The Future of Wind Energy

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I. INTRODUCTION

From time to time, energy crises draw the nation's attention. The power crisis in California in late 2000 and early 2001 is the most recent example. The 2000-2001 crisis has focused public attention on, among other issues, the role of wind energy and other renewables as a source of clean, affordable power.[1] The United States wind energy industry argues that investments in wind energy in areas with a significant wind resource can help prevent future shortages of electricity in California and elsewhere without additional long-term cost, pollution, or delay.[2]

Wind energy has matured and surpasses traditional sources of power on many technological counts.[3] Wind is now the fastest growing commercial scale energy technology in the world.[4] In 1999, wind energy surpassed nuclear energy worldwide in new generating capacity installed.[5] However, wind energy generates only a minute fraction of the world's, and less than 1% of U.S., electricity.[6]

This Essay examines the policies that have shaped the development of wind power in the United States. It argues that for wind energy to play a more significant role in the nation's energy portfolio, policies overwhelmingly aimed at fostering the development of conventional technologies, now outweighed by compelling public interests, should be overhauled to favor the development of cleaner and more reliable technologies such as wind energy.

In addition, it has been shown that the public favors such a realignment of energy policy priorities.[7] For example, in its

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1. *See generally* AMERICAN WIND ENERGY ASSOC. (AWEA), NEWS FROM AWEA, *at* http://www.awea.org/news/index.html (last visited May 12, 2001) [hereinafter NEWS FROM AWEA].

2. *See* AWEA, WIND ENERGY STANDS READY TO HELP EASE CALIFORNIA SHORTAGES, *at* http://www.awea.org/news/news001222ces.html (Dec. 22, 2000) [hereinafter WIND ENERGY STANDS READY].

3. *See generally*, Irving Mintzer et al., *The Environmental Imperative: A Driving Force in the Development and Deployment of Renewable Energy Technologies*, REPP ISSUE BRIEF NO. 1, *at* http://www.repp.org (Apr. 1996) (analyzing wind and other forms of renewable energy, compared to conventional forms of electricity generation).

4. *See* Christopher Flavin, *Wind Power Booms*, *in* VITAL SIGNS 2000: THE ENVIRONMENTAL TRENDS THAT ARE SHAPING OUR FUTURE 57 (2000).

5. *See* Dan Reicher, *Wind Powering America, Clean Energy for the 21st Century*, Powerpoint Presentation Before AWEA (May 1, 2000) (stating in 1999, 3689 MW of wind energy generating capacity and 2700 MW of nuclear energy generating capacity were installed worldwide; figures from the International Atomic Energy Agency and International Energy Agency not adjusted for capacity utilization).

6. *See* U.S. ENERGY INFORMATION ADMIN., ENERGY DATA RANKINGS, *at* http://www.eia.doe.gov/neic/rankings/rankindex.htm (last modified May 8, 2001) (noting that total net U.S. electricity generation was 3620 billion kWh in 1998).

7. *See* SUSTAINABLE ENERGY COALITION, SUSTAINABLE ENERGY POLL 1999, *at* http://csf.Colorado.edu/archive/iggg/renewable/msg00129.html (June 3, 1999) (confirming that

Thanksgiving 2000 Sunday edition, the *New York Times* ran a front page article entitled *Curse of the Wind Turns to Farmer's Blessing*.[8] A brilliant color photograph showed a young farmer half-kneeling amid corn stubble in a snow-covered field with high-tech wind turbines behind him wringing electricity from the bitter winter winds.[9] The farmer, Conrad Schardin, paid off family debts thanks to the revenue he earned for hosting the new, high-tech turbines, while continuing his traditional farming operations.[10]

The article illustrates the promise of wind energy in America today: wind energy is revitalizing the economy of rural communities from Lake Benton, Minnesota to Garrett, Pennsylvania and McCamey, Texas, by blowing cash into farmers' pockets; it can serve as a buffer for consumers and utilities against volatile natural gas and oil prices; and it responds to a preference of the U.S. public for clean energy over conventional sources.

This Essay gives an introductory update on the technology, as well as on the economic, environmental, and public health issues at stake in the development of wind energy in the United States. This Essay then looks at the state and federal policies that have shaped the U.S. wind energy industry into what it is today and the policies that may determine the extent to which this technology will be allowed to deliver on its promise.

