	2005/2009	NEPA requires that Environmental Impact Statements be produced for proposed projects that affect the quality of the human environment.
• Section 10/404 Permit	USACE	Pending final NEPA Review	*See description above*
• Clean Water Act - National Pollutant Discharge Elimination System Permit	EPA	Not yet filed	This program requires operators of a construction site ≤1 acre to obtain a permit. The overall goal of this permit is to protect the quality and beneficial uses of the surface water resources from pollution in storm water runoff from construction activities. This permit would only apply to onshore construction required for transmission cables and/or the substation.
• Clean Air Act- Section 7627 Permit	EPA	2007/ Pending	Permit is required for construction and operational activities on the OCS that may emit emissions.

Table 6: Permitting Scheme Followed by the Cape Wind Project Continued.

	Issuing Agency	Application Date/ Date Issued	Description
State Permits/Reviews • CZMA- Federal and Interstate Consistency Review	MA Executive Office of Environmental Affairs & RI Coastal Resources Management Council	2001/ MA Office 2009	Under the Coastal Zone Management Act (CZMA), applicants for federal licenses or permits to conduct activities affecting a state's coastal zone are required to be reviewed by the state's coastal zone management program to ensure that the project will be conducted in a manner consistent with a states' coastal zone management plan.[199]
• MA Environmental Policy Act	MA Secretary of Environmental Affairs	2001/ 2007*	The Massachusetts Environmental Policy Act (MEPA)[200] governs the state environmental review process over projects proposed within state waters. The review process includes: an analysis of alternatives, an assessment of environmental impact, a review for regulatory consistency with other applicable state laws[201] and the implementation of mitigation measures. As a result of this review, an Environmental Impact Report (EIR) is created, which in many cases is very similar to the EIS produced under NEPA.
• Energy Facilities Siting Board Review	Energy Facilities Siting Board	2002/ 2005*	The Energy Facilities Siting Board (EFSB) is charged with ensuring a reliable energy supply for the Commonwealth of Massachusetts at the lowest possible cost, with a minimal impact on the environment.[202] When reviewing Cape Wind's proposal to construct electric transmission lines, the EFSB was required to consider the need for new transmission resources, and if the activities planned were consistent with Massachusetts Coastal Management Plan.[203] The EFSB concluded that Cape Wind met its burden of demonstrating the need for transmission lines if the wind farm were installed, and that the proposed route of the transmission lines was superior to any alternative approach, minimizing cost and environmental impact.[204]

[199] 16 U.S.C. § 1451 *and* § 1456(c)(3)(A).
[200] G.L.c.30 §§ 61 through 62H, 301 CMR 11.00
[201] Other state regulations that may apply are § 1856 of the Magnuson-Stevens Act.
[202] G.L. Chapter 164, §69H.
[203] MMS, 2008. *Supra* note 181.
[204] *Alliance to Protect Nantucket Sound, Inc. v. Energy Facilities Siting Board*, 448 Mass. 45 (2006), 858 N.E. 2d 294.

Table 6: Permitting Scheme Followed by the Cape Wind Project Continued.

	Issuing Agency	Application Date/ Date Issued	Description
• MA Waterways Act, Chapter 91 License	MA Department of Environmental Protection	2004/ 2008	The Massachusetts Waterfront Act[205] was designed to protect the rights of the public in tidelands by ensuring that the uses and activities within the states' tidelands were limited to water-dependent uses or serving a proper public purpose. License required to perform any 'construction, placement, excavation, addition, improvement, maintenance or removal of any fill or structures in tidelands of the Commonwealth.'[206] Because sections of the submarine transmission cables are located within the Massachusetts Cape and Islands Ocean Sanctuary, the Chapter 91 Waterways License incorporates additional concerns and regulations associated with this sanctuary program.
Local Permits/Reviews			
• MA Wetlands Protection Act	Yarmouth Conservation Committee & the Barnstable Conservation Committee	2007/ Denied 2007*	Local approval is required for activities (i.e. connection of transmission lines to coastal grid) that would impact wetlands
• Cape Cod Commission Review	Cape Cod Commission		CCC is a regional land use planning and regulatory agency that reviews projects within state waters that may affect the regional planning or environment through impacts of water quality, traffic flow, historic values, open space, natural resources or economic development.
* represents approvals or issued permits that were litigated by opposition groups or other government agencies			

[205] G.L. Chapter 91, 310 CMR 9.00.
[206] *Ibid.*

One of the major lessons that Cape Wind has demonstrated is how important public acceptance is to the success of a project. If the public does not welcome a wind farm, litigation is almost certain. Even in instances where the opposition's legal challenges were dismissed by the court, the cases added delay and expense to the project. Building public support prior to formally proposing a project may, in the end, save substantial amounts of time and money for the developer. The potential for delays from litigation and regulatory uncertainty to deter investment in this new industry, has led other coastal states within the Northeast and Mid-Atlantic region to adopt a new permitting scheme for offshore wind energy.

The Cape Wind permitting process has also magnified the current lack of agency coordination and essentially how not to structure an approval process. Coastal states within the region which want to encourage and promote an offshore wind industry in their states have recognized the issues of Cape Wind's experience and are now in the process of formulating a completely different approach that is more streamlined and government driven rather than developer driven. For example, Rhode Island's coastal zone management agency, the Coastal Resources Management Council (CRMC), is developing a Special Area Management Plan (SAMP) covering the state and federal waters out to 20 miles. The offshore SAMP will define use zones for Rhode Island's offshore waters, taking into account existing uses, critical resources and transportation lanes of offshore areas. The result of this SAMP will be pre-selected sites that will be more easily permitted and developed by the project developer. Under the CZMA, preparation of a SAMP enables permitting of projects within the area covered by the SAMP to proceed with a more abbreviated review of an Environmental Assessment in lieu of a full Environmental Impact Statement. Completion of the SAMP is expected within two years.[207] While a offshore SAMP may aid in the siting and permitting of the actual wind farm, it is not clear whether the SAMP will aid in the permitting of transmission lines that run through coastal and tidelands and resulted in many of the lawsuits encountered by Cape Wind. The idea to create a one-stop permitting process though, serves as an incentive to potential developers, choosing a state with a more favorable regulatory environment.

The State of Massachusetts has recognized the need for a comprehensive ocean management scheme and recently enacted the Oceans Act of 2008.[208] The Act is an effort by the state to create a uniform regulatory system to balance current and future commercial and recreational uses within Massachusetts's state waters. The Act calls for a comprehensive ocean management plan to be developed by the Office of Energy and Environmental Affairs, and will be used to coordinate all certificates, licenses, permits and approvals for any proposed projects. This plan is similar to Rhode Island's Ocean SAMP, but in this case applies only to state waters. While the geographical scope of each plan differs, the aim of both plans is the same, determining the optimal locations for future offshore projects and establishing a regulatory regime by which those projects will be developed.

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207 State of Rhode Island, Office of the Governor, 2008. *Supra* note 65.
208 Chapter 114 of the Acts of 2008.

Conclusion

Federal regulation of offshore wind energy has been slow to develop in the United States. Despite the clarification provided by Congress through the Energy Policy Act of 2005 regarding agency jurisdiction, formal rules regarding this new use have been slow to develop. As a result of this regulatory delay, industry development has been slowed. Notwithstanding the delay, the final regulations do contain some advantageous provisions regarding lease and royalty payments, which may aid industry development. The current permitting scheme, however, as seen through the Cape Wind proposal, is extensive and lacking of interagency coordination. With over thirteen reviews and seven lawsuits, two of the main lessons learned from Cape Wind are the importance of public support and a streamlined approval process. As coastal states in the Northeast and Mid-Atlantic attempt to advance the development of and offshore wind energy industry, applying the lessons learned from Cape Wind's experience to the development of management plans and other policies will likely prove invaluable.

V. *Government Incentives*

The current energy market presents several barriers to the emergence of an offshore wind industry in the Northeast/Mid Atlantic region of the United States. Collectively, the high initial investment costs of offshore wind farms, the effects of past conventional energy subsidies and overall regulatory uncertainty has slowed the progression of offshore wind power despite the growing interest in its development. Promotional policies and financial government incentives can each add to the advancement of an offshore wind energy industry, if they address the obstacles present in the energy market. The aim of all support schemes used by governments to encourage renewable energy is to offset some of the competitive disadvantage of renewables, compared to conventional fossil fuel generation, aid in building up overall operating capacity, and further market integration of the technology. Incentives will likely be required for offshore wind for the foreseeable future until either environmental costs are fully internalized, or increased economies of scale and technological development makes offshore wind energy fully competitive with conventional sources such as coal and gas, without considering externalities.[209]

In contrast to a hands-off governmental approach, appropriately designed and implemented government incentives can greatly expedite the development of an offshore wind industry. Several European countries, including Denmark and the United Kingdom, have utilized promotional strategies to overcome the barriers to an

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[209] European Wind Energy Association (EWEA), 2005. "Support Schemes for Renewable Energy: A Comparative Analysis of Payment Mechanisms in the E.U." Available online at: www.ewea.org/fileadmin/ewea_documents/documents/projects/rexpansion/050620_ewea_report.pdf. Last accessed January, 2009.

offshore wind industry, and currently hold the top two positions globally in operating capacity. These two countries provide useful comparisons for the current U.S. incentive scheme, and may help provide useful lessons to apply to U.S. offshore wind energy policy.

The purpose of this chapter is first to define the many types promotional policies and financial incentives that can be employed by a government to advance a new offshore wind industry. Second, it will identify, compare and analyze current incentives being offered at the federal and state level in the Northeast/Mid Atlantic region. Lastly, U.S. incentives for offshore wind energy (both state and federal) will be compared with incentives provided in the United Kingdom and Denmark, two countries which both have established an offshore wind industry.

a. *Types of Incentives*

Government incentives can be designed to either create favorable regulatory conditions or provide financial support for a new industry.[210] Promotional policies include policies that expedite the permitting or approval process, add-in the cost of externalities to conventional energy generation, or facilitate a structured bidding process for offshore leases. Financial incentives provide monetary support fixing price levels to guarantee project profitability, or by providing subsidies, and/or tax credits to lower the cost of installing and operating an offshore wind facility. The various

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[210] There are various other forms market based incentives that can be used to encourage investment in renewable energy. For example, voluntary green marketing allows consumers to choose to pay a premium to ensure their electricity is being generated from renewable sources. The focus of this chapter is on governmental incentives for renewable energy.

promotional mechanisms are not mutually exclusive and can be used in combination to provide the greatest effect. Each method, however, does have advantages and disadvantages to its use (See Table 7). Recognizing their strengths and weaknesses can aid policy makers in deciding which, or what combination of incentives to adopt.

i. Promotional Policies

Promotional policies are policies, regulations or requirements that bolster the use of energy from renewable sources. The support provided by promotional policies can be direct or indirect depending on its structure (see Table 8). Two types of direct promotional policies are renewable quotas that guarantee a share of the energy market to renewable energy, and government sponsored bidding processes, or tendering systems, that facilitate offshore leasing.[211] Indirect promotional policies include policies that help to level the competition between renewables and conventional power generation, or a streamlined regulatory system that makes the approval and development process easier to navigate.

Renewable Portfolio Standards (RPS), also known as renewable obligations, is the most ubiquitous type of promotional policy. Governments that institute RPS targets recognize that a renewable technology may not be able to compete with conventional energy generation on the open market, therefore a separate market just for renewables is created. RPS require electricity retailers to meet a certain percentage of total energy production from renewable sources, through the use of Renewable

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[211] Sawin, J.L., 2006. *Supra* note 132

Table 7 Types of Incentives Used in Promoting New Renewable Energy Industries.

Incentive	Advantages and Disadvantages
Renewable Portfolio Standards: government mandates for a minimum share of electricity generation to come from renewable sources	+ New renewable technologies are not required to compete in the marketplace against conventional energy sources, whose prices do not include all externalities and have been subsidized in the past - All renewable technology competes against one another, even the more advanced, cost competitive technologies
Concise Permitting Scheme: requiring as few permits as are necessary, combines reviews or permits, limits the amount of time a review can take, etc.	+ Could lessen the amount of work that one department or agency must produce - Requires substantial cooperation and agreement among departments or agencies
Tendering Systems: formal call for bids from interested developers in government approved lease areas	+ Tendering allows for greater government control over overall development + Competition among bidders leads to cost reductions
Externality Adders: factor in the environmental impact of a power plant when comparing technologies during the planning stage	- Difficult to calculate an appropriate tax - Challenging to obtain political agreement on imposing new taxes
Environmental Taxation: imposing a per kWh tax based on polluting emissions generated	
Cap and Trade Systems: a system of allocating a fixed amount of emissions through the use of permits or certificates, these can then be traded on an open market between energy producers	

Table 7 Continued. Types of Incentives Used in Promoting New Renewable Energy Industries.

Incentive	Advantages and Disadvantages
[redacted] Pricing Systems or Feed-in Tariffs: electric utilities are obligated to enable renewable energy plants to connect to the grid, and they must purchase any electricity generated with renewable resources at fixed, minimum prices	+ Ensures operators of a fixed return on investment + Transparent and flexible (different technologies can have different tariffs) + Developers can use these agreements to obtain affordable financing +Allow for technology-specific promotion - Prices are usually fixed at higher rates, which are then passed along to the consumer or taxpayer - Does not ensure that a particular target for capacity is met, since the market determines industry capacity
Investment Subsidies or Rebates*: designed to reduce project capital costs through direct payments given to developers based on a percentage of the total investment made or per kilo-watt of capacity installed	+ Straight forward, transparent + Subsidies can be paid upfront which adds security to the project - Economically inefficient, does not differentiate good projects from bad, therefore inefficient projects still get subsidized - Must be strictly monitored by a government regulator for abuse to ensure that project costs are not artificially inflated - Funds need to be generated through taxes or consumer surcharges - Subsidies can be more politically unfavorable
Investment Tax Credits: allows operators to reduce their tax liability based upon the amount invested in facility	+ Effective in enticing large investors into the industry, who want to lower their tax burden - Can be inefficient if investors are more interested in tax shelter than electricity production +/- Less transparent than direct investment subsidies, so it may be more politically acceptable

Table 7 Continued. Types of Incentives Used in Promoting New Renewable Energy Industries.

Incentive	Advantages and Disadvantages
<u>Production subsidies*</u> are direct payments paid per kilowatt-hour of electricity produced	+ Straightforward policy mechanism + Eliminates the temptation to inflate project costs + Encourages production efficiency - Funds need to be generated through taxes or consumer surcharges - Subsidies can be more politically unfavorable - Project owners must rely on the assumption that subsidies will continue to be provided into the future
<u>Production tax credits</u> awarded to project owners based on the per kilowatt-hour of electricity produced	+ Eliminates the temptation to inflate project costs + Encourages production efficiency + Effective in enticing large investors into the industry, who want to lower their tax burden - Project owners must rely on the assumption that subsidies will continue to be provided into the future
<u>Grants or loans *</u>: Funds awarded or temporarily loaned out to projects; most likely funded through a system benefit fund or other government created fund; used to support R&D, capital investments, resource assessment or environmental impacts **<u>Loan Guarantees/ Preferential Financing Organizations</u>**: Government backed loans that reduce the risk to creditors of default	+Lowers the up front capital costs required for a project - Compared to other more direct incentives, investing in R&D projects does not necessarily translate into increased installed capacity + Designed to provide loans at favorable interest rates (below market rates)
* Funds provided by the government or by utility consumers through a surcharge (System Benefit Surcharge)	

Table 8 Classification of Promotional Instruments

Promotional Policies	**Direct**	• RPS & Tradable Credit Systems • Tendering System
	Indirect	• Environmental Taxation or Externality Adders • Concise Permitting Scheme
Financial Incentives	**Direct**	• Fixed Pricing Systems • Investment Subsidies or Tax Credits • Production Subsidies or Tax Credits • Grants, Loans, Loan Guarantees

Energy Credits (RECs). Energy retailers can obtain RECs by: (1) generating renewable energy themselves, (2) purchasing energy from a renewable energy producer, or (3) buying credits from a renewable energy producer without purchasing the electricity from them directly. Meeting RPS requirements through the use of RECs allows the market to determine the most cost effective solution for each electricity retailer, whether it is to produce, or buy the renewable energy directly, or rather buy the tradable credits on the open market.[212] Under an RPS, renewable technologies compete amongst themselves to produce energy at the lowest cost. The problem with this type of reserve renewable market, is that some renewable technology is more developed than others (i.e. landfill gas, waste incineration or onshore wind), and therefore, much more cost competitive. [213] As a result, setting a RPS may only increase the capacity of the most developed technologies, and not always be beneficial to new renewable technology, such as offshore wind.

Tendering systems, or a government process of open bidding of pre-designated areas for offshore wind, allow for controlled industry expansion in appropriate areas. Competition among developers also helps to reduce project costs over time. These systems can be used in conjunction with an abbreviated permitting process, making the development process as easy and as quick as possible. By pre-determining areas for lease, a developer can expect a much lower risk of project litigation or siting delay. This type of promotional policy requires a large amount of government commitment toward the growth of the industry, as well as a well-designed framework coordinating all government agencies involved.

