

RECENT DEVELOPMENT

WIND ENERGY IN TEXAS: AN ARGUMENT FOR DEVELOPING OFFSHORE WIND FARMS

I. INTRODUCTION

Because of the place of oil in Texas history, many find it surprising that Texas leads the nation in the development of wind energy. Even California, which many would suspect to lead the nation (though ranking second in the nation) does not produce half of the wind energy that Texas produces: 2,484 megawatts as compared to 5,317 megawatts of wind capacity.¹ Texas is committed to the continued development of wind energy.² In fact, the state is about to undertake a \$4.93 billion expansion of its grid system in large part to facilitate additional wind capacity.³ Capacity upgrades to the transmission grid will allow for dramatic growth of wind farms in West Texas and allow consumers to access it.⁴ That is not to say that Texas does not

1. GOVERNOR'S COMPETITIVENESS COUNCIL, 2008 TEXAS STATE ENERGY PLAN 18 fig.8 (2008), *available at* http://governor.state.tx.us/files/gcc/2008_Texas_State_Energy_Plan.pdf. "Capacity" measures the productivity of a power production facility. AM. WIND ENERGY ASSOC., WIND ENERGY BASICS, http://www.awea.org/faq/wwt_basics.html (last visited Mar. 28, 2009) ("It compares the plant's actual production over a given period of time with the amount of power the plant would have produced if it had run at full capacity for the same amount of time.") .

2. GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 49.

3. ELEC. RELIABILITY COUNCIL OF TEX., COMPETITIVE RENEWABLE ENERGY ZONES TRANSMISSION OPTIMIZATION STUDY 24 (2008) [hereinafter TRANSMISSION OPTIMIZATION STUDY].

4. GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 40. The International Energy Agency estimates that by 2030, Organizations for Economic Co-operation and Development, ("OECD") countries as a whole will need to invest \$1.8 trillion for transmission and distribution networks to support the rate of growth. INT'L ENERGY AGENCY, VARIABILITY OF WIND POWER AND OTHER RENEWABLE MANAGEMENT OPTIONS AND STRATEGIES 30 (2005), *available at* http://www.uwig.org/IEA_Report_on_variability.pdf.

have additional challenges ahead of it. Additional grid improvements and the variable supply of wind energy as the wind comes and goes limit the state's reliance on wind as an energy source.⁵ In many ways, Texas faces many of the same problems afflicting other states and nations.⁶ Texas would need to take bold action to maximize available wind energy opportunities.

Over the short term, Texas will make critical decisions about its energy infrastructure. Consider a few startling data points. Even with the dramatic growth in wind energy, the state needs 40,000 megawatts of new capacity by 2017 to satisfy growing demand and to replace aging generating capacity.⁷ As early as 2011, Texas may only have a reserve margin of five percent while the current minimum reserve margin is thirteen percent.⁸

How should Texas meet its near-term energy supply needs? The 2008 Texas State Energy Plan in fact grapples with this question, specifically assessing how the state should respond to the forecasted energy deficit. Consider some of the state's most important findings. Natural gas, the state's primary energy source, unpredictably fluctuates in price to where it cannot reliably be considered an affordable option.⁹ Coal, the least expensive energy source to develop,¹⁰ becomes expensive if the federal government regulates carbon dioxide emissions.¹¹ Texas acknowledges that wind energy is a low cost energy source, but it does not consider wind a viable source for major development

5. See GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 16 fig. 4-5. Seven percent of Texas' installed energy capacity comes from wind, but wind energy accounts for two percent of the energy consumed by Texans. *See id.* Even though production of energy varies with the speed of wind, other energy sources such as nuclear and coal power plants produce less electricity a greater percentage of the time because of shutdowns. *See generally* Adam M. Dinnell & Adam J. Russ, *The Legal Hurdles to Developing Wind Power as an Alternative Energy Source in the United States: Creative and Comparative Solutions*, 27 NW. J. INT'L & BUS. 535, 540-41 (2007).