II. WIND ENERGY'S NEW LOOK

Most Americans are still unfamiliar with utility-scale wind energy, although some Europeans routinely see utility-scale wind turbines clustered in the countryside.[11] Myths about the technology therefore

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most citizens would fund renewable energy and energy efficiency but cut funding for nuclear power and fossil fuels, and favor provisions to promote sustainable energy in electric utility restructuring); *see also* Barbara Farhar, *Energy and the Environment: The Public View*, REPP ISSUE BRIEF NO. 3, at 5, *at* http://www.repp.org (Oct. 1996) (compiling data from more than 700 polls on energy issues). Barbara Farhar found that "the pattern of preferences for using energy efficiency to decrease demand and renewables to supply energy has been consistent in the poll data for eighteen years. This is one of the strongest patterns identified in the entire data set on energy and the environment." *Id.*

8. Doug Jehl, *Curse of the Wind Turns to Farmer's Blessing*, N.Y. TIMES, Nov. 26, 2000, at A1.

9. *See id.* at A1, A32.

10. *Id.* at A1, A32; *see also* Lester R. Brown, *U.S. Farmers Double Cropping Corn and Wind Energy*, *at* http://www.worldwatch.org/chairman/issue/000607.html (June 7, 2000) (explaining the benefits to farmers of using wind energy).

11. *See* AWEA, GLOBAL WIND ENERGY MARKET REPORT, *at* http://www.awea.org/faq/global2000.html (last revised May 2001) [hereinafter MARKET REPORT]; *see also* Danish Wind Turbine Manufacturers Ass'n Website, *at* http://www.windpower.dk (last updated May 4, 2001).

abound in the United States. These often misguided perceptions may change, however, as new projects come online in a growing number of states from Washington to New York.

The prevalent design used for today's utility-scale turbines is the horizontal axis turbine. This type of turbine displays a set of feather-shaped blades, usually three, mounted atop a high tower to a unit called a nacelle. The nacelle contains the electric generator.[12] As the winds spin the blades, the blades turn a shaft. The shaft is usually connected to a gearbox which spins magnets in the generator to produce electro-magnetic pulses, as in the generators of conventional power plants.[13]

Utility-scale wind turbines tend to be large, and built for power.[14] The Zond Z-750, one of the turbines most widely used in U.S. wind projects developed in 1998 and 1999, has a tower that is 208 feet (63 meters) high, and blades 79 feet (24 meters) in length each, spanning a rotor diameter of 164 feet (50 meters).[15] In addition, Enron Wind Corporation, which manufactures these turbines, has now introduced a turbine with twice the power rating, the Enron 1.5 MW series.[16] However, as of December 2000, the largest turbines operating in the United States were 1.65 MW machines manufactured by Vestas, a Danish manufacturer, and installed in Big Spring, Texas.[17]

The larger the wind turbine, the more capable it is of generating large amounts of electricity, even though the blades will be spinning much more slowly than with smaller machines. The Z-750, mentioned above, is capable of generating 750 kilowatts (kW) at its peak output.[18] Over a year, a wind turbine typically generates about a third of its rated potential, depending on the site.[19] For example, a 1.65 MW turbine built

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Denmark generates 13% of its electricity from wind and aims to produce 50% of its electricity from renewable energy (primarily wind) by 2030.

12. *See* WIND ENERGY STANDS READY, *supra* note 2.

13. *See id.*

14. *See generally* Enron Wind Corp. Website, *at* http://www.wind.enron.com; Vestas American Wind Technology Website, *at* http://www.vestas-awt.com (last modified Aug. 6, 1999); NEG Micon Website, *at* http://www.neg-micon.com; American Wind Energy Association, *at* http://www.awea.org (last updated May 10, 2001); and the Danish Wind Turbines Manufacturers Ass'n, *supra* note 11.

15. *See generally* ENRON WIND CORP., ENRON WIND PRODUCTS, *at* http://www.wind.enron.com/products/index.html (last visited May 12, 2001) [hereinafter ENRON WIND].

16. *See id.*

17. *See* AWEA, WIND ENERGY PROJECTS THROUGHOUT THE UNITED STATES, *at* http://www.awea.org/projects/index.html (last updated Apr. 26, 2001) [hereinafter WIND ENERGY PROJECTS].

18. *See* ENRON WIND, *supra* note 15.