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[212] Redlinger et al. 2002. *Supra* note 7.
[213] *Ibid.*

Policies that make it easier for interested developers to obtain approval for projects, or level the playing field in the competitive electricity market can indirectly encourage the growth of an offshore wind industry. Developing a clear and concise permitting scheme reduces delays, at either the federal, state or local level, that ultimately increase the cost and can impede the growth of an industry. Both processes, however, require significant amounts of coordination and collaboration across agencies and departments, which may be difficult in situations where there are differing opinions and objectives. Though any degree of cooperation or integration within the approval process, helps to streamline the process and make project development easier. Cape Wind's request to the Energy Facilities Siting Board for a 'super permit' encompassing all remaining state and local reviews demonstrates the importance of a timely review process.[214]

A second form of indirect support that can be provided through regulation is the institution of environmental taxes or externality adders. Environmental taxation aims to correct existing market failures by internalizing the costs to society of environmental degradation caused by fossil fuel energy sources. By subscribing to a polluter pays principle, renewable energy generation can benefit in the exemption from these taxes, therefore, becoming more cost competitive with coal or natural gas generation plants.[215] Imposing a per-kilowatt-hour tax, based on the amount of emissions produced, can be difficult politically, as many industry members oppose the implementation of more taxes. An alternative to imposing actual penalties on polluters through taxes, is the use of externality adders in the analysis of new power

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[214] *See Ch. IV Regulation of Offshore Wind §iii. Approval Process Case Study: Cape Wind.*
[215] EWEA, 2005. *Supra* note 206.

plant construction. Adding the cost of environmental impacts into the hypothetical cost of a new coal-fired power plant, while not actually imposing any fine on polluting, does take into account external impacts during the planning and decision-making process.[216]

ii. Financial Incentives

Financial incentives are defined here as direct fiscal support provided by a government through fixed pricing, subsidies, tax credits, loans or grants. In contrast to fixed pricing and tax credits, subsidies, loans and grants all involve a direct payment to project owners and, therefore, require an appropriation of funding. This funding can come from the general tax base (at the state or federal level) or from utility customers through a surcharge on their utility bills.[217] State mandated surcharges that are applied to consumer bills by the utility provider are often referred to as System Benefit Charges and are used to create a System Benefit Fund, which can then redistribute money to renewable projects in the form of subsidies, loans or grants. Conversely, tax credits do not involve direct payment by the government but rather provide an exemption for a certain portion of a project's tax liability. Because funding does not need to be generated using tax credits, they can be more politically acceptable than subsidies. Nevertheless, all financial incentives, including tax credits, can be challenging politically during hard economic times.

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216 Redlinger et al. 2002. *Supra* note 7.
217 *Ibid.*

Fixed pricing laws mandate the purchase price of electricity generated from renewables, thereby ensuring a certain level of return for an investor. Under fixed pricing systems, the government sets the price for a renewable energy technology and the market determines the amount of capacity that is installed based on that price. Conversely, regulatory policies that set a quota requiring a certain percentage of total energy production to originate from renewable sources, allow government agencies to set the amount of desired renewable energy capacity and let the market determine the price of the electricity produced.[218]The most prevalent form of a fixed pricing system is called a 'feed-in tariff.' Under a feed-in tariff, electric utilities are obligated to enable renewable energy facilities (i.e. an offshore wind farm) to connect to the electric grid, and the operators of the wind farm are paid a fixed price for every kWh of electricity they feed into the grid.[219] The premium added to the market price for electricity is generally passed down to the consumers, or the taxpayers.[220] Today most pricing laws provide a fixed payment for a period of time (approximately 20 years) based on the technology type, facility size and cost of generation, and are incrementally removed thereafter. To succeed in increasing industry growth, feed-in tariffs must be high enough to cover the additional production costs of a technology like offshore wind, and they also need to be guaranteed for a time period long enough to assure a sufficient rate of return for the developer.[221]

In addition to fixed pricing laws, financial incentives can be applied in multiple ways, as investment support upfront or production support throughout the project's

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[218] EWEA, 2005. *Supra* note 206. *See also* Wizelus, 2007. *Supra* note 28.
[219] Sawin, 2006. *Supra* note 132. *See also* EWEA, 2005. *Supra* note 206.
[220] *Ibid.*
[221] *Ibid.*

operating life. Investment incentives are designed to reduce the capital costs of a project, thereby encouraging further investment. Alternatively, production incentives are aimed at reducing the cost of producing electricity from renewable sources.[222] In either case, investment and production incentives can serve as financing instruments to negotiate better lending terms.[223]

Investment subsidies are direct payments provided based on the installed capacity, or a percentage of the total investment cost of a project. While this strategy is straightforward in application, it also requires strict monitoring against abuse to ensure that project costs are not artificially inflated. As a result, an attentive regulator is needed when implementing this type of financial incentive. Similarly, investment tax credits allow owners to reduce their tax liability based on the size of investment in the project and are also subject to problem of project cost inflation by developers. However, with an investment tax credit system, an additional issue can be investors who are more interested in the tax shelter than operating an efficient production facility, ultimately resulting in poor performance projects.[224] On the other hand, investment tax credits can be very effective in enticing large investors who are very interested in lowering their corporate tax burden.[225] Accelerated depreciation, or tax laws that allow for developers to write off a larger portion of their capital expense during the early years of operation, could also be considered a type of investment credit because it results in decreased tax liability.

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222 *Ibid.*
223 *See Ch. III Economics of Offshore Wind §b Financing.*
224 This was the case in California during the early 1980s when investment credits were so lucrative for onshore wind farm developers that investors could recoup 66-95% of their investment over the first few years of a project, producing little to no electricity. *See* Sawin, 2006. *Supra* note 132
225 *Ibid.*

Similarly, production incentives can be granted as subsidies or tax credits, but are based on the yearly kilowatt-hour energy generation of a project and not the amount of capital investment. Consequently, production incentives encourage efficient and reliable facilities and eliminate the temptation of owners to inflate project costs.[226] However, because production incentives are more long-term in nature, project owners must rely on the assumption that the incentives will continue to be available in the future. Continual reauthorization makes production incentives much more sensitive to the political whim of the legislating body, either at the state or federal level. For that reason, the shorter the duration of the production incentive, the more renewals are required, and the greater the risk of termination, which in turn, reduces the financing power of such a subsidy or tax credit, ultimately making it an ineffective promotional strategy.[227]

Along with fixed pricing, investment and production incentives, governments can promote a burgeoning industry through the use of grant or loan programs. Grants can be provided for research and development of new technology, resource assessment or the study of environmental impacts. Investing too much in research and development though, may not necessarily translate into increased installed capacity, especially if there is not a market for the technology.[228] Long-term, low interest loans and loan guarantees work to reduce financing costs and overcome a barrier faced by many offshore wind proposals, large upfront capital costs.

The combination of promotional policies and financial incentives employed, at either the state and/or federal level, can play an important role in stimulating the

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[226] *Ibid.*
[227] *Ibid.*
[228] Redlinger et al. 2002. *Supra* note 7.

emergence of a new clean-energy industry such as offshore wind. In the United States, the federal government can provide incentives to promote offshore wind energy on a national scale, while individual states within the Northeast/Mid-Atlantic region can enact policies to encourage offshore wind projects that will serve their state's energy needs. The absence of any operational wind farms in the region, despite notable interest by developers, prompts the question 'how is the economic feasibility of offshore wind projects affected by current federal and state policies in this region?' To begin, an examination of the promotional policies and financial incentives offered to private industry at the federal and state levels will be performed.[229]

b. *U.S. Federal Incentives*

i. *Federal Promotional Policies*

The first legislation that promoted alternative energy of any kind was the Public Utility Regulatory Policy Act (PURPA) of 1978.[230] This act has been historically seen as the single most effective legislative measure in promoting renewable energy use in the United States.[231] Created as a result of the energy crisis of the 1970s, when the price of oil sky-rocketed, the intent of PURPA was to promote alternative energy in the United States, to reduce the nation's dependence on foreign

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[229] There are a number of incentives offered to public entities (i.e. municipal or tribal projects), such as the Renewable Energy Production Incentive, Clean Renewable Energy Bonds, Qualified Energy Conservation Bonds, however, those will not be discussed here since they are not aimed at promoting a private offshore wind energy industry in the U.S.

[230] Pub. L. No. 95-617, 92 Stat. 3117.

[231] Union of Concerned Scientists, 2008. Public Utility Regulatory Policy Act (PURPA). Accessed online at: http://www.ucsusa.org/clean_energy/solutions/big_picture_solutions/public-utility-regulatory.html. Last accessed January, 2008.

oil. This act required utility companies to buy power from the lowest cost producer, including independently owned electric companies. Prior to PURPA, only utility companies could own and operate electric generating plants. This legislation encouraged the development of renewable resources by guaranteeing a market for their electricity, however, it was fairly limited in that it applied to only small-scale renewable projects, and all onshore.

Technically, PURPA only calls for utility companies to buy renewable energy if it is more cost competitive compared to conventional sources. By strictly interpreting the law, the Federal Energy Regulatory Commission has forbidden the inclusion of externalities and other factors in the pricing of electricity and ultimately PURPA decisions.[232] As a result, most conventional energy generation plants are almost always the most cost competitive, and PURPA has lost much of its applicability to modern energy markets. Since PURPA, the federal government has not instituted any additional promotional policies and instead has relied to a large extent on tax credits to encourage the development of renewable energy (see Table 9.)[233]

ii. *Federal Financial Incentives*

Federal incentives for renewable energy in the U.S. have focused primarily on subsidizing the industry, through the Renewable Electricity Production Tax Credit

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[232] *Ibid.*
[233] J.W. Moeller, 2004. *Supra* note 17.

Table 9. Summary of Incentives Offered Within the United States, Denmark and the United Kingdom.

	Promotional Policies			Financial Incentives					
	Quotas	Externality Tax; Cap and Trade Programs	Expedited Permitting Scheme/ Tendering System	Fixed Pricing	Investment Subsidy/ Rebate	Investment Credit	Production Subsidy	Production Credit	Grants/ Loans
U.S. Federal						MACRS- Accelerated Depreciation (No expiration) Investment Credits for Projects Involving Creating Manufacturing Facilities*		PTC (Expires: 12/31/2012*)	DOE loan guarantee (Expires: 9/30/2011*) U.S. Treasury Grants (Application Deadline 10/1/2011)*

* Represents incentives included in the American Recovery and Reinvestment Act of 2009

Table 9 Continued. Summary of Incentives Offered Within the United States, Denmark and the United Kingdom.

	Promotional Policies			Financial Incentives					
	Quotas	**Externality Tax; Cap and Trade Programs**	**Expedited Permitting Scheme/ Tendering System**	**Fixed Pricing**	**Investment Subsidy/ Rebate**	**Investment Credit**	**Production Subsidy**	**Production Credit**	**Grants/ Loans**
MA	15% by 2020 (No expiration)	RGGI- CO^2 Allowance System for Conventional Power Plants (Beginning 2011)	Oceans Act of 2008 Model Ordinance/ By-law for Wind Facility Permitting By Local Governments						MTC Business Expansion Initiative; Sustainable Energy Economic Development Initiative
RI	16% by 2020 and a Governor Initiative to obtain 15% of state's power from wind	RGGI- CO^2 Allowance System for Conventional Power Plants (Beginning 2011)	Ocean SAMP- pre-zoned siting		Equipment Sales Tax Exemption	Jobs Development Act- reduces Corporate State Income Tax Rate based on job creation			RIREF funded grants & loans

Table 9 Continued. Summary of Incentives Offered Within the United States, Denmark and the United Kingdom.									
	Promotional Policies			**Financial Incentives**					
	Quotas	**Externality Tax; Cap and Trade Programs**	**Expedited Permitting Scheme/ Tendering System**	**Fixed Pricing**	**Investment Subsidy/ Rebate**	**Investment Credit**	**Production Subsidy**	**Production Credit**	**Grants/ Loans**
NJ	22.5% by 2021; NJ Energy Master Plan goal: at least 1000 MW of offshore wind by 2012 and at least 3000 MW by 2020.	RGGI- CO^2 Allowance System for Conventional Power Plants (Beginning 2011)			Meteorological Tower Rebate Program				State of New Jersey Board of Public Utilities Pilot Project Grant
DE	20% by 2019; triple RPS credits for offshore wind energy	RGGI- CO^2 Allowance System for Conventional Power Plants (Beginning 2011)							Green Energy Fund Grants (≤ $250,000)

Table 9 Continued. Summary of Incentives Offered Within the United States, Denmark and the United Kingdom.									
	Promotional Policies			**Financial Incentives**					
	Quotas	**Externality Tax; Cap and Trade Programs**	**Expedited Permitting Scheme/ Tendering System**	**Fixed Pricing**	**Investment Subsidy/ Rebate**	**Investment Credit**	**Production Subsidy**	**Production Credit**	**Grants/ Loans**
European Union	Kyoto Protocol; reduce CO^2 emissions 8% below 1990 levels by 2012. Offshore Wind Energy Workshop and Strategy Development	E.U. Emissions Trading Scheme (Began 2005)							
Denmark	30% by 2025	CO2 Credits used to meet Kyoto Protocol Quota	Tendering System	Feed-in Tariff for the first 10-20 years of operation		Members of Cooperatives Income Tax Credit	Rebate of €0.003/ kWh		Demon-stration Projects

Table 9 Continued. Summary of Incentives Offered Within the United States, Denmark and the United Kingdom.									
	Promotional Policies			**Financial Incentives**					
	Quotas	**Externality Tax; Cap and Trade Programs**	**Expedited Permitting Scheme/ Tendering System**	**Fixed Pricing Laws**	**Investment Subsidy/ Rebate**	**Investment Credit**	**Production Subsidy**	**Production Credit**	**Grants/ Loans**
U.K.	20% by 2020	Fossil Fuel Levy; Climate Change Levy	Tendering System: Round 1 & 2 Marine Bill 2009?	NFFO (expired)					Capital Grants Scheme

(PTC) enacted by the Energy Policy Act of 1992.[234] Under this legislation, a tax credit of 1.5 cents/kWh (adjusted for inflation, and is presently 2.1 cents/kWh) is granted to all qualified renewable energy producers (including wind, biomass, hydroelectric, methane, and geothermal) for the first 10 years of operation.[235] The PTC plays such a central role in renewable energy proposals that many land-based wind projects have been financed to a large extent based on these tax savings.[236]

Despite the importance of the PTC to the renewable industry as a whole, this tax credit has expired three times before being renewed or retroactively reinstated by Congress.[237] Legislation for the PTC has never implemented the credit for more than two years at a time, making it unpredictable and unreliable to developers. Most recently the PTC was renewed through December 31, 2009 as an amendment to the urgently passed Economic Stabilization Act of 2008 and then again the American Recovery and Reinvestment Act of 2009.[238] Prior to these two very recent amendments, the fate of the PTC beyond the end of 2008 was very unclear, as Congress was repeatedly unable to pass an extension bill.[239] Some argue that the irregularity of the PTC has been causing a 'boom-bust' cycle in the wind industry,

[234] 26 U.S.C § 45

[235] The Renewable Energy Production Incentive is similar to the PTC, but instead of granting a credit toward federal income taxes this incentive is intended for project owners that are not subject to federal income taxes (i.e state and local municipalities, or non-profit organizations) and gives a payment based on the per kilowatt-hour generation.[235] This incentive program administered through the Department of Energy over time lost much of its appropriated funding and became unable to pay out all incentive payments.

[236] P. Astolfi, S. Baron and M. J. Small, 2008. *Supra* note 10. *See also* Ch. IV *Economics of Offshore Wind § Financing.*

[237] J.W. Moeller, 2004. *Supra* note 17.

[238] Economic Stabilization Act of 2008, H.R. 1424. Pub. L. 110-343. § 102.

[239] Energy Improvement and Extension Act of 2008, 110th Congress 2nd Session, H.R. 7201

ultimately hurting its expansion.[240] The inability of Congress to pass a longer extension of this credit also demonstrates the lack of long-term political support behind this incentive.

A second federal tax credit provided under the federal Modified Accelerated Cost-Recovery System (MACRS), allows developers to recover a greater proportion of their capital investment during the early years of operation, through greater depreciation deductions on installed turbines.[241] The MACRS establishes a five-year depreciation period for wind technology placed in service after 1986, and allows a depreciation deduction of 50% of the asset cost at the time the asset is placed into service in the first year, with the remainder depreciated over the regular depreciation period.[242] Accelerated depreciation of the fixed assets associated with a wind farm (i.e. turbines, sub-stations, transmission cables) during the first five years of operation, acts to lower a developers federal tax liability during that period. Essentially, this type of incentive acts as an indirect tax credit for offshore wind operators during the early stages of operation.[243]

Title XVII of the federal Energy Policy Act of 2005 authorized the U.S. Department of Energy (DOE) to issue loan guarantees for projects that:

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[240] American Wind Energy Association (AWEA). 2008. *Supra* note 20. *See also* J.I. Lewis and R.H. Wiser, 2006. *Supra note* 10. *See also* Union of Concerned Scientists, 2007. *Supra note* 20. *See also* L. Bird, M. Bolinger, T. Gagliano, R. Wiser, M., Brown, B. Parsons, 2005. *Supra* note 10.
[241] 26 USC §168
[242] D.A. Yarano and A. L. Mertens, 2009. American Recovery and Reinvestment Act of 2009 - Wind Energy Provisions. Available online at: http://www.fredlaw.com/articles/energy/energy_0902_day_alm.html. Last accessed March, 2009.
[243] The accelerated depreciation incentive was taken even further by the federal Economic Stimulus Act of 2008, which included a 50% bonus depreciation provision for eligible renewable-energy systems acquired and placed in service in 2008. If property met these requirements, the owner was entitled to deduct 50% of the adjusted basis of the property in 2008. The remaining 50% of the adjusted basis of the property is depreciated over the ordinary depreciation schedule. However, since no offshore wind farms were installed in 2008, this incentive does not directly apply.