6. Barry Rabe, *Race to the Top: The Expanding Role of U.S. State Renewable Portfolio Standards*, 7 SUSTAINABLE DEV. L & POL'Y 10, 12 (2007).

7. GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 25. Without replacing older units, the state estimates an additional 20,000 megawatts of capacity are needed to satisfy consumer demand. *Id.*

8. Patrick D. Nolan, *New Answers to Projected Electric Power Shortfalls in Texas*, THE STAR-TELEGRAM, Oct. 26, 2008, at D1. ERCOT utilizes the reserve margin electricity when demand exceeds the expected peak demand or conditions necessitate an alternative energy source. *Id.*

9. GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 26-27, 29-30 fig. 22.

10. *Id.* at 29-30 fig. 22.

11. *Id.* at 36-37 fig. 28-30. The state also considered the likelihood of new nuclear generation, but dismissed it as a viable solution for the state's near-future energy needs because of the lengthy federal permitting and construction process. *Id.* at 28-30.

because of its production variability.¹²

Some have argued that offshore wind farms can mitigate the Achilles' heel of wind energy: variability and inadequate transmission. Wind generated offshore is generally stronger, more consistent, and closer to high demand population centers than wind generated onshore.¹³ With offshore and onshore wind farms, several countries generate ten to twenty percent of their energy supply from wind.¹⁴ Because the United States has yet to build an offshore wind farm, they remain an elusive possibility.¹⁵ Consequently, even though Texas agrees offshore wind farms should be developed,¹⁶ the state continues to analyze wind energy in terms of onshore wind.¹⁷

Part II of this Recent Development outlines Texas' renewable energy regulations and the state's plans for upgrading the transmission grid. Part III describes the limitations of West Texas wind farms and the benefits of offshore wind farms. Ultimately, in Part IV, this Recent Development argues that to supply the state's future energy needs while maximizing the state's development of renewable energy, Texas should actively encourage the development of offshore wind farms.

II. TEXAS' CURRENT REGULATIONS

In 2005, the Texas Legislature passed Senate Bill 20.¹⁸ The legislation calls for 5,880 megawatts of installed renewable energy capacity by 2015.¹⁹ To implement the mandated increase in renewable energy sources, the state developed a free market system where electricity providers must obtain renewable energy in proportion to their share of the market. Under the Renewable Portfolio Standard ("RPS"), "a competitive retailer with ten percent of the Texas retail electricity sales in 2009 would be required to obtain 200 megawatts of renewable energy

12. *See id.* at 30, 36.

13. OFFSHORE WIND COLLABORATIVE ORG. GROUP, A FRAMEWORK FOR OFFSHORE WIND ENERGY DEVELOPMENT IN THE UNITED STATES 10 (2005), http://www.masstech.org/offshore/final_09_20.pdf.

14. *Id.*

15. Bent Ole Gram Mortensen, *International Experiences of Wind Energy*, 2 ENV'T'L & ENERGY L. & POL'Y J. 179, 207 (2008).

16. GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 49.

17. *See id.* at 28, 34.

18. S.B. 20, 79th Leg., 1st Spec. Sess. (Tex. 2005). The Texas Legislature established the RPS system in 1999 as part of its deregulation of the electricity industry. S.B. 7, 76th Leg., (Tex. 1999). Deregulation of the electricity market began in 1995. GOVERNORS COMPETITIVENESS COUNCIL, *supra* note 1, at 13.