19. *See generally* AWEA Website, *supra* note 14.

today generates 120 times the energy, at only twenty times the cost, of a 25 kW machine built in the 1980s.[20]

These new high-tech machines feature complex electronic controls, which monitor wind speed and direction, as well as relaying information about turbine performance to computer monitors. The monitors may be located as far away as Denmark.[21]

Today's turbines are very quiet. The blades on these larger machines spin slowly, at around seventeen to thirty revolutions per minute (RPM) or less, an RPM that tends to be peaceful.[22] They are usually not heard above the sound of the wind itself. Thousands of turbines are squeezed into the San Gorgonio Pass, but tourists and residents downwind in Palm Springs would not be aware of the nearby existence of the turbines, even the older, noisier ones, if it were not for the local wind tour advertisements and the turbines' prominent position along the local highway.

Finally, the wind turbines are very reliable. Most wind projects are available 99% of the time to generate electricity, an outstanding availability record for any energy source, as turbines can be serviced one at a time while the others continue to spin and generate electricity.[23] In contrast, a nuclear or coal power plant goes off-line entirely when repairs and maintenance are needed, making many of them available for a lower percentage of the time than a wind farm. In California, for example, at the height of the energy crisis in January 2001, close to 11,000 MW of generating capacity, an amount equivalent to about a third of the power the state would need at peak demand, was out of commission for "required maintenance" or because of breakdowns.[24]

Wind turbines can be sited in dispersed clusters that feed into local transmission lines, as is the case for projects developed in Minnesota by Navitas Energy, Inc., a Minneapolis-based company, for completion in

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20. *See id.*

21. *See id.*

22. Lucy Chubb, *Pennsylvania Inherits the Wind for Power*, *at* http://www.enn.com/enn-news-archive/2000/06/06212000/windfarm_14062.asp (June 21, 2000) (writing that Arlene & Donald Decker, farmers in Pennsylvania who have four state-of-the-art 200-foot-tall wind turbines on their farm, told Environmental News Network "[the wind turbines] are clean and they are noiseless. We just love them. Everybody around here likes them as far as I know. I hope in the future that more people get them. The wind's free and it's here").

23. Information on the availability of wind turbines is posted at http://www.awea.org/faq/index.html/windturbines.

24. *See* Renee Sanchez & William Booth, *Low Reserves Forced Early Decision to Power Down*, WASH. POST, Jan. 19, 2001, at A15. The article further notes that "[a]lthough some critics have suggested that out-of-state power companies might be keeping those plants out of commission to help drive up prices, ISO Chief Operating Officer Kellan Fluckiger said that ISO inspections have turned up nothing to support those allegations."

early 2001.[25] Turbines can also be sited in greater numbers and concentration to take advantage of a windy corridor, ridge, or pass, as in California's San Gorgonio and Altamont Passes, or spread out on flat, open terrain, as along Buffalo Ridge in Minnesota and Iowa.

III. WHY DEVELOP WIND ENERGY?

A combination of factors makes wind energy an attractive source of electricity in the United States: the competitive cost of wind energy at good wind sites, the country's large, untapped wind potential, and wind energy's environmental benefits. The technology's drawback, its "intermittency," or the fact that power output varies with the force at which the wind is blowing, has proven to be more a psychological obstacle than a technical one.

A. The Competitive Cost of Wind Energy at Good Wind Sites

Wind energy is drawing attention primarily because of its competitiveness. In areas with a good wind resource, wind energy's costs are now competitive with electricity from conventional sources.

Progress in design, increase in size and reliability, and breakthroughs in electronics have dramatically brought down the costs of utility-scale wind energy, from over 35¢/kWh in 1980 to 4¢ to 6¢/kWh today.[26] A federal production tax credit, which acknowledges the benefits to the public in health and secures local energy supplies, further reduces that cost to a range of 3¢ to 5¢/kWh.[27] For example, during 2000, electricity at new projects in Iowa and Texas were contracted at less than 3¢/kWh.[28] That is considerably less than electricity from natural gas fired plants, which were running as high as 15¢ to 20¢/kWh in January 2001.[29]

Wind energy's competitiveness is even more apparent if the levelized cost of energy is used to compare it to other energy sources. Levelized costing calculates in current dollars all capital, fuel, and operating and maintenance costs associated with the plant over its lifetime and then divides that total cost by the estimated output in kWh over the lifetime of the plant. Capital costs are thus amortized over the

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25. *See generally* Navitas Energy, Inc. Website, *at* http://www.windpower.com.