> [A]void, reduce or sequester air pollutants or anthropogenic emissions of greenhouse gases; and employ new or significantly improved technologies as compared to commercial technologies in service in the United States at the time the guarantee is issued.[244]

The loan guarantee program has over $10 billion in authority to issue loan guarantees for energy efficiency, renewable energy and advanced transmission and distribution projects, however, the authority to issue these loan guarantees expires on September 30, 2009.[245] Since the program's initiation in 2005, energy efficiency, renewable energy and advanced transmission and distribution projects have received $10 billion in guarantees; nuclear and clean-coal power facilities have received twice that amount, receiving $28.5 billion in backing.[246]

There are additional incentives offered by the federal government to promote wind energy, however, they are aimed at projects developed by the public sector (municipalities, states, cities, counties, territories, Indian tribal governments, or any political subdivision thereof). For example, Clean Renewable Energy Bonds (CREBs) and Qualified Energy Conservation Bonds both offer financing for public projects with 0% interest. The public entity pays back only the principal of the bond, and the bondholder receives federal tax credits in lieu of the traditional bond interest.[247] The U.S. Federal Government Green Power Purchasing Goal formed under Section 203 of Energy Policy Act of 2005, requires that, to the extent it is economically feasible and technically practicable, the total amount of renewable electric energy consumed by the federal government during any fiscal year shall not be less than that year's target

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244 42 USC § 16511 et seq.; 10 CFR 609
245 *Ibid.*
246 DOE, 2009. *Loan Guarantee Program Press Releases.* Available online at: http://www.lgprogram.energy.gov/press.html. Last accessed February, 2009.
247 26 USC § 54

percentage. Between 2007 and 2009 a 3% target is set, rising to 5% for 2010-2012 and up to 7.5% in 2013 and beyond.[248] These standards, however, lack the teeth present in a hard quota and only apply to federal buildings and not the entire electric market.

iii. American Recovery and Reinvestment Act of 2009

A substantial boost for renewable energy incentives occurred in the American Recovery and Reinvestment Act of 2009, including multiple provisions to further encourage wind energy development in the United States.[249] Four items applying specifically to offshore wind include:

- A 3-year extension of the PTC, therefore, any new installations in-service before 2013 will receive a 10-year, 2.1 ¢/kWh production tax credit.
- An option to convert the PTC into a U.S. Treasury Grant for projects placed in service before 2013,
- Extension of DOE loan guarantees until September 30, 2011 and an additional $6 billion appropriated to this program, and
- New investment credits to projects creating or retooling manufacturing facilities to make components used to generate renewable energy.

Under this new Act, offshore wind developers originally eligible for the PTC, can now choose to receive a grant from the U.S. Treasury Department instead of taking the PTC for new installations. The cash grant from the U.S. Treasury Department can be

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[248] 42 USC § 1585; Executive Order 13423
[249] Public Law No: 111-5.

used to cover 30% of the cost of qualified property (qualified property is new equipment including tangible property integral to the wind energy facility), however the grant application must be filed prior to October 1, 2011.[250] These grants can provide a large portion of the upfront capital costs required for an offshore wind facility and eliminate the need for a tax-equity partner.[251] This provision provides flexibility to the developer in choosing the most beneficial form of financial incentive. In all this Act opens up new sources and forms of funding for offshore wind energy at a time when many renewable energy projects are being stalled by the economic downturn and it provides a longer commitment to the PTC, in comparison to past practice.

In spite of the recent improvements to the financial incentives available to offshore wind, currently there are still no strong promotional policies. As PURPA has become less influential over time, the financial incentives of the PTC, MACRS accelerated depreciation standards, the DOE loan guarantee program and the new grants and investment credits offered under the American Recovery and Reinvestment Act of 2009, make up the entire promotional scheme at the federal level. Even though, the American Recovery and Reinvestment Act extended the PTC and the DOE loan guarantees, their duration is still somewhat short, with each set to expire within the next three years. As a result, offshore wind projects that are still in early proposal stages in the Northeast/Mid Atlantic cannot be assured that these incentives will be present as their project progresses to installation.

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[250] DSIRE, 2009. U.S. Department of Treasury - Renewable Energy Grants. Available online at: http://www.dsireusa.org/library/includes/GenericIncentive.cfm?Incentive_Code=US53F&currentpageid=3&EE=1&RE=1. Last accessed March, 2009.
[251] D.A. Yarano and A. L. Mertens, 2009. Supra note 239.

c. *Northeast/Mid-Atlantic State Incentives*

One common promotional policy shared by all of the four Northeast/Mid-Atlantic States examined in this study, along with six additional states within the region, results from involvement in the Regional Greenhouse Gas Initiative (RGGI). This initiative is implementing the first mandatory cap-and-trade program in the United States to reduce greenhouse gas emissions.[252] Beginning in 2011, RGGI will limit the total amount of CO_2 emissions from conventional fossil-fuel power plants in all ten states to an amount called the "cap," currently set at 188 million tons of CO_2 per year.[253] While there is no limit on the amount of CO_2 that any particular power plant can emit, the combined CO_2 emissions from all covered power plants within the region cannot exceed this cap. Under this system, every regulated power plant is required to own one permit (called an "allowance") for each ton of CO_2 that it emits. Allowances can be traded within a market, at any time before a compliance deadline, however, the individual states control the total number of allowances available within their state to guarantee that the cap is not exceeded (See Table 10.). The market-based approach of tradable allowances not only attaches a price to some of the externalities associated with fossil fuel power plants, but also promotes power plant efficiency and will help level the playing field for offshore wind energy within the energy market.

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[252] RGGI, 2009. Available online at: http://www.rggi.org. Last accessed February, 2009.
[253] *Ibid.*

Table 10. Auction Proceeds from RGGI allowance actions held December 17, 2008.

The clearing price is the price per allowance and the final column contains cumulative proceeds from all auctions held to date. Massachusetts and Rhode Island participated in an additional auction on September 25,2008. *Adapted from* Regional Greenhouse Gas Initiative, 2009. *Auction Proceeds*. Available online at: http://www.rggi.org/states/Auction_Proceeds. Last accessed February 2009.

State	CO_2 Allowances Auctioned	Clearing Price	Auction 2 Proceeds	Cumulative Proceeds
Massachusetts	4,387,534	$3.38	$14,829,864.92	$28,176,794.30
Rhode Island	438,774	$3.38	$1,483,056.12	$2,830,092.30
Delaware	755,979	$3.38	$2,555,209.02	$2,555,209.02
New Jersey	4,532,761	$3.38	$15,320,732.18	$15,320,732.18

i. Massachusetts

The central promotional policy in the State of Massachusetts is a Renewable Portfolio Standard that establishes a state-wide renewable energy quota. The state has also started to take the initial steps in expediting the permitting review process, by developing a comprehensive ocean management plan and providing a model from which local governments can base their permitting schemes. Additionally, the state offers a number of small financial incentives, such as sales tax exemptions, grants and loans, through funding provided by the state's systems benefit fund.

The State of Massachusetts, beginning in 1997, with subsequent revisions in 2002 and 2007, adopted a Renewable Portfolio Standard (RPS) mandating 15.0% of all electricity sales in the state come from renewable sources by 2020, with an additional 1% increase each year thereafter.[254] In addition, an executive order from the governor's office in 2007 set renewable targets for state government buildings under control of the executive office. The order directed state government agencies to procure 15% of annual electricity consumption from renewable sources by 2012 and 30% by 2020.[255] The RPS mandate may be achieved through procurement of renewable energy supply, purchase of renewable energy certificates (RECs), and/or through the production of on-site renewable power.

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[254] M.G.L. Ch. 25A, § 11F; 225 CMR 14.00 et seq.
[255] Executive Order 484, titled "Leading by Example: Clean Energy and Efficient Buildings."

A second promotional policy in Massachusetts, attempts to give much needed guidance to state agencies and local governments involved in reviewing or permitting offshore wind-energy development. The Massachusetts Department of Energy Resources (DOER) and the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA) issued a model ordinance, or by-law, designed to provide guidance in the formation of a permitting scheme for the construction and operation of wind facilities, and to provide standards for the placement, design, construction, monitoring, modification and removal of wind facilities.[256] This model may be modified to fit the needs of an area, but is intended to assist the creation of a state-wide comprehensive review process. The Oceans Act of 2008 requires the Secretary of Energy and Environmental Affairs to develop, with input from scientists and stakeholders, a comprehensive plan for ocean uses in state waters by December 31, 2009.[257] Essentially, the legislation ensures that there will be a zoning plan for Massachusetts coastal waters, whereby all certificates, licenses, permits and approvals for structures or uses will need to be consistent with the terms of the Plan. This Ocean Management Plan replaces the current *ad hoc* evaluation of commercial developments and other proposals, with a more integrated approach to regulating ocean use. Projects that have received approval prior to the effective date of the Act (e.g. Cape Wind) will not be affected by this plan, however the additional offshore wind projects proposed for Massachusetts will not be reviewed until the plan is completed.[258] As a result of

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[256] Massachusetts Division of Energy Resources and Massachusetts Executive Office of Environmental Affairs, 2008. *Model Amendment to a Zoning Ordinance or By-law: Allowing Wind Facilities by Special Permit.* Available online at: http://www.mass.gov/Eoca/docs/doer/renew/model-allow-wind-by-permit.pdf. Last accessed February, 2009.

[257] MA Ch. 114 of the Acts of 2008.

[258] B. O'Connell. 2008. "Massachusetts Passes Oceans Act." Available online at: http://www.mwe.com. Last accessed March, 2009.

the creation of a comprehensive ocean management plan, a framework is being created to improve the review process of proposed offshore projects.[259]

Financial incentives within the state are provided through the Massachusetts Renewable Energy Trust Fund (MRET), a system benefits fund supported by a non-by-passable surcharge of surcharge of $0.0005 per kilowatt-hour, imposed on electric customers.[260] The Massachusetts Technology Collaborative (MTC), a quasi-public research and development entity, administers the fund, with oversight and planning assistance from the Massachusetts Department of Energy Resources (DOER) and an advisory board. The MRET is used to fund a multitude of financial incentives, in the form of grants and loans, and is also used to support the state's purchase of renewable energy and has to date awarded more than $250 million in financial assistance. Many of the MRET funded programs are geared toward public projects and business development and not toward promoting private projects, or an offshore industry.

Massachusetts also provides incentives to encourage technology development and manufacturing through the Massachusetts Technology Collaborative (MTC) Business Expansion Initiative, which offers grants, loans and/or equity to, companies that currently, or plan to, manufacture renewable energy technology products in the state.[261] Similarly, the MTC Sustainable Energy Economic Development Initiative provides financial assistance up to $500,000 per year (in the form of convertible loans)

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[259] *See Ch IV Regulation of Offshore Wind Energy, §iii. Permitting Case Study: Cape Wind.*
[260] M.G.L. Ch. 40J, § 4E (amended by S.B. 2768) (2004) and M.G.L. ch. 25,§ 20 (amended by S.B. 2768).
[261] Massachusetts Technology Collaborative (MTC), 2007. *Business Expansion Initiative Solicitation (No. 2007-BEI-01).* Available online at: http://www.masstech.org/renewableenergy/BEI/index.html. Last accessed February, 2009.

to support renewable-energy companies in the early stage of development.[262] The state also has an Alternative Energy and Energy Conservation Patent Exemption that grants a corporate excise tax deduction for any income received from the sale or lease of a U.S. patent deemed beneficial for energy conservation or alternative energy development for up to five years.[263]

Many of the financial incentives offered through MTC, except for the Business Expansion Initiative grants, which can equal up to $3 million, are for amounts less than or equal to $500,000.[264] Incentives of such small amounts, relative to the total cost of an offshore wind facility, do not provide strong encouragement for the developing industry. As a result, it appears that in Massachusetts the promotional policies are more robust than the financial incentives. Out of the promotional policies, the RPS is by far the strongest promotional instrument. Furthermore, the comprehensive Ocean Management Plan being created, as well as the model ordinance for local permitting is the first step in creating a concise permitting structure through all levels of government.

ii. Rhode Island

Rhode Island shares many of the same types of incentives offered in Massachusetts, with a few notable differences. The promotional policies present in

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[262] Massachusetts Technology Collaborative (MTC), 2009. *Sustainable Energy Economic Development (SEED)*. Available online at: http://www.masstech.org/SEED. Last accessed February, 2009. Convertible loans entitle the lender to convert the loan to common or preferred stock at some point in the future.
[263] MGL ch. 62, § 2(a)(2)(G).
[264] DSIRE, 2009. *Supra* note 24.

Rhode Island center on an RPS, a governor initiative to meet 15% of Rhode Island's annual electric energy demand from wind energy, and an expedited review process resulting from an ocean zoning plan.

Rhode Island's Renewable Energy Standard, enacted in June 2004, requires electric utility providers within the state to supply 16% of their retail sales from renewable resources by the end of 2019.[265] The target began at 3% by the end of 2007, increasing by an additional 0.5% per year through 2010, an additional 1% per year from 2011 through 2014, and an additional 1.5% per year from 2015 through 2019. In 2020, and in each year thereafter, the minimum RES established in 2019 must be maintained unless the Rhode Island Public Utilities Commission (PUC) determines that the standard is no longer necessary. In addition, the legislation that created Rhode Island's RPS, also directed the Rhode Island State Energy Office to authorize the Rhode Island Economic Development Corporation to integrate and coordinate all renewable energy policies within the state to maximize their impact.

To further operationalize the goals associated with Rhode Island's RPS, in 2006 the RIWINDS program was established as a result of the Governor's initiative to meet 15% of Rhode Island's annual electric energy demand from wind energy.[266] Through this program, the technical and economic feasibility of producing 1.3 million MWh of wind energy in Rhode Island was evaluated, ultimately concluding that it could be cost competitive, and technically feasible, to obtain the 15% goal using

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[265] R.I. Gen. Laws § 39-26-1 et seq.(2004); CRIR 90-060-015.
[266] ATM, 2007. *Supra* note 62.

primarily wind resources off the coasts of the state.[267] This program is unique, in that it specifically targets offshore wind energy in meeting the state's RPS.

In a decision to be proactive in balancing offshore activities, Rhode Island began an unprecedented process of zoning its offshore waters. The Ocean Special Area Management Plan (Ocean SAMP) will define use zones for Rhode Island's offshore waters, taking into account existing uses, critical resources and transportation lanes of offshore areas (see Figure 8). The result of this SAMP will be pre-selected sites for offshore renewable energy that will be more easily permitted and developed by a project developer. Under the federal Coastal Zone Management Act, Special Area Management Plans are loosely defined as

> [A] comprehensive plan providing for natural resource protection and reasonable coastal-dependent economic growth containing a detailed and comprehensive statement of policies; standards and criteria to guide public and private uses of lands and waters; and mechanisms for timely implementation in specific geographic areas within the coastal zone.[268]

Preparation of a SAMP enables permitting of projects within the area covered by the SAMP to proceed on the basis of an Environmental Assessment, in lieu of an Environmental Impact Statement which saves the developer both time and money.[269] While the completion of the ocean SAMP is expected to take two years, its creation fosters a friendlier proposal process, with the potential to attract greater developer interest in the future.[270]

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[267] *Ibid.*

[268] Public Law 92-583, 16 U.S.C. 1451-1456. *See also* NOAA, 2003. "*The Coastal Management SAMP of Approval.*" Available online at: http://www.csc.noaa.gov/magazine/2003/06/samp.html. Last accessed February 2009.

[269] Rhode Island Coastal Resources Management Council, 2008. Supra note 64. "Under the federal Coastal Zone Management Act, preparation of a SAMP enables permitting of projects within the area covered by the SAMP to proceed on the basis of an Environmental Assessment in lieu of an Environmental Impact Statement." State of Rhode Island, Office of the Governor, 2008. Supra note 65.

[270] *Ibid.*

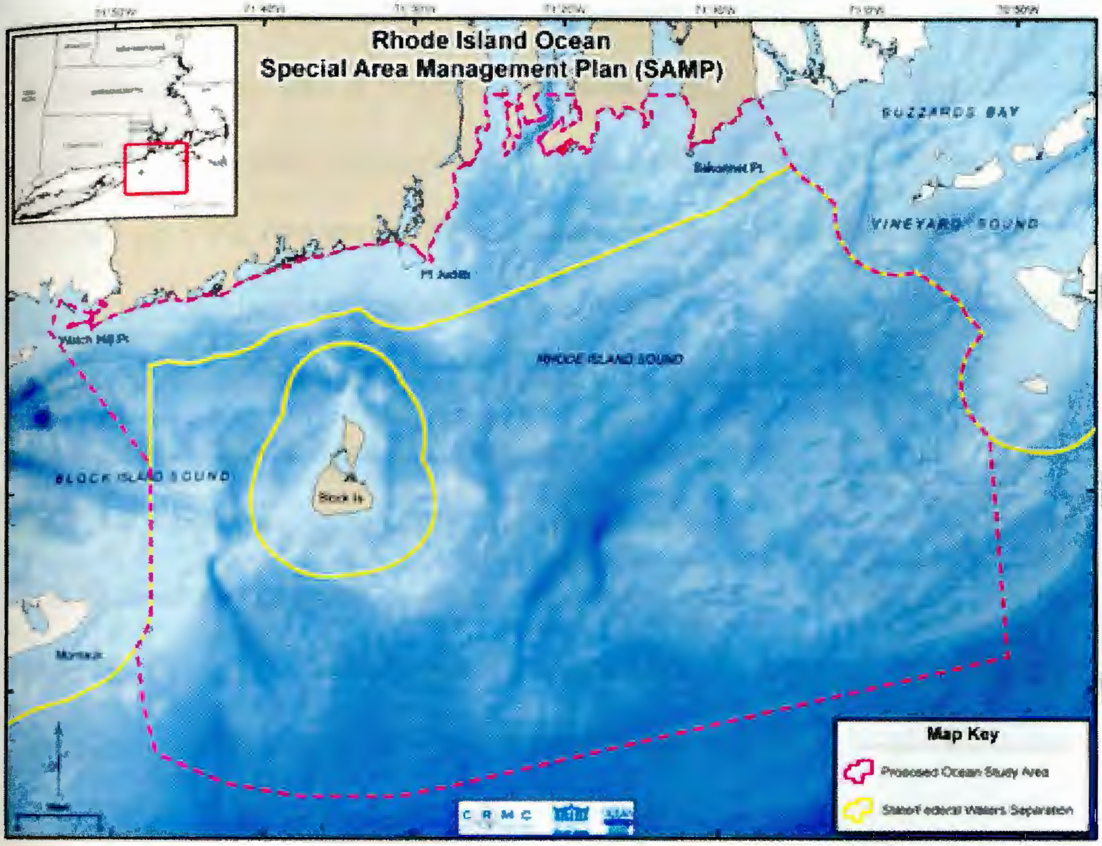

Figure 8. Map of Proposed Rhode Island Ocean Special Area Management Plan.
Source: Coastal Resources Management Council, 2009. Available online at: http://seagrant.gso.uri.edu/oceansamp/ . Last accessed March, 2009.