19. Tex. Util. Code Ann. §39.904(a) (Vernon 2007). Renewable sources include solar, wind, geothermal, hydroelectric, tidal energy, and biomass. *Id.*

capacity.”²⁰ While the RPS system includes renewable resources other than wind energy, the primary result of the RPS has been onshore wind farm development due to the state’s enormous wind resources.²¹ By 2006, Texas had become the leader in the production of wind energy.²²

Because of the dramatic growth in the development of wind farms resulting from the RPS system, the Texas legislature in 2005 mandated that the Public Utility Commission (“PUC”) improve its transmission system to supply the new growth in wind energy.²³ These improvements would allow energy created at the rural wind farms to make its way to urban markets where energy demand is highest.²⁴ Because the grid cannot currently transport the state’s capacity for wind energy to high demand areas, the price for power in the western part of the state is occasionally negative.²⁵

In order to follow its statutory mandate to “construct or enlarge transmission . . . [to meet] the goal for generating capacity from renewable energy,”²⁶ the PUC divided the state into areas with the greatest potential for wind generation, competitive renewable energy zones (“CREZ”). For the CREZ areas, the PUC developed a plan to increase transmission capacity.²⁷ After having analyzed which areas in Texas had the highest quality of wind, the PUC designated eight geographic areas as CREZ within five zones.²⁸ In July 2008, the Electric Reliability Council of Texas (“ERCOT”) settled on a plan to coordinate transmission development with the PUC’s CREZ development.²⁹ With an estimated cost of \$4.93 billion, the

20. STATE ENERGY CONSERVATION OFFICE, TEXAS RENEWABLE PORTFOLIO STANDARD, http://www.seco.cpa.state.tx.us/re_rps-portfolio.htm (last visited Mar. 28, 2009).

21. Rabe, *supra* note 6, at 11.

22. TEX. COMPTROLLER OF PUB. ACCOUNTS, THE ENERGY REPORT 2008 160 (2008), <http://www.window.state.tx.us/specialrpt/energy/pdf/11-WindEnergy.pdf> [hereinafter THE ENERGY REPORT 2008].

23. S.B. 20, *supra* note 18.

24. TRANSMISSION OPTIMIZATION STUDY, *supra* note 3, at 38. Between January 2002 and February 2004, wind generators were paid \$11.5 million to curtail output because the system was unable to transmit the power. Lisa Chavarria, *Wind Power*, 68 TEX B. J. 823, 834 (2005).

25. GOVERNOR’S COMPETITIVENESS COUNCIL, *supra* note 1, at 40 fig. 31.

26. S.B. 20, *supra* note 18.

27. Tex. Util. Code Ann. §39.904(g)(1)-(2) (Vernon 2007). Holding true to its identity as the “Lone Star” state, unlike the rest of the country, eighty-five percent of the state is on a single power grid. GOVERNOR’S COMPETITIVENESS COUNCIL, *supra* note 1, at 13.

28. STATE ENERGY CONSERVATION OFFICE, *supra* note 20. The five zones are in Uptown County, Abilene, Sweetwater, and the Panhandle.

29. ERCOT published a study suggesting four possible system development plans.

upgraded transmission system will have a capacity of 18,456 megawatts.³⁰ The upgraded system should be operational within four to five years.³¹ Six transmission companies forming Electric Transmissions Texas, LLC (“ETT”) have put forth a proposal to build the new lines. Each of the six companies that comprise EET will develop and maintain a segment of the proposed lines.³² However, other companies want to participate in the expansion.³³

Breaking from its traditional method of allocating new transmission capacity to the incumbent service provider, PUC intends to choose providers to implement Plan Two through a competitive bidding process.³⁴ PUC is currently developing a competitive bidding process and selecting the criteria by which it will choose the transmission provider.³⁵

III. OFFSHORE WIND FARMS

The amount of energy produced, the size and location, and the aesthetic and environmental impact of offshore wind farms distinguishes them from onshore wind farms. Offshore winds are generally higher and more consistent; therefore, offshore wind farms have the potential to transmit more steady and reliable energy.³⁶ The greater the wind strength, the greater the energy produced at the least cost.³⁷ Offshore winds often exceed that of

Plan Two was chosen for implementation. TRANSMISSION OPTIMIZATION STUDY, *supra* note 3, 17-28.

30. *Id.* at 24.

31. Texas PUC Approves Wind Transmission Plan, RENEWABLE ENERGY WORLD.COM, July 24, 2008, <http://www.renewableenergyworld.com/rea/news/story?id=53138> (last visited Mar. 28, 2009) [hereinafter *PUC Approves Wind Transmission*].

32. Press Release, Elec. Transmission Tex. (Sept. 12, 2008), <http://www.ettexas.com/projects/consortium.asp> (last visited Mar. 28, 2009).

33. Eileen O’Grady, *Texas Agency Seeks Deal As Wind Expansion Slows*, THOMPSON FIN. NEWS, Oct. 9, 2008, available at <http://www.forbes.com/feeds/afx/2008/10/09/afx5529054.html>.

34. GOVERNOR’S COMPETITIVENESS COUNCIL, *supra* note 1, at 48.

35. *Id.*

36. Ronald H. Rosenberg, *Diversifying America’s Energy Future: The Future of Renewable Wind Power*, 26 VA. ENVTL. L.J. 505, 519 (2008).

37. Kamaal R. Zaidi, *Wind Energy and Its Impact in Future Environmental Policy Planning: Powering Renewable Energy in Canada and Abroad*, 11 ALB. L. ENVTL. OUTLOOK J. 198, 204 (2007) (“Generally as wind speed increases, the energy output increases from the turbine, producing more electricity.”); AM. WIND ENERGY ASS’N, THE ECONOMICS OF WIND ENERGY 1 (2005), www.awea.org/pubs/factsheets/EconomicsOfWind-Feb2005.pdf [hereinafter THE ECONOMICS OF WIND ENERGY]. Increases in wind strength and consistency raise the capacity factor. “[For] every one percent increase in capacity factor, the total energy costs from wind farms will decrease by approximate \$1.50 Mwh.” ELEC. RELIABILITY COUNCIL OF TEX., ANALYSIS OF TRANSMISSION ALTERNATIVES FOR COMPETITIVE RENEWABLE ENERGY ZONES IN TEXAS 24 (2006), http://www.ercot.com/news/presentations/2006/ATTCH_A_CREZ_Analysis_Report.pdf

onshore wind to such a degree that “the power output of two identical turbines will be approximately [fifty percent] greater for a turbine sited offshore than a turbine sited onshore.”³⁸ Also, offshore wind farms produce greater amounts of energy because offshore winds are typically less turbulent.³⁹

Wind farms benefit from economies of scale.⁴⁰ Large wind farms typically require strong, direct transmission connections. Because of the steep cost of transmission upgrades, developers have a financial incentive to build wind farms either where there is spare transmission capacity or proximity to high demand populations.⁴¹ Compared to onshore wind farms, offshore wind farms are often located closer to major population centers and produce more energy;⁴² therefore, the higher capital costs of building an offshore wind farm may be less than the dual costs of developing onshore wind farms and extensively upgrading the power grid.⁴³

Both onshore and offshore wind farms face aesthetic and environmental opposition.⁴⁴ The aesthetic effect of offshore wind farms will depend largely on the coastal landscape.⁴⁵ But, compared to onshore wind farms, offshore development is less likely to incite “not in my back yard” concerns regarding the turbines’ aesthetics.⁴⁶ Environmentalists are particularly concerned with the turbines killing migratory birds.⁴⁷ Recognition of landowners’ and environmentalists’ concerns through visual and avian exclusion areas, which reduce the turbines visual impact and protect bird flyways, could create buy-in from such groups and minimize opposition to offshore projects.

[hereinafter ANALYSIS OF TRANSMISSION ALTERNATIVES 2006].

38. Mortensen, *supra* note 15, at 207.

39. Dinnell & Russ, *supra* note 5, at 544.

40. THE ECONOMICS OF WIND ENERGY, *supra* note 39, at 2.

41. See Mortensen, *supra* note 15, at 204-05.

42. Rosenberg, *supra* note 36, at 519.

43. *Id.* at 527-28.