Financial incentives within the state are funded through the Rhode Island Renewable Energy Fund (RIREF).[271] This system benefit fund is supported by a surcharge on electric customers' bills, set at $0.0023 per kWh, however, this surcharge is divided into two types of programs, renewable energy promotion and demand-side management programs. The portion of the total surcharge dedicated to renewables is $0.0003 per kWh, compared to demand-side management programs that collect $0.002 per kWh from the surcharge.[272] This charge will remain in effect for a 10-year period, beginning January 1, 2003, resulting in an annual budget for the fund of approximately $2.4 million, however only the portion of the RIREF funded from the renewable surcharge can be used to support renewable development.[273] From the RIREF, a number of grants, recoverable grants and loans are offered for renewable projects. Commercial projects within the state can receive up to $250,000 per year in assistance, municipal renewable energy projects can apply for up to $1 million per year in grants from the fund, and technical and feasibility studies can receive up to $200,000 per year in funding.

Besides the incentives provided under the RIREF, Rhode Island also offers two tax exemptions to renewable projects within the state. First, the Renewable Energy Sales Tax Exemption, which exempts wind turbines sold within the state from state sales tax (a 7% savings).[274] For proposals such as the one agreed to by Deepwater Wind in Rhode Island, that promise to employ a number of people in the state for

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[271] R.I. Gen. Laws § 39-2-1.2.
[272] DSIRE, 2009. *Supra* note 24.
[273] *Ibid.*
[274] R.I.G.L § 44-18-30. Rhode Island's Sales Tax Rate equals 7%. Federation of Tax Administrators, 2008. State Sales Tax Rates: January 1, 2008. Available online at: http://www.taxadmin.org/fta/rate/sales.html. Last accessed March, 2009.

manufacturing or operations, corporate tax reductions may also apply.[275] The Jobs Development Act provides an incremental reduction in the corporate income tax rate (currently 9%) to companies that create new employment in Rhode Island over a three-year period.[276] A firm that creates a certain proportion of jobs relative to the company's size may permanently reduce its state income tax liability down to 3%, provided the jobs remain within the state and the employees are paid above a set wage standard.[277]

In all, Rhode Island has focused primarily promotional policies, rather than the use of financial incentives. It is similar to most states within the region in mandating an RPS, however additional promotional policies offered have gone a step further, with the creation of the Ocean SAMP and the initiative to obtain 15% of its electricity from wind energy specifically. While the Ocean SAMP has yet to be completed, and its impact on the permitting and approval process of offshore wind projects is still unknown, the initiation of such a process indicates the state's commitment to promoting offshore renewable energy. It also provides a unique type of incentive in comparison to surrounding states, and has the potential to safeguard against the delays experienced by the Cape Wind project.[278]

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[275] T. Nesi, 2008. "R.I., Deepwater sign wind-farm agreement." *Providence Business Journal*, January 8, 2009. Available online at: http://www.pbn.com/stories/37176.html. Last accessed February, 2009.
[276] R.I. Gen. Laws §42-64.5-1
[277] RIEDC, 2009. *Jobs Development Act: Corporate Income Tax Reduction for Job Creation.* Available online at: http://www.riedc.com/business-services/business-incentives/corporate-income-tax-reduction-for-job-creation. Last accessed February, 2009.
[278] *See Ch. IV Regulation §b Permitting and Review Process §§iii Permitting Case Study: Cape Wind.*

iii. New Jersey

Compared to its neighboring states, the State of New Jersey set an ambitious goal of an RPS mandating 22.5% by 2021.[279] However, this goal is more geared toward offshore wind energy specifically than other states in the area through designated installation goals. The New Jersey Energy Master Plan, released in 2008, contains a goal of installing at least 1000 MW of offshore wind energy by 2012 and at least 3000 MW by 2020. To further facilitate these goals, the New Jersey Board of Public Utilities is taking a very active stance in promoting offshore wind energy through its approval of a stakeholder process for rulemaking and its authorization of a rebate program for the construction of meteorological towers to support the development of at least 1000 MW of OSW by 2012.

Funding for this rebate program, which is expected to amount to $12 million, in addition to other financial incentives offered by the State of New Jersey, is provided through a system benefit fund.[280] The State's Societal Benefits Charge of approximately 3% of a customer's energy bill, has resulted in a total of $358 million that was collected in 2001, 2002 and 2003, $124 million in 2004, and a total of $745 million in 2005, 2006, 2007 and 2008.[281] The allocation of funding between renewable energy programs and energy efficiency was about 25% and 75% respectively, in 2005, but funding for renewables is scheduled to gradually increase

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[279] N.J. Stat. § 48:3-49 et seq.

[280] State of New Jersey Board of Public Utilities, 2008. *In the Matter of the Offshore Wind Rebate Program for the Installation of Meteorological Towers.* DOCKET NO. EO0811 0971. Available online at: http://www.njcleanenergy.com/renewable-energy/technologies/wind/shore-wind. Last accessed February, 2009.

[281] N.J. Stat. § 48:3-60. *See also,* New Jersey Clean Energy Program, 2009. Societal Benefits Charge. Available online at: http://www.njcleanenergy.com/main/about-njcep/societal-benefits-charge/societal-benefits-charge-sbc. Last accessed February, 2009.

overtime, to approximately 44%. From this fund, the State awarded a $4 million grant to Garden State Offshore Energy to install, a 350 MW pilot facility. Pilot projects provide an important test run for a new industry, allowing issues surrounding installation or operation, or problems within the regulatory process to be identified and corrected prior to substantial private investment. The Board of Public Utilities emphasized that the approval of this grant was a first step, and that it would continue to look for ways in which to support the development of offshore wind, perhaps through additional grants.[282]

The State of New Jersey has employed strong promotional policies and financial incentives specific to offshore wind energy, through the use of ambitious RPS targets, in combination with offshore wind energy goals within the state's Energy Master Plan, a rebate program for Meteorological Towers, and large grant funding for a 350 MW offshore wind pilot project. Similar to Rhode Island, New Jersey has demonstrated through policy its commitment to offshore wind energy. New Jersey has gone even further in advancing the development of an industry by providing direct financial support in combination with strong promotional policies. The pilot program in particular, has the potential to greatly streamline the state's regulatory process, while also provide valuable insight to surrounding states who also aim to develop a concise approval process.

[282] *Ibid.*

iv. Delaware

Delaware has instituted an RPS of 20% by 2019, which applies to all private utility companies servicing the state, municipal utilities, and rural electric cooperatives.[283] However, municipal utilities and rural electric cooperatives are allowed to opt out of the RPS requirements if they establish their own green energy fund. All cooperative and municipal utilities to date have opted out of the state RPS, and have instead formed their own funds. In an attempt to encourage faster development of renewables, the RPS legislation includes provisions granting suppliers a 150% credit toward RPS compliance for energy generated by wind turbines sited in Delaware on or before December 31, 2012.[284] A recent amendment offers a 350% RPS credit to utilities supplied by offshore wind facilities sited on or before May 31, 2017.[285] These enlarged RPS credits encourage utilities, which must conform to RPS standards, to purchase electricity from offshore wind farms. In essence, this type of promotional instrument aids in guaranteeing offshore wind a portion of the market, even if its cost per-kilowatt would not normally be cost competitive.

The Delaware system benefits fund collects a surcharge of $0.000356 per kWh, generating approximately $3.2 million annually for the Green Energy Fund.[286] From this fund, cash grants for the installation, research and development are provided for the advancement of many types of renewable technologies. However, this fund supports both small-scale residential projects and commercial projects, resulting in

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[283] 26 Del. C. § 351 et seq.
[284] DSIRE, 2009. *Supra* note 24.
[285] Delaware 114th Senate Bill 328 (2008).
[286] 26 Del. C. § 1014; 29 Del. C. § 8051 et seq.

smaller sized grants (less than $250,000), which are less beneficial to developers of larger offshore projects.

Offshore wind energy in Delaware is primarily promoted through the state's RPS mandates and the inflated RPS credits. Exemptions in Delaware's RPS, however, that allow municipal and rural cooperatives to not participate in the state's RPS, reduces the demand for RPS credits, and may undermine the influence of this promotional policy. Lastly, the financial incentives offered by the State of Delaware are too small for commercial offshore wind energy projects and, therefore, do not help to encourage a commercial offshore wind energy industry.

d. Comparison Between Federal and State Incentives

The three main barriers identified in this study to an offshore wind energy industry in the Northeast/Mid-Atlantic are (*i*) high upfront capital costs, (*ii*) an extensive and at times unclear regulatory/approval process, and (*iii*) inequitable competition from conventional energy sources. Therefore, the incentives offered in the U.S. at the federal and state level will be evaluated within the context of these three issues. In general, on the federal level, financial incentives are the dominant form of promotional instrument being used, in contrast to primarily regulatory incentives on the state-level (see Table 5-2). The fact that no offshore wind facilities have yet been installed in the Northeast/Mid-Atlantic suggests that past support mechanisms in place (prior to those offered in the American Recovery and Reinvestment Act of 2009) may have not addressed all the obstacles facing offshore wind. The new federal support, however, may provide the additional support necessary to assure an offshore wind farm installation within the near future.

High upfront capital costs are primarily relieved through federal financial incentives: PTC, U.S. Treasury grants, the accelerated depreciation program and the DOE loan guarantees. However, the effectiveness of the main financial incentive, the PTC, has been impacted by its short duration and unpredictability. The PTC, while very important to the feasibility of offshore wind projects, has been allowed to expire on so many occasions that its value in the financing of projects has been diluted. Even with the recent renewal of the PTC for three years, this credit still remains unreliable to project developers, especially when particular offshore wind proposal like Cape Wind have been in assessment for over seven years. The inconsistency of this production credit not only reduces financing opportunities for offshore wind developers, it also signals that there is a lack of long-term commitment by Congress in the development of an offshore wind energy industry. The option to convert the PTC into a U.S. Treasury Grant upfront, given in the recent economic stimulus package, is a much more reliable financial incentive as all the support is given at once. The grants may also be a more valuable to developers who need the most assistance with financing capital costs (i.e. turbines and support structures, which can together account for over 50% of the cost).[287] Both of these financial incentives, the PTC and the U.S. Treasury Grants, are only guaranteed for the next 2-3 years, after which time their futures remain uncertain. This is especially true when considering the fact that this current period of economic stimulus, which resulted in the extension and creation of

[287] *See Ch III Economics of Offshore Wind Energy, Figure 3-3.*

these two incentives, will likely be followed by a period of budgetary cuts by the government to address the nation's deficit.

Despite the fact that all four Northeast/Mid-Atlantic states have System Benefit Funds, most are not large enough to provide financial incentives to offset the large capital investment required for commercial offshore wind projects. Most of the grants and loans offered through these funds are for less than $250,000 or offered to public entities, such as municipalities. The only state that appears to be offering direct financial assistance in the development of an offshore wind industry is New Jersey, with the rebate program for meteorological towers, and the $4 million grant offered for a pilot program. By offering financial incentives, tailored to meet the needs of current offshore wind developers, the greater the potential there is to advance the industry within the state. In an attempt to create a more favorable business environment for an offshore wind energy manufacturing industry, Rhode Island is offering sales tax exemptions for equipment sold within the state and corporate state tax exemptions for companies that create a certain number of jobs within the state. These incentives indirectly lower the amount of capital investment by supporting local production of wind turbines and other infrastructure.

Currently, there are no applicable federal promotional policies to expedite the approval/permitting process. In fact, the delay in MMS regulations regarding offshore wind energy has further delayed proposed projects throughout the region. The recent change in political climate however, has placed a higher priority on the development of renewable energy industries, and opens the door for greater regulatory support of offshore wind in the future. State incentives addressing this issue are currently offered in Rhode Island through the Ocean SAMP, and in Massachusetts through the Ocean Management Plan, and Model Local Ordinance for Permitting Large Wind Facilities. Together the RI Ocean SAMP and the MA Ocean Management Plan go the farthest in providing for an expedited review system, the Model Local Ordinance for Permitting Large Wind Facilities provides a valuable tool to local governments in developing a fully streamlined permitting/approval process. New Jersey has not formally adopted any regulatory incentive to improve the approval process, however the funding of a pilot project will likely serve as a learning exercise in how the state's regulatory process can be improved upon for future projects.

Incentives intended to level the playing field between renewable and conventional energy sources are all implemented at the state level, through the use of RPS, and the RGGI cap and trade system. Each state's RPS sets aside a certain portion of the energy market just for renewable energy, eliminating the unfair competition between the developing offshore wind industry and the long subsidized conventional energy sources. In addition, New Jersey and Rhode Island have both set specific state targets for offshore wind energy generation, which shows state commitment to industry development within their waters. The RGGI cap and trade system begins to force electricity producers to internalize the externalities that they produce, and, therefore, indirectly helps to promote the development of clean energy throughout the region.

In summary, the promotional schemes provided to offshore wind energy in the U.S. consist of financial incentives offered on the federal level and primarily promotional policies on the state level. The federal financial incentives while strengthened from the economic stimulus bill, still lack a long-term reliable future. However, the flexibility provided by the option between production tax credits and upfront capital grants may offer the added financial support needed to assure the installation and operation of the region's first offshore wind facility. Out of the four states examined in this study, New Jersey and Rhode Island appear to be the states most favorable to offshore wind energy development. Both states have specific offshore wind energy targets and incentives, through the New Jersey Energy Master Plan, the Meteorological Tower Rebate Program, the New Jersey Offshore Wind Pilot Project, the RIWINDS and Ocean SAMP. Massachusetts and Delaware, on the other hand, offer more generic incentives to all forms of renewable energy.

e. *European Incentives*

The European Union (E.U.) has for decades now been fostering a political environment committed to environmental responsibility and clean energy development. Toward that effort, the E.U. has long been considered a leader in climate change policy, principally as a result of its ratification of the Kyoto Protocol.[288] Under the terms of this international agreement, the E.U. has committed to reducing greenhouse gas emissions by 8% of its 1990 levels by the years 2008-2012.[289] Moreover, at the European Council in March 2007 the E.U. extended its goal, with an aim to reduce its CO_2 emissions by 20% by 2020 and called on developed countries to

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[288] Kyoto Protocol to the United Nations Framework Convention on Climate Change. Available online at: http://unfccc.int/kyoto_protocol/items/2830.php. Last accessed February, 2009.
[289] *ibid.*

conclude an international agreement establishing a global reduction target of 30% by 2020.[290] While it is questionable if these targets can be met, nevertheless, this convention has served as a major promotional policy for renewables, including offshore wind energy within the region.

In recognition that not all E.U. member states have the same capacity to reduce emissions, in 2003 the E.U. Council created the European Union Emissions Trading Scheme, establishing an open market for emissions quotas.[291] This scheme, allows each member state to determine how many emission allowances to issue to its energy generators, based on a national threshold assigned to the state by the E.U., and develop its own National Allocation Plan for E.U. approval. Energy producers within participating states must stay within their allocated emissions quota, or purchase allocation certificates on the trading market from producers with a certificate surplus.[292] This cap and trade system is analogous to the Regional Greenhouse Gas Initiative started on the East Coast of the U.S.

In conjunction with the goals set under the Kyoto protocol, the E.U. signed a binding Directive to source 20% of their energy needs from renewables such as biomass, hydro, wind and solar power by 2020.[293] On January 23, 2008, the Commission put forward differentiated targets for each EU member state, based on the per capita GDP of each country.

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[290] European Commission, 2009. *Kyoto Protocol.* Available online at: http://europa.eu/scadplus/glossary/kyoto_protocol_en.htm. Last accessed February, 2009.

[291] European Parliament and Council, 2003. *Directive Establishing a Scheme for Greenhouse Gas Emission Allowance Trading Within the Community and Amending Council Directive 96/91/EC.* (Directive 2003/87/EC).

[292] European Commission, 2009. *Emission Trading Scheme (EU ETS).* Available online at: http://ec.europa.eu/environment/climat/emission/implementation_en.htm. Last accessed February, 2009.

[293] European Parliament and Council, 2008. *Directive of the European Parliament and of the Council on the Promotion of the Use of Energy from Renewable Sources.* (Directive 2008/0016 COD).

These overarching E.U. emissions and renewable energy objectives create an encouraging environment for renewable energy production within the union, and for Denmark and the United Kingdom where offshore wind resources are favorable, a positive environment for the development of an offshore wind energy industry. To further facilitate offshore wind energy within the E.U. two informal workshops were conducted by member states, resulting in the Egmond Policy Declaration (2004), the Copenhagen Strategy 2005 and the Berlin Declaration in 2007.[294] The aim of these meetings was to identify obstacles to the development of offshore wind, focus on possible solutions, approaches and structural cooperation between parties and create a starting point for a comprehensive European policy for offshore wind. The conclusions reached at these meetings include:

- A "one-stop shop office approach" - defining division of responsibility among different layers of the public administration in Member States;
- A need for long-term grid planning;
- The importance of more efficient approval procedures, which build on past experience and are in proportion with the scale of the project;
- A need to ensure good quality assessments and clear rules for allocation of grid costs; and
- The establishment and use of marine spatial planning instruments to reach optimal site selection.

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[294] Egmond Policy Declaration, 2004. EU Policy Workshop Development of Offshore Wind Energy. Egmond aan Zee, Netherlands, September 30- October 1, 2004. Copenhagen Strategy on Offshore Wind Power Deployment 2005. European Policy Seminar on Offshore Wind Power, Copenhagen, October 27, 2005. Berlin Declaration, 2007. European Policy Workshop on Offshore Wind Power Deployment. Berlin, Germany, February 23, 2007. All available online at: http://www.ewea.org/index.php?id=203. Last accessed February, 2009.

In response to these recommendations, the European Commission published its Strategic Energy Review in November 2008. It proposed a number of Priority Infrastructure Projects, particularly creating a blueprint for a North Sea offshore grid, "to interconnect national electricity grids in North-West Europe together and plug-in the numerous planned offshore wind projects", along with additional interconnection plans for the Mediterranean and Baltic regions to facilitate the development of renewables and form the foundation for "a future European supergrid."[295]

Together all of these promotional policies are building an E.U. framework for offshore wind power targeted at removing industry barriers. In addition, each member state can institute its own promotional instruments to encourage offshore wind development of its shores. The two countries operating the largest percentage of global offshore wind energy are Denmark (with 28%, 409.15 MW, see Figure 9) and the United Kingdom (with 39%, 590.8 MW).

i. *Denmark*

Denmark was the first country to install and operate an offshore wind farm in 1991, and currently boasts the two largest operational offshore wind farms, though multiple U.K. farms under construction will soon take that title. Much of Denmark's early success in the development of offshore wind can be attributed to strong and explicit government ambition to develop offshore wind energy, with the goal of becoming a world leader in the industry. A stable commitment to renewable energy

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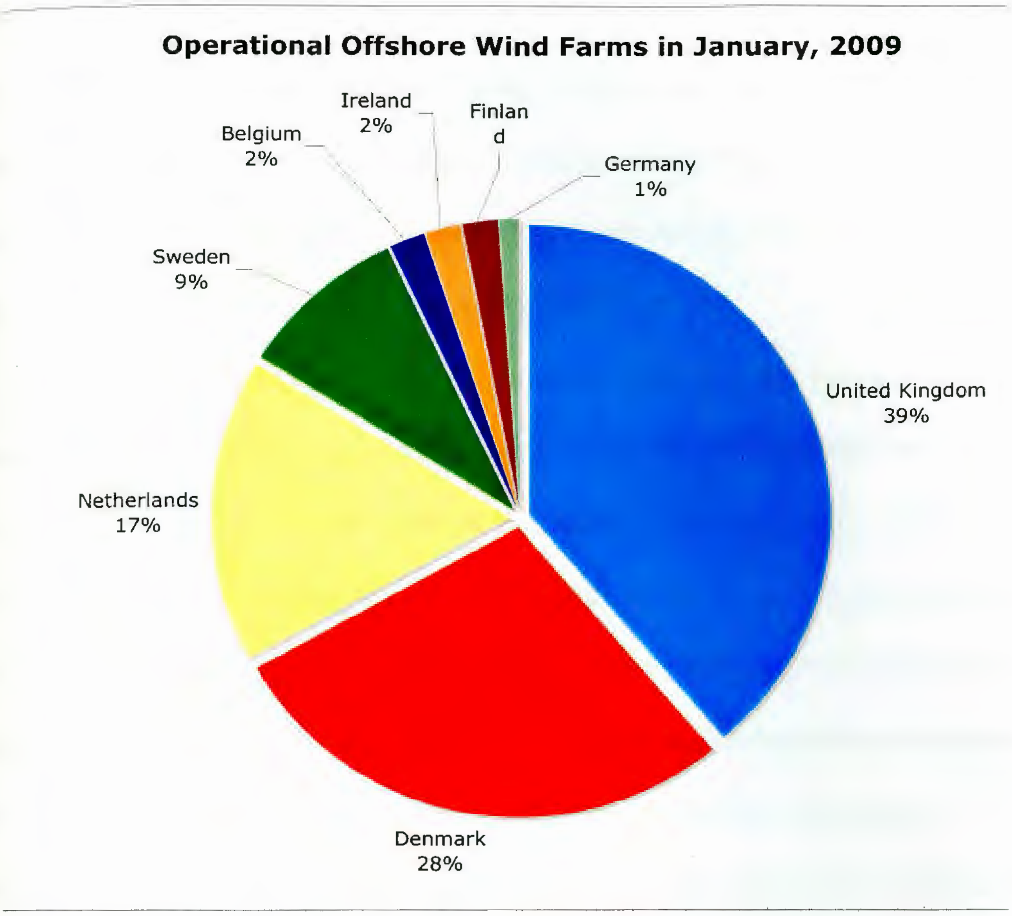
[295] European Parliament, 2008. *Second Strategic Energy Review*. (2008/2239(INI)). Available online at: http://www.ewea.org/index.php?id=203. Last accessed February, 2009.



	MW	% of Total Operating Capacity
United Kingdom	590.8	39%
Denmark	409.15	28%
Netherlands	246.8	17%
Sweden	133.3	9%
Belgium	30	2%
Ireland	25.2	2%
Finland	24	2%
Germany	12	1%
Total Operating Capacity	1471.25	100%

Figure 9. Operational Offshore Wind Farms Globally in January, 2009. *Adapted from*: European Wind Energy Association, 2009. Wind now leads EU power sector. Available online at: http://www.ewea.org/index.php?id=180. Last accessed February, 2009.

development in Denmark, starting from the 1970s onward, helped to provide a reliable domestic market within the country.[296] Early recognition of the need for political and financial support for renewable energy in order to gain a foothold in the energy market, led to the creation of strong government incentives and the development of ten offshore wind projects (See Figure 10).

Early on, the Danish government understood the need for a clear regulatory system regarding offshore wind energy development, therefore primary jurisdiction over the emerging industry was given to the Danish Energy Authority, with all other relevant government agencies coordinated through this authority. A tendering system of pre-designated offshore lease areas was also employed to control the rate and areas developed. The aim of this regulatory structure is to create a streamlined framework for "one-stop shopping."[297] In addition, the Danish government realized the importance of public/private collaboration with electricity companies to analyze and plan for offshore wind development. As a result of this partnership, an Action Plan on Offshore Wind Power and an extensive demonstration program emerged, resulting in the two largest offshore projects (Horns Rev and Nysted/Rodsand, see Figure 10).[298] The Danish Energy Authority, also engaged in a government screening process, identifying areas for future offshore wind expansion, taking into account all known interests in Danish waters. The expansion plan aims to concentrate future offshore

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[296] J. Lipp, 2007. "Lessons for effective renewable electricity policy from Denmark, Germany and the United Kingdom." *Energy Policy,* 35(2007): 5481-5495.

[297] S. Shaw, M.J. Cremers, G. Palmers and European Wind Energy Association (EWEA), 2002. *Enabling Offshore Wind Developments.* EWEA Publishing, Brussels. Available online at: www.ewea.org. Last accessed February, 2009.

[298] Danish Energy Authority, 2005. *Offshore Wind Power: Danish Experiences and Solutions.* Danish Energy Authority, Copenhagen, October, 2005. Available online at: http://www.energistyrelsen.dk. Last accessed March, 2009.

wind energy development in a few areas, while maximizing the use of existing infrastructure and reducing as far as possible the impact on the coastal landscape.[299]

Denmark's feed-in tariff has been seen as a vital financial incentive in the development of the country's offshore wind energy industry. Beginning in the 1980s onshore, the use of a feed-in tariff system obligated utilities to purchase wind-generated electricity at a rate that equaled 85% of the price paid by consumers.[300] The tariff led to the creation of a bottom-up market for small (25-55 kW) onshore wind projects, gradually growing into offshore wind development as demand rose and onshore space became limited. The tariff requirements were modified in 2001, no longer requiring utilities to pay a fixed tariff, but rather a variable feed-in tariff in addition to the market price so that the total price fell within €0.048- 0.069/kWh (approximately $0.06- 0.09 USD/kWh).[301] Past feed-in tariffs have been on the order of approximately $0.02 USD/kWh for the first 10-12 years of the facility's operation.[302] The amount required in the form of the variable feed-in tariff then became a criterion on which tendering bids were evaluated. The applicant requiring the least amount of financial support from a feed-in tariff was awarded the lease. However, some have argued that this change in the financial incentive to a variable feed-in tariff has made the industry less profitable and caused a slow-down in installed capacity within the country (see Figure 11). This immediate effect on industry activities, as a result of policy changes, underlines the need for continued regulatory stability until

[299] EWEA, 2002. *Supra* note 291.
[300] Danish Energy Authority, 2005. *Supra* note 295. *See also* Redlinger, et al. Supra note 7.
[301] Lipp, 2007. *Supra* note 290. Based on conversion factor of €1= $1.25 USD.
[302] The tender for Horns Rev II to Energi E2 A/S, included a fixed feed-in price of €0.013/kWh (approximately $0.02 USD/kWh) for approximately the first 12 years of operation. *See* Danish Energy Authority, 2005. Based on conversion factor of €1= $1.25 USD.

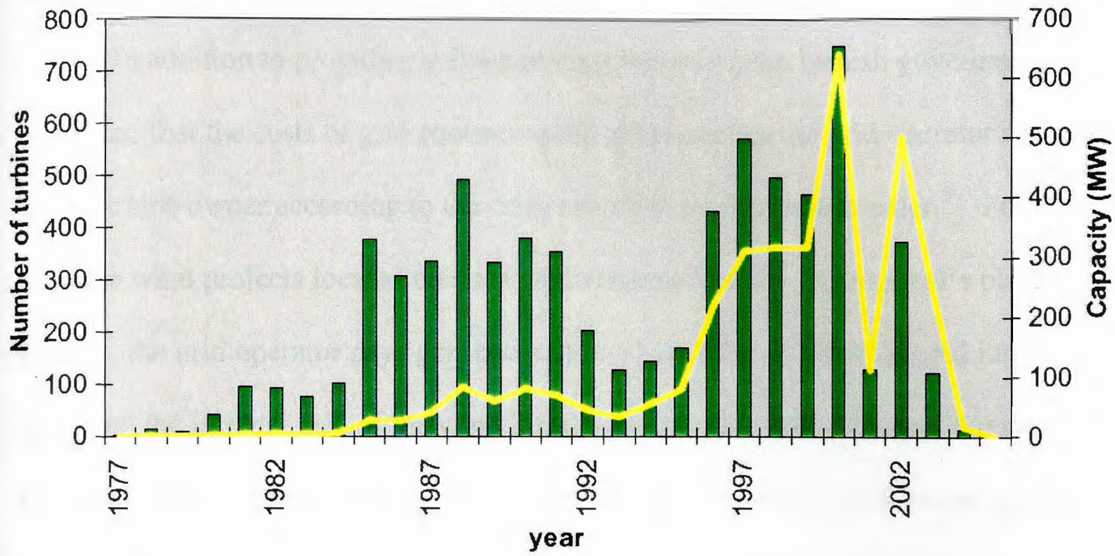

Figure 11. Installed capacity and turbine installations in Denmark, 1997-2005. Overall drop in capacity after 2000, following changes made to the feed-in tariff system. *Adapted from*: J. Lipp, 2007. "Lessons for effective renewable electricity policy from Denmark, Germany and the United Kingdom." *Energy Policy,* 35(2007): 5481-5495.

this industry is able to compete on a more even basis with conventional energy sources.

In addition to providing a fixed pricing incentive, the Danish government also mandated that the costs of grid connection be split between the grid operator and the wind turbine owner according to the rules set out in a government order.[303] For offshore wind projects located on sites predetermined by the government's planning process, the grid operator pays grid connection costs from an offshore grid junction point and the internal grid of the wind farm is paid by the project owner. For offshore farms in other locations, the developer has to pay the connection costs to an onshore junction point.[304] This not only reduced the amount of upfront capital costs required for a project, but also encourages development within pre-determined offshore wind energy zones.

Widespread public support of renewable energy was fostered throughout the country through government encouragement for cooperative ownership schemes, or local, public ownership of wind farms. Generous tax benefits from the government, as well as the ability to sell surplus energy produced to the open market, not only encouraged local investment, but also created large-scale public acceptance for renewable development, even if it was located in the public's backyard.[305] For example, in 2000 when a 27-turbine wind farm was proposed for 3.5 km off the shores of Copenhagen Harbor, the Danish government decided to fund 50% of the project

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[303] Bekendtgoerelse 2001: 87 (16th of March) om nettilslutning af vindmøller og prisafregning for vindmølleproduceret elektricitet m.v.
[304] EWEA, 2002. *Supra* note 291.
[305] Lipp, 2007. *Supra* note 290.

through private investment. People bought shares of the project and became members of the Middelgruden Cooperative.[306] Shareholders not only saw income from their ownership stake, but the payout received from the project received generous income tax liability reduction.[307] Therefore, as a result of the financial incentives associated with local cooperative ownership the large upfront capital needs were met more easily and, public acceptance issues lessened.

In conclusion, Denmark was able to pioneer offshore wind energy through a long history of regulatory support and financial promotion. Strong government backing, through the use of early Action Plans on Offshore Wind Power, pre-screening processes to map out the best areas for development, clear regulatory oversight by one authority and partnerships formed with industry to develop demonstration projects have all created a friendly regulatory environment for offshore wind development. Additionally, the underlying standards set by the E.U. participation in the Kyoto Protocol has provided an encouraging atmosphere for offshore wind energy. Many studies have determined that the key to Denmark's success in establishing such a robust wind energy industry centered on the use of the feed-in tariff system, to ensure project profitability.[308] Unique financial incentives designed around shared grid connection costs between developers and utilities, and cooperative ownership arrangements have aided in addressing the high capital costs of offshore wind developed and also fostered large-scale public acceptance.

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[306] H.C. Sorenson, L.K. Hansen and J.H. Molgaard Larsen, 2002. "Middelgruden 40 MW Offshore Wind Farm Denmark-Lessons Learned." Available at: http://www.middelgrunden.dk/MG_UK/project_info/organization.htm. Last accessed February, 2009.

[307] PREDAC- European Actions for Renewable Energies, Local Investment into Renewable Energies. Available online at: http://www.cler.org/info/spip.php?article884. Last accessed February, 2009.

[308] Lipp, 2007. *Supra* note 290. *See also* A. Held, R. Haas, and M. Ragwitz, 2006. "On the success of policy strategies for the promotion of electricity from renewable energy sources in the EU." *Energy & Environment*, 17, 6, 849-868.

ii. United Kingdom

The United Kingdom boasts some of the best offshore wind resources in the world. With relatively shallow waters and strong wind resources extending far into the North Sea, the U.K. is estimated to have over 33% of the total European potential offshore wind resource - enough to power the country nearly three times over.[309] Recently, the U.K. has become the global leader in installed offshore wind capacity, with 39% of total global offshore wind capacity (590.8 MW).[310] This increase in development is the direct result of aggressive renewable energy policies and promotional instruments. The focus in the U.K. currently centers on promotional polices to encourage offshore wind energy development, mainly through the Renewable Obligation, Climate Change and Fossil Fuel Levy, and large scale tendering of offshore leases, placing little emphasis on direct financial support. However, the first promotional schemes involved fixed pricing systems, together with a national quota.

The first promotional instrument used was the Non- Fossil Fuel Obligation (NFFO), introduced in 1990 following the privatization of its electricity supply industry. The original intention of this program was to support the country's nuclear power plants, which were not otherwise cost competitive, however, renewable energy generation also benefited from this scheme. The NFFO system set aside a certain portion of the electricity market for renewable energy, and used a competitive bidding

[309] BWEA, "Offshore Wind." Available online at: http://www.bwea.com/offshore/info.html. Last accessed March, 2009.

[310] European Wind Energy Association, 2009. Wind now leads EU power sector. Available online at: http://www.ewea.org/index.php?id=180. Last accessed February, 2009.

system to solicit proposals from developers. Bids with the lowest per kilowatt-hour production rate, would be awarded power purchase contracts by the government. Regional electricity suppliers were mandated to purchase electricity produced from these NFFO renewable projects at premium prices, to be later compensated by the government for the additional cost. Government funding for these price premiums were raised through a Fossil Fuel Levy, or tax on electricity generated from conventional fossil fuels.[311] This NFFO strategy was the main policy used by the United Kingdom for almost a decade and in the end was seen as being generally successful. This instrument did manage to drive down the costs of wind energy generation by 31%, however, it did not result in the rapid growth seen in other European countries, such as Denmark.[312]

As a result, in 2002, the U.K. government decided to replace the NFFO scheme with a more market-driven mechanism called the Renewable Obligation (RO), analogous to a RPS system in the U.S.[313] Under this obligation system, electricity suppliers must provide a minimum percentage of power from renewable sources or pay a penalty of £34.30/kWh (approximately $50 USD).[314] Renewable Obligation Certificates (ROCs) are tradable credits, representing 1 MWh of renewable energy generation, used to satisfy the requirement. The Office of Gas and Electricity Markets certifies renewable energy providers and administers ROCs.[315] In cases where

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[311] Redlinger et al. *Supra* note 7.