44. Dinnell & Russ, *supra* note 5, at 548-65.

45. Amardeep Dhanju et al., *Assessing Offshore Wind Resources: An Accessible Methodology*, 33 RENEWABLE ENERGY 55 (2007) (noting that the Cape Wind proposal in Nantucket Sound is surrounded on three sides by populated lands and is in between two shipping lanes, causing more people’s views to be affected by the wind farm than in most coastal areas).

46. Mortensen, *supra* note 15, at 191 (discussing “NIMBY” groups concerned with the aesthetic effects of wind farms in note 76).

47. *Id.* Environmentalists are not uniformly opposed to offshore wind farms. For example, Greenpeace USA, Natural Resources Defense Council, and Conservation Law Foundation openly support the Cape Wind Project off the Nantucket coast. CAPE WIND, Supporters, <http://www.capewind.org> (last visited Mar. 28, 2009).

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Although several offshore wind farms are in the development stage, the United States currently has no offshore wind farms.⁴⁹ Europe invests in offshore wind farms largely because high population density limits the development of onshore farms, whereas the United States has low population density areas with high wind speeds.⁵⁰ Consequently, onshore wind farms have been the most cost effective and practical way to develop wind energy in the United States.⁵¹

However, we are now at the tipping point in the development of wind energy.⁵² To move wind energy from an alternative to a primary energy source, wind energy development should include a stronger and less variable method of production that is located near high demand areas and generally attracts less opposition.

A. Why Texas Should Look to the Gulf of Mexico

Texas recognizes wind as a desirable low cost energy source.⁵³ Because upgrades to the transmission grid lag behind onshore wind farm development, wind energy development in Texas could stall. Offshore sites present a supplemental area for development. However, the higher capital costs should not dissuade the development of offshore wind farms, which could alleviate the state's forecasted energy deficit at a low cost to consumers. The positive externalities derived from renewable energy merit maximizing the development of wind energy.

i. Problems with Wind Energy Production in West Texas

A fertile wind source with a low population density, West Texas has enormous potential for wind generation.⁵⁴ But, recognizing the state's current and future deficiency in transmission capability, the 2008 Texas State Energy Plan

48. See Dhanju et al., *supra* note 45, at 3-4; SOJI ADELAJA & CHARLES MCKEOWN, LAND POL'Y INST., MICHIGAN'S OFFSHORE WIND POTENTIAL 3, 11 (2008).

49. See generally Press Release, TEX. GEN. LAND OFFICE, TEXAS AWARDS FIRST COMPETITIVE WIND LEASES IN THE UNITED STATES (Oct. 2, 2007); *First U.S. Sale of Offshore Wind Power Signed*, ENV'T NEWS SERV. (June 24, 2008) <http://www.ens-newswire.com/ens/jun2008/2008-06-24-092.asp> (last visited Mar. 28, 2009); Steven Mufson & Juliet Eilperin, *Offshore Farm Is Approved: Plant off Texas Coast to Be Biggest of Its Kind in U.S.*, WASH. POST, May 12, 2006, at B1 (correction 5/22/06).

50. Mortensen, *supra* note 15, at 206.

51. Dinnell & Russ, *supra* note 5, at 542.

52. See Kate Galbraith, *Texas Approves a \$4.93 Billion Wind Power Project*, NY TIMES, July 19, 2008, at B1.

53. GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 31 fig. 23.

54. Rabe, *supra* note 6, at 11.

makes the following recommendation:

The state should encourage onshore and offshore wind generation along the Texas Gulf Coast. While the development of these resources should be balanced with concerns related to migratory birds and other ecological conditions, coastal wind resources appear to have a much smaller incremental transmission need due to their proximity to the existing transmission grid, and are expected to have energy production that more closely aligns with peak demand.⁵⁵