[312] British Wind Energy Association (BWEA), 2009. "History of the NFFO." Available online at: http://www.bwea.com/ref/nffo.html. Last accessed February, 2009.

[313] British Wind Energy Association (BWEA), 2009. "The Renewables Obligation." Available online at: http://www.bwea.com/business/roc.html. Last accessed February, 2009.

[314] Current exchange rate of 1£/ $1.44 USD used.

[315] The Office of Gas and Electricity Markets (OFGEM), 2009. Available online at: http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Pages/RenewablObl.aspx . Last accessed Feburary, 2009.

suppliers do not have sufficient ROCs to meet their obligations, they must pay an equivalent amount into a fund. The proceeds of this ROC fund are then used pay back (on a pro-rated basis) suppliers that have met their RO obligation. ROCs have increased the profitability of renewable energy generation within the country, as the certificates have an additional value over and above the price of electricity. The total RO level for the country started at 3% in 2002/2003, then rose to 10.4% for 2010/2011 and 15.4% by 2015/2016 (See Table 11). The Government intends that suppliers will be subject to a RO until 2027.

Working parallel with the RO policy, the Climate Change Levy is a tax on energy consumption by industrial, commercial and public sector users, aimed at encouraging energy efficiency, reducing overall energy consumption and lowering greenhouse gas emissions.[316] The amount of the tax varies depending on the type of energy being consumed (i.e. electricity, petroleum, etc.), ranging from £0.001-0.004 per kWh or on average an increase of 8-10% on electric bills. Tax exemptions are provided to businesses that decide to generate clean energy (through wind turbines or solar cells) or switch to energy suppliers that use green technologies.[317]

To date, two rounds of tendering offshore wind projects have occurred in the U.K. The Crown Estate, the body that officially owns almost all the UK coastline out to 12 nautical miles, made its first call for bids in 2000 and the second in 2003.These two rounds of tenders demonstrated substantial interest in developing the industry, and resulted in 30 approved bids, which in addition to the previous demonstration projects

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[316] United Kingdom Department for Environment, Food and Rural Affairs, 2005. "Climate Change Agreements: the Climate Change Levy." Available online at: http://www.defra.gov.uk/environment/climatechange. Last accessed March, 2009.
[317] British Wind Energy Association, "Climate Change Levy." Available online at: http://www.bwea.com/business/lec.html. Last accessed March, 2009.

Table 11. Renewable Obligation Standards in the United Kingdom.
Source: The Office of Gas and Electricity Markets (OFGEM), 2009. Available online at:
http://www.ofgem.gov.uk/Sustainability/Environment/RenewablObl/Pages/RenewablObl.aspx . Last accessed Feburary, 2009.

Year	% of Renewable Energy Required
2002/2003	3.0
2005/2006	5.5
2006/2007	6.7
2007/2008	7.9
2008/2009	9.1
2010/2011	10.4
2015/2016	15.4

have now resulted in 22 operational offshore wind farms and 16 in the planning stages (see Figures 12 and 13). To further expedite projects following tender, an office within the Department of Trade and Industry was established where all aspects and permissions for an offshore wind project were processed in close dialogue with the developer. The North Hoyle offshore wind farm was granted to start project preparations in April 2001, followed by construction approval and environmental assessments in February 2002 and resulting in an operational facility by December 2003. This centralized approval process led to an increase of approved applications from 56.5% in 2000 to 96.1% in 2003.[318] Most recently the Department of Energy and Climate Change (DECC) was created in October 2008, to better integrate energy policy (previously with BERR - the Department for Business, Enterprise and Regulatory Reform) with climate change mitigation policy (previously with Defra - the Department for Environment, Food and Rural Affairs).

In conjunction with the tendering of offshore leases, the U.K. also implemented a Capital Grant Scheme to provide funding for certain offshore projects. The primary aim of the scheme is to:

- Stimulate early development of a significant number of offshore wind farms.
- Deliver an early contribution to the Renewables Obligation and emission reductions;
- Underpin development of the industry and the equipment supply chains;
- Provide a learning experience which can improve confidence and help reduce future costs; and

[318] T. Wizelius, 2007. *Supra* note 28.

Figure 12. Round 1 of United Kingdom Offshore Wind Energy Tender.
Source: British Wind Energy Association (BWEA), 2009. "Offshore Wind- Round 1 Wind Farms." Available online at: http://www.bwea.com/offshore/round1.html. Last accessed March, 2009.

Round 1 Tender

Location	Status	Capacity	Developer/Turbines
North Hoyle	Operating (Dec 2003)	60 MW	npower renewables (Vestas 2 MW)
Scroby Sands	Operating (Dec 2004)	60 MW	E.ON UK Renewables (Vestas 2 MW)
Kentish Flats	Operating (Sep 2005)	90 MW	Vattenfall
Barrow	Operating (Sept 2006)	90 MW	Centrica/DONG Energy(Vestas 3 MW)
Gunfleet Sands	Approved	30 turbines	DONG Energy
Lynn/Inner Dowsing	Approved	57 turbines	Centrica
Cromer	Withdrawn after approval	30 turbines	EDF
Scarweather Sands	Approved	30 turbines	E.ON UK Renewables/DONG Energy
Rhyl Flats	Approved	25 turbines	npower renewables
Burbo Bank	Operational	25 turbines	DONG Energy (Siemens)
Solway Firth	Approved	60 turbines	E.ON UK Renewables
Shell Flat	Submitted	90 turbines	ScottishPower/Eurus/Shell/DONG Energy
Teesside	Approved	30 turbines	EDF
Tunes Plateau *	Submitted	30 turbines	RES/B9 Energy
Ormonde *	Submitted	30 turbines	Eclipse Energy

* These two projects were outside the original Round 1 process but conform to its terms, Ormonde is an innovative wind-gas hybrid project.

Figure 12 Continued. Round 1 of United Kingdom Offshore Wind Energy Tender.

Figure 13. Round 2 of United Kingdom Offshore Wind Energy Tender.
Source: British Wind Energy Association (BWEA), 2009. "Offshore Wind- Round 1 Wind Farms." Available online at: http://www.bwea.com/offshore/round1.html. Last accessed March, 2009.

Round 2 Tender

Location	Maximum capacity (MW)	Developer
Docking Shoal	500	Centrica
Race Bank	500	Centrica
Sheringham	315	Ecoventures/Hydro/SLP
Humber	300	E.on
Triton Knoll	1,200	npower renewables
Lincs	250	Centrica
Westermost Rough	240	DONG
Dudgeon East	300	Warwick Energy
Greater Gabbard	500	Airtricity/Fluor
Gunfleet Sands II	64	DONG Energy
London Array	1,000	DONG Energy-Farm Energy/Shell/ E.ON UK Renewables
Thanet	300	Warwick Energy
Walney	450	DONG Energy
Gwynt y Mor	750	npower renewables
West Duddon	500	ScottishPower / Eurus / DONG Energy
TOTAL	7,169	

Figure 13 Continued. Round 2 of United Kingdom Offshore Wind Energy Tender.

- Enable future projects to proceed without the need for grant support.[319]

Following completion of Round 1 & 2 of the tendering system, the total budget for the Scheme increased from £64 million to £92 million. As a result, at least £30 million of capital grant funding is available to support offshore wind demonstration projects under Round 3 of the Scheme. In addition, a further £10 million will be available through the New Opportunities Fund (NOF), bringing the total available under the next Round to at least £40 million.[320] It is expected that when the country's offshore wind energy industry reaches a sustainable level, these grants will no longer be required.

Currently, the U.K. is working to further strengthen the regulatory framework and assist industry development through the proposed Marine Bill being debated in Parliament.[321] The Bill seeks to address all users of the marine environment to ensure a sustainable approach to the use of the sea. Its objectives are to streamline the consenting process; address the possible need for a single overarching marine agency, responsible for all ocean uses and undertake an evaluation as to the necessity of Marine Spatial Planning. This bill recognizes the importance of an efficient approval process, the need to balance multiple stakeholders, and the role government as a facilitator in the planning process. The U.K. Energy Minister Brian Wilson said regarding the siting of future projects, "As the wind farms will be closer together, it means developers can share their resources and help bring down the cost of this

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[319] U.K. Department of Trade and Industry, *Offshore Wind Capital Grant Scheme.* Available online at: http://www.berr.gov.uk/energy/environment/etf/offshore-wind/page45496.html/environment/etf/offshore-wind/page45496.html. Last accessed, March, 2009.
[320] *Ibid.*
[321] Marine and Coastal Access Bill, HL 54/4, 2009. Available online at: http://www.defra.gov.uk/marine/legislation/index.htm. Last accessed March, 2009.

abundant source of energy."[322] This Marine Bill is part of a large movement within the E.U. for marine spatial planning, to promote efficient use of maritime space and support investments in offshore renewable energy.[323]

Overall, the United Kingdom has utilized primarily promotional polices to advance offshore wind energy, following the fixed pricing system of the NFFO and with the current exception of the financial incentives offered under the Capital Grant Scheme. The country's Renewable Obligation creates a market for renewable energy within the country, while also adding to the profitability of offshore wind projects through the proceeds generated from the ROC trading scheme. Both the RO and the Climate Change Levy help to level the playing field between offshore wind and conventional energy sources. The tendering system utilized by the U.K. government, along with an expedited and centralized approval process led to very fast development and growth of the country's offshore wind industry, resulting in the country becoming a global leader in installed offshore wind capacity.

iii. Comparison Between U.S. and European Incentives

If the goal of a country or state is to generate a sustainable and profitable offshore wind energy industry, continual government commitment is needed, as well as policies that create markets and increase the potential rate of return for investors. [324] Denmark and the United Kingdom have both been able to successfully grow an

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[322] BBC World News, 2002. "Wind Farms Get Minister's Backing." *BBC World News*, November 22, 2002. Available online at: http://news.bbc.co.uk/2/hi/uk_news/england/2504581.stm. Last accessed February, 2009.

[323] Maritime Journal, 2009. "EU launches maritime spatial planning workshops." Available online at: http://www.maritimejournal.com/archive101/2009/march/online_news/eu_launches_maritime_spatial_planning_workshops. Last accessed March 2009.

[324] Sawin, J.L., 2006. *Supra* note 132.

offshore wind energy industry within their country as the result of effective promotional strategies, and long-term political commitment. Denmark's overall strategy has involved both regulatory and financial incentives, in contrast to the United Kingdom, which has relied mostly upon regulatory incentives to support industry growth. In both cases, the following characteristics were evident: (1) a clear regulatory system was created and channeled through a single department or agency, (2) a tendering system was used to coordinate offshore lease areas, (3) national quotas were used to create a long-term market for renewable energy, (4) policies mandating conventional energy sources to internalize their externalities, and (5) some financial support to increase project profitability or investment cost. This suggests that while financial support is important, regulatory incentives may provide an even more effective instrument in promoting this new industry.

Although financial support was provided in Denmark through a feed-in tariff system, shared grid connection costs between the developer and utility companies, and cooperative ownership schemes, the U.K. was able to rapidly grow its offshore wind industry, and become the world leader without the use of these financial incentives. Instead, the U.K.'s incentives have been the result of promotional policies. Creating a national market for renewable energy through an RPS or other quota system, in turn, encourages utilities to enter into long-term power purchase agreements, and helps to facilitate favorable financing agreements for the developer, and may provide sufficient support for the growth of an offshore wind industry.

International comparisons between the U.S., Denmark and the United Kingdom are limited by the fact that each country has its own unique political structure. Though, the five common elements identified above can serve as evaluation criteria to aid in recognizing current deficiencies in U.S. policies, and suggest potential areas in which modifications can be made to better support industry growth. In comparison to the federal incentives offered in the U.S., both European countries provide overall more types of support to offshore wind, especially in terms of promotional policies.

Currently, there are no federal promotional policies related to offshore wind, suggesting the U.S. lacks a consistent vision when it comes to offshore wind energy. The Energy Policy Act of 2005 was a step in the right direction toward a more streamlined regulatory process, however, the absence of firm regulation regarding offshore wind energy for four years presented an added barrier to proposed offshore wind projects. The MMS has a form of tendering within its final regulations, though this process seems to be far from ready for implementation. Present Secretary of the Interior Salazar has shown increased support towards developing a new offshore energy strategy within DOI, especially in regards to renewables, so the likelihood of streamlining the regulatory process and instituting a tendering system have improved.[325]

Without a national RPS within the U.S., the market for renewable energy remains somewhat limited, forcing offshore wind energy to compete against conventional energy sources. Past attempts at instating a national quota have all be

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[325] MMS, 2009. "Secretary Salazar Details Strategy for Comprehensive Energy Plan on U.S. Outer Continental Shelf, Provides More Time for Public Comment: Incorporates Renewable Energy." *Press Release,* February 10, 2009. Available online at: http://www.mms.gov/ooc/press/2009/press0210.htm. Last accessed March, 2009.

unsuccessful.[326] However, currently there are two bills in Congress proposing a national RPS in committee; the success of these two bills is still unknown, though the recent increase in attention on renewable energy within Washington may improve the bills chances.[327] In addition, there are no federal policies requiring fossil fuel plants to internalize any of the externalities produced, resulting in under-priced electricity rates and an unfair competitive advantage against renewables. Instead, the U.S. on the federal level has chosen to focus on financial incentives, which have a limited time span and are subject to federal economic policy decisions.

On the state level, the types of incentives offered in the Northeast/Mid-Atlantic appear to better match the characteristics seen within Denmark and the United Kingdom. All of the states examined have initiated programs to attach a price to the externalities associated with non-renewable energy generation, through the initiation of the RGGI cap and trade program. Each state has also implemented RPS targets, creating a market for the renewable energy created from offshore wind projects. In particular however, New Jersey and Rhode Island have included specific targets for offshore wind energy, further promoting this particular technology. These two states also exhibit the most progress toward a clear and concise regulatory process, and an in-state tendering system through the pilot project funded in New Jersey, and the Ocean SAMP in Rhode Island. All the states offer modest financial support through System Benefit Funds, however, most of these are too small to facilitate large-scale commercial development.

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[326] 105th Congress H.R. Bill #656, S. 237; 105th Congress 2nd Session S. 2287; 106th Congress H.R. 1828 and H.R. 2050; 108th Congress H.R. Bill #6; H.R.

[327] 111th U.S. Congress, Senate Bill #433 and H.R. Bill # 890. Both call for a target of 25% renewable energy use by 2025.

Together, the federal and state incentives offered in the United States pertaining to offshore wind energy cover a wide range of strategies. On a federal level, incorporating promotional policies into the preexisting matrix of financial incentives could spur rapid growth in the industry. What appears to be lacking most of all on the federal level is long-term political commitment. President Obama is beginning to take steps to change this, however, there is room for much improvement.[328] For example, a national quota for renewable energy use, or the use of environmental taxation to internalize the cost of damages caused by fossil-fuels could help level the playing field for offshore wind energy, allowing it to be more competitive within the energy market. In addition, developing a clear and concise regulatory process, encompassing all reviews, and expediting the approval process by the MMS, would demonstrate political support to growing this industry. On the state level, Northeast/Mid-Atlantic states could more effectively promote an industry through developing more specific offshore wind energy targets and programs, while also taking the time to streamline the state and local approval process.

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[328] Remarks of President Barack Obama's – As Prepared for Delivery Address to Joint Session of Congress, Tuesday, February 24th, 2009. Available online at: http://www.whitehouse.gov/the_press_office. Last accessed March, 2009.

VI. Conclusions

The focus of this study was to examine government incentives offered by the U.S. federal government and Northeast/Mid-Atlantic states to promote an offshore wind energy industry. Four questions guided the analysis:

1. What are the economic and regulatory challenges facing businesses proposing to install offshore wind energy facilities in the Northeast/Mid-Atlantic?

2. How is the feasibility of offshore wind projects affected by current federal and state policies in the region?

3. How do the incentives provided in the United States compare internationally with those provided by Denmark and the United Kingdom, countries with leading offshore wind energy industries?

4. What additional incentives might be needed in the United States to encourage the development of offshore wind power?

These questions directed the study to identify potential road blocks to an offshore wind energy industry within this region, to consider how U.S. incentives are helping to diminish those obstacles, and to determine how promotional policies might be improved, using models provided in Europe. Despite notable interest from developers, the lack of any operational offshore wind farms in the U.S., suggests there are still obstacles to development and that there is much room for improvement in U.S. promotional policies.

Question 1: What are the economic and regulatory challenges facing businesses proposing to install offshore wind energy facilities in the Northeast/Mid-Atlantic?

There are currently both economic and regulatory challenges facing the development of an offshore wind energy industry in the U.S. As seen in the body of this study, the three main economic hurdles are: the high upfront capital investment required, financing difficulties in the current economic conditions, and an uncompetitive production cost in comparison to fossil fuel power generation. The high capital costs of the turbines, foundations, and transmission cables, combined with logistical challenges in the installation of these structures, requires that a project developer rely heavily on financing. Financing agreements can be hard to secure by a developer if the proposal appears too risky or unprofitable. Without a power purchase agreement, tax credits or other form of revenue backing, financing institutions will likely not lend to project developers, especially in such a credit tight economy. The profitability of offshore wind projects is too uncertain, primarily as a result of stiff production cost competition with conventional fossil fuel powered generation. Offshore wind energy remains economically uncompetitive because fossil fuels have enjoyed a long history of subsidies and are not currently mandated to include externalities in production costs.