The upgraded transmission grid will be able to support 18,456 megawatts of installed wind capacity by approximately 2014.⁵⁶ Thus, consumers will not effectively utilize major investment in West Texas wind for four to five years.⁵⁷ Upgrades to the grid infrastructure typically lag behind developed wind capacity and increased user demand.⁵⁸ The delay between wind farm development and adequate grid infrastructure has already slowed the development of wind energy.⁵⁹ For example, in August 2008, developers canceled requests to connect 200 megawatts of new wind capacity and delayed development of 120 megawatts of new wind capacity until 2009.⁶⁰

Conversely, transmission lines along the coast currently have the capacity for additional energy and are located near high demand markets.⁶¹ Even with the planned upgrades to the transmission system, West Texas wind energy will not reach the high demand energy areas in southeast Texas.⁶² Additionally, having wind sources in various locations throughout the state greatly reduces “integration costs by reducing the net volatility and the reserves required to respond to that volatility.”⁶³ Thus, the state can maximize, expedite, and reduce the cost of

55. GOVERNOR’S COMPETITIVENESS COUNCIL, *supra* note 1, at 8.

56. TRANSMISSION OPTIMIZATION STUDY, *supra* note 3, at 24.

57. *See PUC Approves Wind Transmission*, *supra* note 31.

58. Nolan, *supra* note 8, at D1; *See ANALYSIS OF TRANSMISSION ALTERNATIVES 2006*, *supra* note 39, at 53, 57.

59. *See Jim Fuquay, Wind Power is Hitting the Brakes*, FORT WORTH STAR-TELEGRAM, Nov. 17, 2008, at C1.

60. O’Grady, *supra* note 33.

61. *See ANALYSIS OF TRANSMISSION ALTERNATIVES 2006*, *supra* note 37, at 31.

62. The proposed upgrades to the transmission grid will largely direct West Texas wind energy to the Dallas/Fort Worth area without developing new pathways to direct energy to the east or southeast. *See TRANSMISSION OPTIMIZATION STUDY*, *supra* note 3, at 10-11, 24, 26-30.

63. BRENDAN KIRBY, EVALUATING TRANSMISSION COSTS AND WIND BENEFITS IN TEXAS: EXAMINING THE ERCOT CREZ TRANSMISSION STUDY 14 (2007), *available at* www.windcoalition.org.

developing renewable energy by concurrently encouraging the development of wind energy in West Texas and in the Gulf of Mexico.

ii. Benefits of Offshore Wind Energy Production

In addition to maximizing the state's development of renewable energy, offshore wind farms would supply energy during peak consumer demand periods, whereas West Texas wind often supplies energy during off-peak periods.⁶⁴ The off-peak supply of wind energy partly accounts for why only two percent of the state's energy use comes from wind energy.⁶⁵

For developers, the Texas coast is particularly well suited for the development of offshore wind farms because Texas controls the coastal waters ten miles from the shore.⁶⁶ Therefore, developers may avoid many federal regulations that have slowed the development of other offshore wind farms.⁶⁷ Because Texas lacks a wind farm permitting process, the state's regulations will not slow development either.⁶⁸

Even though offshore wind farms require a higher capital investment than onshore wind farms, development of offshore wind farms is feasible. Offshore wind projects cost between forty to seventy-five percent more than onshore wind farms.⁶⁹ However, the increased production, regularity of supply, and relative close proximity to high demand population centers may make offshore wind farms a financially prudent choice.⁷⁰

64. ANALYSIS OF TRANSMISSION ALTERNATIVES 2006, *supra* note 37, at 13, 15 fig. 7.

65. *Cf. id.* at 14; GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 16 fig. 5.

66. Brit T. Brown, *Wind Power: Generating Electricity and Lawsuits*, 28 ENERGY L.J. 489, 508 (2007). Other states control three miles of water from their shore. Mufson & Eilperin, *supra* note 49, at B1.

67. Opponents of Massachusetts's Cape Wind Project, an offshore wind farm near Nantucket and Martha's Vineyard, have used federal environmental statutes and regulations to delay the projects development. Dinnell & Russ, *supra* note 5, at 542.

68. THE ENERGY REPORT 2008, *supra* note 22, at 160. Because Texas lacks a permitting process, opponents of offshore development have fewer avenues to block development. *Cf.* Dinnell & Russ, *supra* note 5, at 545-65 (describing the state and federal legal obstacles to the development of the Cape Wind Project in Massachusetts).

69. Rosenberg, *supra* note 36, at 528. Analyzing the potential for wind farm development in the Great Lakes off Michigan, the study estimated that even small wind turbines at current market prices and without considering tax credits or other incentives for the development of renewable energy would produce revenue of over \$2 billion a year. Dhanju et al., *supra* note 45, at 9.

70. Rosenberg, *supra* note 36, at 527. The low operation costs of wind farms compensate for high capital costs. Corey Stephen Shooock, Note, *Blowing in the Wind: How A Two Tiered National Renewable Portfolio Standard, A System Benefit Fund, and Other Programs Will Reshape American Energy Investment and Reduce Fossil Fuel Externalities*, 12 FORDHAM J. CORP. & FIN. L. 1011, 1018 (2007).

iii. Positive Externalities of Wind Energy Production

There are significant positive externalities associated with wind energy that, if factored into the cost of offshore wind farms, dramatically increases the net return from their development.⁷¹ Benefits accrue from lower energy prices, a new source of revenue, and the reduction of greenhouse gases.

Increasing the diversity of the state's energy supply insulates Texas consumers from volatile price changes in other energy sources.⁷² Natural gas generates forty-nine percent of Texas's electricity. But between 1998 and 2006, natural gas prices tripled and exposed the state's vulnerability to the natural gas market.⁷³ Wind energy lowers overall energy prices because, when available, wind energy must run capacity and therefore serves to depress wholesale prices.⁷⁴ Furthermore, wind energy often sells at a low price because of the negligible production costs.⁷⁵

Wind energy not only reduces the price of energy, but also creates revenue for Texans and the state itself. The United States Department of Energy chose a coalition of Texas universities, state agencies, and private industries to test large turbine blades. Because of the research, the State anticipates turbine manufacturers will locate in Texas.⁷⁶ For every 100 megawatts of installed wind capacity, an estimated six to ten permanent operations and maintenance jobs are created.⁷⁷ Offshore wind farms raise revenue for the state because developers lease tracts of the Gulf of Mexico from the state. From a wind farm with a generation capacity of 250 to 300 megawatts, the Texas General Land Office estimated the state would receive \$433 million over the thirty-year lease period.⁷⁸

Texas also derives benefits from the clean energy wind farms provide. The National Renewable Energy Laboratory estimates that it would cost \$43 billion to install enough wind farms for the

71. Shook, *supra* note 70, at 2, 23.

72. Jeff Anthony, Am. Wind Energy Ass'n, *Clearing the Air: Wind Power and Reliability*, WINDLETTER, Feb. 2008, available at <http://www.renewableenergyworld.com>.

73. Michael Goggin, *Texas Study: Benefits of Wind Transmission Outweigh Costs*, WIND ENERGY WKLY., Apr. 4, 2008, available at <http://www.renewableenergyworld.com>.

74. GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 29-31; KIRBY, *supra* note 63, at 17-18.

75. GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 31 fig.23. ERCOT estimated that upgrading the transmission grid under Plan Two will save \$1.7 billion per year in fuel costs. Goggin, *supra* note 73.

76. THE ENERGY REPORT 2008, *supra* note 22, at 162.

77. LARRY FLOWERS, NAT'L RENEWABLE ENERGY LAB., WIND ENERGY UPDATE 22 (2008), www.windpoweringamerica.gov/pdfs/wpa/wpa_update.pdf.