In addition to economic obstacles, the development of an offshore wind energy industry in the U.S. is faced with two major regulatory issues: delayed federal regulations for offshore wind energy and an extensive permitting and review process that is complicated, time consuming and costly. The Energy Policy Act of 2005 identified DOI (and subsequently MMS) as the lead federal authority over offshore wind energy, however, the lack of formal rules and regulations for the past four years regarding the process for leasing and operating facility on the OCS has created an impenetrable obstruction to progress within the industry.

All of the Northeast/Mid-Atlantic states examined within this study are attempting to encourage offshore wind energy development within their state, though it is the lack of regulatory clarity on the federal level that is impeding state efforts. Furthermore, Cape Wind, the one proposal that has advanced into the approval process, has demonstrated the deficiency of appropriate state and federal offshore wind energy policy and a framework for interagency coordination at either the federal or state level. As a result, offshore wind proposals must undergo extensive reviews by individual agencies, which lengthens the permitting and approval process, and ultimately adds to preconstruction expense. Together, these regulatory and economic challenges create significant barriers to the development of an offshore wind energy industry.

Question 2: How is the feasibility of offshore wind projects affected by current federal and state policies in the region?

Three barriers focused on for analysis in this study were: (*i*) high upfront capital costs, (*ii*) extensive and at times unclear regulatory/approval process, and (*iii*) inequitable competition from conventional energy sources. The effect of current federal and state policies on these barriers was examined to assess how well promotional strategies by the federal and state governments have addressed the current challenges facing an emerging offshore wind energy industry within the region.

Overall, U.S. federal policy relies solely on financial incentives in the form of tax credits, grants, and loan guarantee programs to promote offshore wind projects, addressing only one of the barriers identified, namely high upfront capital costs (see Table 12). Currently, there are no promotional policies or regulatory incentives (such as a national renewable energy quota, externality tax, or cap and trade program for fossil fuel energy, or expedited permitting or tendering scheme for offshore wind leases) offered at the federal level, which together with the limited duration of the financial incentives, demonstrates a lack of political commitment toward this new industry. Conversely, states within the Northeast/Mid-Atlantic lack the ability to provide substantial financial incentives for commercial offshore wind energy projects, and, therefore, rely primarily on promotional policies such as state Renewable Portfolio Standards, a regional cap and trade emissions program and expedited permitting schemes to encourage industry development.

All the states examined have mandated Renewable Portfolio Standards or quotas, creating a separate market for renewable energy and eliminating market competition between renewable energy and fossil fuels (see Table 12). In addition, all four states are members of RGGI cap and trade system, which further adds to the cost competiveness of offshore wind energy in the open market. Initiatives in Rhode Island through the Ocean SAMP, and in Massachusetts through the development of an Ocean Management Plan and local permitting models are leading examples on how states are attempting to streamline the regulatory and approval process for commercial offshore wind farms. Although New Jersey has not initiated specific regulatory policies to reduce delays in permitting, the funding provided to support a pilot project within the region will likely serve as an important learning experience in how the state's approval process can be improved. New Jersey and Rhode Island also exhibit the most explicit support for offshore wind energy, above other forms of renewables, through targets set within each state pertaining particularly to offshore wind energy generation. These targets have the potential to promote power purchase agreements between utilities and offshore wind developers, which can provide assistance in financing projects.

Table 12 Summary Table of Incentives Offered Within the United States, Denmark and the United Kingdom.[1]									
	Promotional Policies			**Financial Incentives**					
	Quotas	**Externality Tax; Cap and Trade Programs**	**Expedited Permitting Scheme/ Tendering System**	**Fixed Pricing Laws**	**Investment Subsidy/ Rebate**	**Investment Credit**	**Production Subsidy**	**Production Credit**	**Grants/ Loans**
U.S. Federal						some		strong	strong
MA	strong	strong*	strong*						some
RI	strong	strong*	strong*		some	some			some
NJ	strong	strong*			some				strong
DE	strong	strong*							some
E.U.	strong	strong							
Denmark	strong	strong	strong	strong		some	some		some
U.K.	strong	strong	strong						some

blank boxes= no policies or financial incentives offered for offshore wind energy under this mechanism
some = few or limited policies or financial incentives present supporting offshore wind energy under this mechanism
strong = many or substantial policies or financial incentives present supporting offshore wind energy under this mechanism
• as a result of policy or programs to begin in the near future

[1] For a more in-depth comparison, see *Ch. V Government Incentives, Table 9. Summary of Incentives Offered Within the United States, Denmark, and the United Kingdom.*

Question 3: How do the incentives provided in the United States compare internationally with those provided by Denmark and the United Kingdom, countries with very strong offshore wind energy industries?

When comparing the strategies used within the U.S. to Denmark and the United Kingdom, the lack of federal promotional policies and long-term commitment to developing the industry is most evident (see Table 12). The government of Denmark has provided steady political support for offshore wind energy since the early 1990s, and over time developed a clear, concise regulatory process. In addition, under a government facilitated tendering system and offshore planning/mapping process, industry growth has been encouraged while also being controlled. The financial incentive created by a feed-in tariff has also been instrumental in the growth of Denmark's offshore wind energy industry. Feed-in tariff systems, while effective at ensuring developer profitability, often result in higher rates for consumers.

To the contrary, the United Kingdom, which started out with a fixed pricing system under the Non-Fossil Fuel Obligation, abandoned this financial incentive (along with the risk of rising consumer rates) for promotional policies, and in the end was still able to rapidly grow its offshore wind energy industry. Through an ambitious Renewable Obligation, tendering system, and expedited review process the United Kingdom has been able to effectively use promotional policies to create a growing market for offshore wind energy. Environmental taxes on fossil fuel use have also helped to incorporate environmental degradation into the cost of conventional power generation and level competition between technologies. The one financial incentive offered by the United Kingdom, the Capital Grant Scheme, addresses the issue of high upfront capital costs, though these grants were not utilized by all offshore wind energy projects presumably because financing could be obtained as a result of the market demand created under the promotional policies.

Of course, supplementing both of these national strategies to promote offshore wind the E.U. has also employed a strong commitment to reducing emissions, increasing renewable energy use, and coordinating offshore wind energy initiatives across member states. The creation of such a favorable political climate has undoubtedly helped the European offshore wind energy industry expand so quickly, and provides an important lesson to the United States.

Overall, one lesson that can be learned from the example of Denmark and the United Kingdom is that there is more than one way to support an offshore wind energy industry. Denmark focused its promotional strategy on controlling the price of offshore wind energy, ensuring its profitability. The United Kingdom focused instead on mandating renewable energy production under a renewable obligation system. The growth of offshore wind energy in both of these countries, suggests that both promotional strategies can be effective. Common to both countries, though, was a clear regulatory process, combined with a tendering system to efficiently allocate offshore leases, and an overarching climate change policy that internalizes the externalities associated with competing energy sources. Furthermore, coordination between countries has helped to facilitate quick expansion in Europe of the offshore wind energy industry.

Question 4: What additional incentives might be needed in the United States to encourage the development of offshore wind power?

From these European examples it is evident that on the federal level, the U.S. lacks strong political commitment and effective promotional policies. Financial incentives have played the central role in encouraging renewable energy development on the federal level, though the duration of those incentives, especially during tough economic times remains questionable and ultimately undermines their influence. In the long-run, promotional policies that encourage cost reductions in offshore wind power, such as a system of competitive tendering of lease areas, will add to the technologies cost competitiveness and lower the overall cost to society. Federal promotional policies, in the form of a national renewable quota, a tendering system that provides an expedited review process, or an environmental tax system would dramatically increase the demand for renewable energy, facilitate responsible development of the industry, and level the competition among clean energy generation and fossil fuels. While the implementation of an additional tax on energy companies seems politically unlikely, a national RPS and tendering system remains possible. National RPS targets can also facilitate more long-term power purchase agreements from utilities, which aid in financing agreements and help to reduce challenges associated with high capital costs. MMS has outlined a possible tendering process within their recently released final rules, however, the delay in finalizing those rules created a major roadblock to the industry's development. With formal regulations now in place and support from the current administration, these advancements in federal policy can begin to take place.

At the state level, Northeast/Mid-Atlantic states have done much to promote offshore wind energy development. Some states such as Rhode Island and New Jersey have given special attention to offshore wind energy, thus creating the most favorable political environment, while Massachusetts and Delaware offer more generic renewable energy incentives. Because it is difficult for states to offer meaningful financial incentives from a limited system benefit fund, strong promotional policies currently appear to be the best option for states within the region. Regional promotional policies can also help to spur larger federal policies.

While the MMS has begun to initiate interagency coordination, through the signing of multiple MOUs with different departments, federal/state coordination is also needed. Given the federal system of government in the United States, federal/state coordination can help streamline the approval process through the use of joint reviews or permitting. Federal/state coordination would also make it possible to provide the most effective mix of promotional instruments. Clearly, the federal government has a greater capacity to offer financial incentives on a scale useful to offshore wind energy projects, and the states have already implemented a number of promotional policies, combining them more effectively could synergize the impact of both strategies. Further investigation into how federal and state promotional instruments could be complementarily designed to increase their success would be helpful in determining how best to support a U.S. offshore wind energy industry.

In summary, this study has shown that if the U.S. is to harness the vast offshore wind energy potential off the Northeast/Mid-Atlantic coasts, changes in federal policy are necessary. Foremost, political commitment for the industry needs to be solidified and the regulatory framework needs to be fully finalized. A national RPS would increase power purchase agreements between new projects and utility companies, and indirectly help project financing. As seen in the United Kingdom, the use of a tendering system by MMS could result in a rapid growth of the industry. In all, the U.S. has the potential to become an industry leader in offshore wind energy, though it remains to be seen if there will be enough governmental support for this new clean energy industry.

APPENDIX A - List of Acronyms

AEAUP- Alternative Energy and Alternate Use Program
AWEA- American Wind Energy Association
CAOWEE- Concerted Action on Offshore Wind Energy in Europe
CREB- Clean Renewable Energy Bonds
CRMC- Rhode Island Coastal Resources Management Council
CWA- Clean Water Act
CZMA- Coastal Zone Management Act
DEIS- Draft Environmental Impact Statement
DOE- U.S. Department of Energy
DOI- U.S. Department of Interior
DSIRE- Database of State Incentives for Renewables and Efficiency
DTI- United Kingdom Department of Trade and Industry
EIA- Energy Information Administration
EIS- Environmental Impact Statement
EPA- Environmental Protection Agency
EU- European Union
EUROPA- European Commission
EWEA- European Wind Energy Association
FERC- Federal Energy Regulatory Commission
GW- Giga-watt
kWh- Kilo-watt Hour
MACRS- Modified Accelerated Cost-Recovery System
MMS- Mineral Management Service
MOU- Memorandum of Understanding
MW- Mega-watt
MWh- Mega-watt hour
NEPA- National Environmental Policy Act
NFFO- Non-Fossil Fuel Obligation
NJBPU- New Jersey Board of Public Utilities
NREL- National Renewable Energy Laboratory
O&M- Operations and Maintenance
OCS- Outer Continental Shelf
OCSLA- Outer Continental Shelf Lands Act
PPA- Power Purchase Agreement
PURPA- Public Utility Regulatory Policy Act
PTC- Production Tax Credit
REC- Renewable Energy Certificate
RGGI- Regional Greenhouse Gas Initiative
RHA- Rivers and Harbors Act
RIREF- Rhode Island Renewable Energy Fund

RO- Renewable Obligation
ROC- Renewable Obligation Certificate
RPS- Renewable Portfolio Standard
SAMP- Special Area Management Plan
UK- United Kingdom
URI- University of Rhode Island
USACE- United States Army Corps of Engineers

American Wind Energy Association (AWEA). 2008. "Fair Transmission Access for Wind: A Brief Discussion of Priority Issues." Accessed online at: http://www.awea.org/resources/ . Last accessed March, 2008.

American Wind Energy Association, 2007. "Top 20 States with Wind Energy Resource Potential." Accessed online at: http://www.awea.org/newsroom/pdf/Top_20_States_with_Wind_Energy_Potential.pdf. Last accessed October, 2008.

Amerkhail, R., 2008. "Grid Modernization and the Integration of Renewables." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

Armistead, H., 2008. "Offshore Wind- Its time has come." Presentation at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, Delaware, September 8-10, 2008.

Associated Press, 2008. "State-by-state summary of offshore wind proposals." *The Northwest Herald,* September 9, 2008. Accessed online at: http://www.nwherald.com/articles/2008/09/09/news/nation_and_world/doc48c6439e07991495096395.txt. Last accessed September, 2008.

Astolfi, P., S. Baron and M. J. Small, 2008. "Financing Renewable Energy." *Commercial Lending Review* Mar/Apr 2008: 3-8.

ATM, 2007. "Final Report RIWINDS Phase I: Wind Energy Siting Study." Accessed online at: http://www.energy.ri.gov/documents/independence1/RIWINDSReport.pdf. Last access September, 2008.

Bailey, B., 2008. "Defining the Offshore Resource." Presentation at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, Delaware, September 8-10, 2008.

Baird, S., 2008. "Carcieri vetoes key renewable-energy measure." *Providence Business News,* June 27, 2008. Accessed online at: http://www.pbn.com/stories/33132.html.

Barmann, T.C., 2008. "Carcieri vetoes renewable-energy bill." *The Providence Journal*. Saturday, June 28, 2008.

BBC World News, 2002. "Wind Farms Get Minister's Backing." *BBC World News*, November 22, 2002. Available online at: http://news.bbc.co.uk/2/hi/uk_news/england/2504581.stm. Last accessed February, 2009.

Bird, L., M. Bolinger, T. Gagliano, R. Wiser, M., Brown, B. Parsons, 2005. "Policies and Market Factors Driving Wind Power Development in the United States." *Energy Policy* 33: 1397-1407.

Black, K., 2008. "Offshore Wind Farm Developments and Scouring Effects." *Hydro International* 12(8). Accessed online at: http://www.hydro-international.com/issues/id71-October_,_Volume_,_number.html. Last accessed December, 2008.

Blue H, 2008. "Submits Deepwater Wind Energy - NOMINATION FOR LEASE." Accessed online at: http://www.bluehgroup.com/company-newsandpress-080310.php. Last accessed September, 2008.

British Wind Energy Association (BWEA), "Offshore Wind." Available online at: http://www.bwea.com/offshore/info.html. Last accessed March, 2009.

British Wind Energy Association (BWEA). "History of the NFFO." Available online at: http://www.bwea.com/ref/nffo.html. Last accessed February, 2009.

British Wind Energy Association (BWEA). "The Renewables Obligation." Available online at: http://www.bwea.com/business/roc.html. Last accessed February, 2009.

Brown, C. and P. Cassidy, 2002. "Paying for the wind: Financing issues facing the wind energy industry." *Refocus* 3(4): 60-61.

Brown, C. 2008. "Deepwater Wind: Clean Energy is Just Over the Horizon." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

Cape Wind Associates, 2008. *America's First Offshore Wind Energy on Nantucket Sound.* Accessed online at: www.capewind.org. Last accessed April, 2008.

Cassidy, P., 2008. "Wind farm caught up in legal swirl." *Cape Cod Times,* October 12, 2008.

Cassidy, P. 2008. "State siting board hears wind farm dispute." *Cape Cod Times*, November 13, 2008.

Cherry, P., Delaware Department of Natural Resources and Environmental Control, 2008. "U.S. Offshore Wind Collaborative: A Conversation Among States Advancing Offshore Wind." Presented at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, Delaware, September 8-10, 2008.

Cohen, J., 2008. "Buzzards Bay Wind Farm Plan Changed." *Cape Cod Times,* May 06, 2008. Accessed online at: http://www.capecodonline.com/apps/pbcs.dll/article?AID=/20080506/NEWS11/80506009/-1/SPECIAL01. Last accessed September, 2008.

Danish Energy Authority, 2005. *Offshore Wind Power: Danish Experiences and Solutions.* Danish Energy Authority, Copenhagen, October, 2005. Available online at: http://www.energistyrelsen.dk. Last accessed March, 2009.

Danish Wind Industry Association, 2008. "Monopile Foundations." Available online at: http://www.windpower.org/en/tour/rd/monopile.htm. Last accessed December, 2008.

Database of State Incentives for Renewables and Efficiency (DSIRE). 2008. http://www.dsireusa.org. Last accessed April, 2008.

DSIRE, 2009. U.S. Department of Treasury - Renewable Energy Grants. Available online at: http://www.dsireusa.org/library/includes/GenericIncentive.cfm?Incentive_Code=US53F&currentpageid=3&EE=1&RE=1. Last accessed March, 2009.

Department of Trade and Industry (DTI), 2007. "Study of the costs of offshore wind generation." A report to the Renewables Advisory Board & DTI. URN Number 07/779. Available online at: www.berr.gov.uk/files/file38125.pdf. Last accessed December, 2008.

DeSista, R. J., 2008. "Marine Renewable Energy: The Current State of Regulatory Affairs." Presented at the Roger Williams University School of Law, 7th Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions for Legal, Economic, and Policy Challenges. October 23-24, 2008, Bristol, Rhode Island.

Energy Information Administration (EIA). February 2006. *Annual Energy Outlook 2006*. Report No. DOE/EIA-0383.Washington, DC: EIA.

Energy Information Administration (EIA), 2008. "Federal Financial Interventions and Subsidies in Energy Markets 2007." Available online at:

http://www.eia.doe.gov/oiaf/servicerpt/subsidy2/index.html. Last accessed January, 2009.

European Commission (EUROPA), 2003. External Costs: Research results on socio-environmental damages due to electricity and transport. Available online at: http://ec.europa.eu/research/energy/pdf/externe_en.pdf. Last accessed January, 2009.

European Commission, 2009. *Kyoto Protocol*. Available online at: http://europa.eu/scadplus/glossary/kyoto_protocol_en.htm. Last accessed February, 2009.

European Commission, 2009. *Emission Trading Scheme (EU ETS)*. Available online at: http://ec.europa.eu/environment/climat/emission/implementation_en.htm. Last accessed February, 2009.

European Wind Energy Association (EWEA), 2009. Wind now leads EU power sector. Available online at: http://www.ewea.org/index.php?id=180. Last accessed February, 2009.

European Wind Energy Association, 2009. Wind now leads EU power sector. Available online at: http://www.ewea.org/index.php?id=180. Last accessed February, 2009.

European Wind Energy Association, 2005. "Support Schemes for Renewable Energy: A Comparative Analysis of Payment Mechanisms in the E.U." Available online at: www.ewea.org/fileadmin/ewea_documents/documents/projects/rexpansion/050620_ewea_report.pdf . Last accessed January, 2009.

European Wind Energy Association (EWEA). 2004. "Wind Energy- The Facts." Accessed online at: www.ewea.org/fileadmin/ewea_documents/documents/publications/WETF.pdf Last accessed March, 2008.

EWEA, 2004. " Wind Power Economics." Available online at: www.ewea.org/fileadmin/ewea_documents/documents/press_releases/factsheet_economy2.pdf. Last accessed December, 2008.

Fasig, L. B., 2003. "Wind Farmers Plow Ahead—Developers Choose Manufacturer, Reduce Number of Planned Turbines", *Providence Journal*, Jan. 22, 2003.

Firestone, J., K. Willet, A. Krueger and C. Loper, 2004. "Regulating Offshore Wind Power and Aquaculture: Messages from Land and Sea," *Cornell Journal of Law and Public Policy* 14(2004): 71-111.

Gan, L., G. S. Eskeland, and H. H. Kolshus, 2007. "Green Electricity Market Development: Lessons Learned From Europe and the U.S." *Energy Policy* 35(2007): 144-155.

German Energy Agency (DENA), 2006. "Offshore networks: The connection of offshore wind parks to the national grid." Accessed online at: www.offshorewind.de/page/fileadmin/offshore/documents/dena-Material__Factsheets_usw._/02_eng_Offshore_Grids.pdf. Last accessed December, 2008.

Hammond, J. 2008. "ACCIONA Energía, A Leader in Renewable Energy. *A Viable Marine Renewable Energy Industry: Pursuing Innovation and Reducing Lifecycle Costs.*" Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

Held, A., R. Haas, and M. Ragwitz, 2006. "On the success of policy strategies for the promotion of electricity from renewable energy sources in the EU." *Energy & Environment*, 17, 6, 849-868.

Henry, R. 2008. "RI awards offshore wind farm rights to NJ firm." *The Boston Globe.* September 25, 2008. Accessed online at: http://www.boston.com/news/local/rhode_island/articles/2008/09/25/ri_awards_offshore_wind_farm_rights_to_nj_firm/. Last accessed September, 2008.

Holt E. and L. Bird, 2005. *Emerging Markets for Renewable Energy Certificates: Opportunities and Challenges.* Technical Report by the National Renewable Energy Laboratory, NREL/TP-620-37388. Available online at: http://www.epa.gov/greenpower/gpmarket/rec.htm#rec_chart. Last accessed January, 2009.

Kempton, W., C.L., Archer, A. Dhanju, R.W. Garvine, 2007. "Large CO2 reductions via offshore wind power matched to inherent storage in energy end-uses." *Geophysical Research Letters* 34: L02817.

Kyoto Protocol to the United Nations Framework Convention on Climate Change. A vailable online at: http://unfccc.int/kyoto_protocol/items/2830.php. Last accessed February, 2009.

Lipp, J., 2007. "Lessons for effective renewable electricity policy from Denmark, Germany and the United Kingdom." *Energy Policy,* 35(2007): 5481-5495.

Lewis, J.I. and R.H. Wiser, 2006. "Fostering a renewable energy technology industry: An international comparison of wind industry policy support mechanisms." *Energy Policy* 35: 1844-1857.

MacAskill, A. 2008. "SeaEnergy Renewables." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

Manwell, J. F., 2007. Hull Offshore Wind. Renewable Energy Research Laboratory, University of Massachusetts. Accessed online at: www.mtpc.org/rebates/Owec_pdfs/HullOffshore2_24_07.pdf. Last accessed September, 2008.

Manwell, J.F., A.L. Rogers, J.G. McGowan and B.H. Bailey, 2002. . "An Offshore Wind Resource Assessment Study for New England." *Renewable Energy* 27(2): 175-187.

Maritime Journal, 2009. "EU launches maritime spatial planning workshops." Available online at: http://www.maritimejournal.com/archive101/2009/march/online_news/eu_launches_maritime_spatial_planning_workshops. Last accessed March 2009.

Martin, G.R. and O. A. Smith, 2004. "The World's Largest Wind Energy Facility in Nantucket Sound? Deficiencies in the Current Regulatory Process for Offshore Wind Energy Development." *Boston College Environmental Affairs Law Review* **31**(2004): 285-323.

Massachusetts Division of Energy Resources and Massachusetts Executive Office of Environmental Affairs, 2008. *Model Amendment to a Zoning Ordinance or By-law: Allowing Wind Facilities by Special Permit.* Available online at: http://www.mass.gov/Eoca/docs/doer/renew/model-allow-wind-by-permit.pdf. Last accessed February, 2009.

Massachusetts Technology Collaborative (MTC), 2007. *Business Expansion Initiative Solicitation (No. 2007-BEI-01).* Available online at: http://www.masstech.org/renewableenergy/BEI/index.html. Last accessed February, 2009.

Massachusetts Technology Collaborative (MTC), 2009. *Sustainable Energy Economic Development (SEED).* Available online at: http://www.masstech.org/SEED. Last accessed February, 2009.

Mineral Management Service (MMS), 2006. "Technology White Paper on Wind Energy Potential on the U.S. Outer Continental Shelf." Available online at: http://ocsenergy.anl.gov (last accessed April, 2008).

MMS, 2007. *Alternative Energy Programmatic Environmental Impact Statement-* Executive Summary. Available online at: http://www.mms.gov. Last accessed April, 2008.

MMS, 2008. Notice of Nominations Received and Proposed Limited Alternative Energy Leases on the Outer Continental Shelf (OCS) and Initiation of Coordination and Consultation. *Federal Register,* Friday, April 18, 2008, 73(76): 21152-21155.

MMS, 2008. "MMS Moving Forward With Alternative Energy Leases on the Outer Continental Shelf." Press Release, July, 23, 2008. Accessed online at: http://www.mms.gov/ooc/press/2008/press0723.htm. Last accessed September, 2008.

MMS, 2008. Press Release:"MMS Issues Record of Decision on Offshore Alternative Energy and Alternate Use Program." Accessed online at: http://www.mms.gov/ooc/press/2008/press0110.htm. Last accessed April, 2008.

MMS, 2008. "Alternative Energy and Alternate Uses of Existing Facilities on the Outer Continental Shelf." *Federal Register* 73(132): 39376-39504.

MMS, 2008. "Final Proposed Notice Outer Continental Shelf (OCS) Chukchi Sea Alaska, Oil and Gas Lease Sale 193." Available online at: www.mms.gov/alaska/cproject/Chukchi193/PNOS193/FinalProposedNotice.pdf. Last accessed January, 2009.

MMS, 2008. Cape Wind Draft Environmental Impact Statement. Accessed online at: http://www.mms.gov/offshore/AlternativeEnergy/CapeWind.htm. Last accessed April, 2008.

MMS, 2008. "MMS Extends Comment Period on Cape Wind Energy Project." Accessed online at: http://www.mms.gov/ooc/press/2008/press0305a.htm. Last Accessed April, 2008.

MMS, 2009. "Secretary Salazar Details Strategy for Comprehensive Energy Plan on U.S. Outer Continental Shelf, Provides More Time for Public Comment: Incorporates Renewable Energy." *Press Release,* February 10, 2009. Available online at: http://www.mms.gov/ooc/press/2009/press0210.htm. Last accessed March, 2009.

Moeller, J.W., 2004. "Of Credits and Quotas: Federal Tax Incentives for Renewable Resources, State Renewable Portfolio Standards, and the Evolution of Proposals for a Federal Renewable Energy Portfolio Standard." 15 *Fordham Environmental Law Review* 69. Winter 2004.

Musial, W., 2008. "Offshore Wind Technology." Presentation at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, DE, September 8-10, 2008.

Musial, W. S. Butterfield and B. Ram, 2006. "Energy from Offshore Wind." NREL/CP-500-39450 Conference paper presented at Offshore Technology Conference, Houston, TX. May 1-4, 2006.

National Oceanic and Atmospheric Administration (NOAA), 2003. *"The Coastal Management SAMP of Approval."* Available online at: http://www.csc.noaa.gov/magazine/2003/06/samp.html. Last accessed February 2009.

New Jersey Clean Energy Program, 2009. Societal Benefits Charge. Available online at: http://www.njcleanenergy.com/main/about-njcep/societal-benefits-charge/societal-benefits-charge-sbc. Last accessed February, 2009.

Nesi, T., 2008. "R.I., Deepwater sign wind-farm agreement." *Providence Business Journal*, January 8, 2009. Available online at: http://www.pbn.com/stories/37176.html. Last accessed February, 2009.

Offshore Wind Collaborative Organizing Group, 2005. *A Framework for Offshore Wind Energy Development in the United States.* Available online at: http://masstech.org/renewableenergy/owec.htm. Last accessed March, 2009.

Patriot Renewables, 2008. South Coast Offshore Wind Project. Accessed online at: http://www.southcoastwind.org/. Last accessed September 2008.

Pershing, J. and J. Mackenzie, 2006. "Chapter 6, Removing Subsidies: Leveling the Playing Field for Renewable Energy Technologies." *Renewable Energy: A global review of technologies, policies and markets.* D. Abmann, U. Laumanns and D. Uh (Editors). Earthscan Publishing, London and Sterling, VA.

Porretto, J., 2007. "Developer cites cost in nixing offshore wind farm in South Texas." *Mexia Daily News*: June 13, 2007.

Pospisil, R. 2007. "LIPA open to wind power in Master Plan despite killing offshore project on cost." *Electric Utility Week*: December 10, 2007.

Redlinger, R., P.D., Andersen and P.E. Morthorst, 2002. *Wind energy in the 21st century: economics, policy, technology, and the changing electricity industry.* Palgrave Publishing, New York, NY.

Regional Greenhouse Gase Initiative (RGGI), 2009. Available online at: http://www.rggi.org. Last accessed February, 2009.

Rhode Island Coastal Resources Management Council, 2008. "RI Ocean SAMP." Accessed online at: http://www.crmc.ri.gov/samp/ocean.html. Last accessed October, 2008.

Rhode Island Economic Development Corporation (RIDEC), 2009. *Jobs Development Act: Corporate Income Tax Reduction for Job Creation.* Available online at: http://www.riedc.com/business-services/business-incentives/corporate-income-tax-reduction-for-job-creation. Last accessed February, 2009.

Riner, B., 2007. "LIPA Unplugs Plan for Long Island Wind Farm." *Natural Gas Week*: August, 27, 2007.

Roark, T., 2008. "Offshore Wind An International Perspective." Presented at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

Robinson M. C. and W. Musial, 2006. "Offshore Wind Technology Overview." National Renewable Energy Laboratories (NREL) Report, NREL/PR-500-40462. Accessed online at: http://www.nrel.gov/docs/gen/fy07/40462.pdf. Last accessed September, 2008.

Rogers, A.L., J.F. Manwell and J.G. McGowan, 2003. "A year 2000 summary of offshore wind development in the United States," *Energy Conversion and Management* 44 (2003): 215-219.

Rogers, A.L., J.F. Manwell and J.G. McGowan, A.F., Ellis, U. Abdulwahid and A., LaCroix, 2000. "A Fresh Look at Offshore Wind Opportunities in Massachusetts," Proc. Windpower 2000, AWEA.

Sawin, J. L., 2006. "Chapter 4, National Policy Instruments: Policy Lessons for the Advancement and Diffusion of Renewable Energy Technologies Around the World." *Renewable Energy: A global review of technologies, policies and markets.* D. Abmann, U. Laumanns and D. Uh (Editors). Earthscan Publishing, London and Sterling, VA.

Shaw, S., M.J. Cremers, G. Palmers and European Wind Energy Association (EWEA), 2002. *Enabling Offshore Wind Developments.* EWEA Publishing, Brussels. Available online at: www.ewea.org. Last accessed February, 2009.

Sorenson, H.C., L.K. Hansen and J.H. Molgaard Larsen, 2002. "Middelgruden 40 MW Offshore Wind Farm Denmark-Lessons Learned." Available at: http://www.middelgrunden.dk/MG_UK/project_info/organization.htm. Last accessed February, 2009.

State of New Jersey, Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters, 2006. Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters- Final Report to Governor Jon S. Corzine. Available online at: http://www.state.nj.us/njwindpanel/. Last accessed December, 2008.

State of Rhode Island, Office of the Governor, 2008. Press Release: Carcieri Names Deepwater Wind as Developer for Rhode Island's Off-Shore Wind Farm. September 25, 2008. Accessed online at: http://www.ri.gov/press/view.php?id=7202. Last accessed September, 2008.

Stolarski, C., 2008. Presentation at Roger William's Marine Law Symposium: A Viable Marine Renewable Energy Industry: Solutions to Legal, Economic and Policy Challenges. Bristol, RI, October 23-24. Available online at: http://law.rwu.edu/sites/marineaffairs/symposia/seventhMLS.aspx. Last accessed December, 2008.

Tomsho, R., 2008. "Currents: Winds Shift in Energy Debate." *Wall Street Journal*, June 19, 2008, pg. A11.

Union of Concerned Scientists, 2007. "Renewable Energy Tax Credit Extended Again, but Risk of Boom-Bust Cycle in Wind Industry Continues." Accessed online at: http://www.ucsusa.org/clean_energy/clean_energy_policies/production-tax-credit-for-renewable-energy.html . Last accessed April, 2008.

Union of Concerned Scientists, 2008. Public Utility Regulatory Policy Act (PURPA). Accessed online at: http://www.ucsusa.org/clean_energy/solutions/big_picture_solutions/public-utility-regulatory.html. Last accessed January, 2008.

United Kingdom Department for Environment, Food and Rural Affairs, 2005. "Climate Change Agreements: the Climate Change Levy." Available online at: http://www.defra.gov.uk/environment/climatechange. Last accessed March, 2009.

United Kingdom Department of Trade and Industry, *Offshore Wind Capital Grant Scheme*. Available online at: http://www.berr.gov.uk/energy/environment/etf/offshore-wind/page45496.html/environment/etf/offshore-wind/page45496.html. Last accessed, March, 2009.

United Nations Development Programme (UNDP), 2000. *World Energy Assessment: Energy and the Challenge of Sustainability*, J. Goldemberg (Editor),World Energy Council Publication, New York.

U.S. Army Corps of Engineers, 2002. "Intent to Prepare a Draft Environmental Impact Statement (DEIS) for Proposed Cape Wind Energy Project, Nantucket Sound and Yarmouth, MA Application for Corps Section 10/404 Individual Permit." *Federal Register* 67: 4414. (Jan. 30, 2002).

United States Commission on Ocean Policy, 2004. *An Ocean Blueprint for the 21st Century.* Final Report. (Washington, D.C.).

United States Department of Energy (DOE), 2008. Office of Energy Efficiency and Renewable Energy "Wind Power Today." Accessed online at: http://www1.eere.energy.gov/windandhydro/. Last accessed March 2008.

U.S. Department of Energy, Energy Efficiency and Renewable Energy, 2008. "20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply." Accessed online at: http://www.osti.gov/bridge. Last accessed October, 2008.

U.S. Department of Energy (DOE), 2006. "Technology White Paper on Wind Energy Potential on the U.S. Outer Continental Shelf." Available online at: http://ocsenergy.anl.gov. Last accessed November, 2008.

U.S. Department of Energy (DOE), 2006, "U.S. Department of Energy to Develop Multi-megawatt Offshore Wind Turbine with General Electric," News Release, Office of Energy Efficiency and Renewable Energy, March 9. Available online at: http://www.energy.gov/news/3309.htm. Last accessed January, 2009.

U.S. Department of Energy (DOE), 2009. *Loan Guarantee Program Press Releases.* Available online at: http://www.lgprogram.energy.gov/press.html. Last accessed February, 2009.

US Offshore Wind Collaborative, 2008. "Status of U.S. Offshore Wind Development Activity by State: Public sector initiatives and responses to development proposals." Presented at the American Wind Energy Association Offshore Wind Power Workshop, Wilmington, Delaware, September 8-10, 2008.

Utzinger, T.A, 2004. "Federal Permitting Issues Relating to Offshore Wind Energy, Using the Cape Wind Project in Massachusetts as an Illustration." *Environmental Law Reporter* 34 (2004): 10794-808.

Wizelius, T., 2007. *Developing wind power projects: theory and practice.* Sterling, VA, Earthscan Publishing.

Yarano, D.A. and A. L. Mertens, 2009. American Recovery and Reinvestment Act of 2009 - Wind Energy Provisions. Available online at: http://www.fredlaw.com/articles/energy/energy_0902_day_alm.html. Last accessed March, 2009.