78. Press Release, TEX. GEN. LAND OFFICE, *supra* note 50.

United States to generate twenty percent of its energy from wind, but reductions in emissions of greenhouse gasses and other atmospheric pollutants would create a savings of \$98 billion. When combined with an estimated \$150 billion saved from reductions in natural gas use and price pressure, the net benefit from moving to twenty percent wind energy is \$205 billion.⁷⁹ The significant residual benefits to society justify state action to increase the state's reliance on renewable energy.

iv. Need for Government Incentives

The high and uncertain capital costs impose a financial hurdle to the development of offshore wind farms. Government aid and incentives aimed towards the development of offshore wind farms needs to catalyze private investment. Economic incentives, particularly federal tax credits, spurred the development of onshore wind farms.⁸⁰ As development steadily increased, technology has improved and farm size has escalated.⁸¹ Consequently, the cost of onshore wind decreased by more than eighty percent since the 1980s.⁸² Wind is now a cost competitive energy source and the risks associated with the development of an onshore wind farm have decreased dramatically.⁸³ Texas' experience with onshore wind farms demonstrates that private markets would develop wind farms if governments provide adequate economic incentives,⁸⁴ and that, with development, wind energy increasingly becomes cost competitive.⁸⁵ Therefore, for offshore wind farms to have the same success as onshore wind farms, the state should design incentives that promote their development.

79. FLOWERS, *supra* note 77, at 66. The study estimated a seventeen percent reduction in water consumption. *Id.*

80. See RYAN WISER & MARK BOLINGER, NAT'L RENEWABLE ENERGY LAB., ANNUAL REPORT ON U.S. WIND POWER INSTALLATION, COST, AND PERFORMANCE TRENDS: 2007 4 (2007); Mortensen, *supra* note 15, at 183, 193-95.

81. Since the 1980s, the rotor diameter of a turbine has increased from ten meters to fifty meters. The increased size "yields a 55-fold increase in yearly electricity output, partly because the swept area is twenty-five times larger and partly because the tower height has increased substantially, and wind speeds increase with distance from the ground." THE ECONOMICS OF WIND ENERGY, *supra* note 37, at 2. See WISER & BOLINGER, *supra* note 80, at 12, 25.

82. JONATHON G. DORN, EARTH POL'Y INST., GLOBAL WIND POWER CAPACITY REACHES 100,000 MEGAWATTS, (2008), available at <http://www.earth-policy.org/Indicators/Wind/index.htm>.

83. See WISER & BOLINGER, *supra* note 80, at 19.

84. Rabe, *supra* note 6, at 11.

85. See WISER & BOLINGER, *supra* note 80, at 12, 25.

V. CONCLUSION

Coupled with financial incentives, the Texas Legislature could easily tailor the RPS system to develop a strong market for offshore wind farms. Currently mandating that a utility obtain renewable energy from any source, the state could alter the RPS system to require a portion of the renewable energy to come from offshore wind farms. Just as the market quickly responded to the initial RPS requirements, the energy market will largely develop offshore wind farms.⁸⁶ With the development of offshore wind farms, wind energy may be able to protect Texas from the forecasted energy deficit at a competitive, if not lower cost than natural gas or coal. Moreover, the state would reap the benefits derived from clean energy.

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86. See THE ENERGY REPORT 2008, *supra* note 22, at 176. Utility ownership can reduce the capital costs of wind facilities by as much as a third because publicly owned facilities can take advantage of lower cost debt. THE ECONOMICS OF WIND ENERGY, *supra* note 37, at 3; WISER & BOLINGER, *supra* note 81, at 14 (noting the development of a public-private partnership that utilized low-cost tax-exempt debt). However, facilities developed in Texas will likely be investor-owned because the state remains dedicated to free market ideals. See GOVERNOR'S COMPETITIVENESS COUNCIL, *supra* note 1, at 38.