26. *See* AWEA, WHAT ARE THE FACTORS IN THE COST OF ELECTRICITY FROM WIND TURBINES?, *at* http://www.awea.org/faq/cost.html (last visited May 12, 2001).

27. *See* Rev. Rul. 94-31, 1994-1 C.B. 16 (May 23, 1994).

28. *See generally* NEWS FROM AWEA, *supra* note 1.

29. *See* Jim Carlton, *As Demands for Energy Multiply, Windmill Farms Stage a Comeback*, WALL ST. J., Jan. 26, 2001, at B1.

expected power output for the life of the plant.[30] Levelized costs are the costs that should be used when selecting the least-cost technology to use in constructing a new power plant.

The following table, compiled by the American Wind Energy Association (AWEA), compares the levelized costs of major fuel types, as calculated by the California Energy Commission (CEC) in its *Energy Technology Status Report 1996*.[31] The CEC did not take into account the costs of pollution or subsidies.[32] While the levelized cost of hydro-electric, nuclear, and coal power remains about the same, the cost of natural gas has increased considerably since then, so that the levelized cost of natural gas would now be considerably higher.[33]

Fuel	*Cost of New Capacity (cents/kWh)*
Coal	4.6-5.5
Gas	3.9-4.4
Hydro	5.1-11.3
Biomass	5.8-11.8
Nuclear	11.1-14.5
Wind (without PTC)	4.0-6.0
Wind (with PTC)	3.3-5.3

A study in Iowa found that investments in wind energy to meet 10% of the state's demand would save Iowa electric customers over $300 million over a twenty-five-year period.[34] However, the study did not take into account environmental benefits, such as reduced pollution and increased human health, or other economic benefits, such as boosting income for local farms and creating local jobs.[35]

In addition to the importance of including the cost of fuel over the long-term in the calculation of energy costs, three additional points about wind's economics should be considered when estimating its relative cost. First, the cost of wind energy is strongly affected by two factors: average

30. *See* CALIFORNIA ENERGY COMM'N (CEC), ENERGY TECHNOLOGY STATUS REPORT 1996, *available at* http://www.energy.ca.gov/etsr/index.html (1997) [hereinafter CEC STATUS REPORT].

31. *Id.* at 57. All CEC estimates are in constant dollars as of 1993, with costs "levelized over a typical lifetime (usually thirty years) beginning in 2000." *Id.* at 74 (estimating a wind cost of 4.6¢/kWh without the PTC).

32. *See id.*

33. *See* Carlton, *supra* note 29.

34. Tom Wind, *The Electric Price Impact of an RPS in Iowa*, *at* http://www.awea.org/policy/documents/oo9.pdf (May 1, 2000). The study found that the investment would result in an increase of about 30¢ per month per household for the first ten years, followed by a decrease of 66¢ per month for the following fifteen years. The calculations were made before the steep rise in the price of natural gas at the end of 2000.

35. *See* WIND ENERGY STANDS READY, *supra* note 2.

wind speed and interest rates. "Since the energy that the wind contains is a function of the cube of its speed, small differences in average winds from site to site mean large differences in production and, therefore, in cost."[36] Also, wind is a capital-intensive technology; there is no fuel cost for a wind plant, so most of its cost comes from the "capital required for equipment manufacturing and plant construction."[37] This in turn means that wind's economics are highly sensitive to the interest rate charged on that capital. One study found that if wind plants were financed on the same terms as gas plants, their cost would drop by nearly 40%.[38] However, the higher rate of interest charged for many wind energy projects seems to reflect a perception by investors that wind projects are more risky than other forms of power generation.

Second,

> the cost of wind energy is dropping faster than the cost of conventional generation. While the cost of a new gas plant has fallen by about one-third over the past decade, the cost of wind has dropped by fifteen percent with each doubling of installed capacity worldwide, and capacity has doubled three times during the 1990s. Wind power today costs only about one-fifth as much as in the mid-1980s, and its cost is expected to decline by another 35-40% by 2006.[39]

Third, when "environmental costs [are] included in the calculation of the costs of electricity generation, wind energy's competitiveness" increases even further, as wind energy's few environmental costs pale in comparison to those associated with conventional forms of electricity generation.[40] Wind energy generates no emissions, so there is no damage to the environment or public health from emissions of sulfur dioxide, nitrogen oxide, carbon dioxide, particulate matter, mercury, and other toxic heavy metals, all of which are associated with the production of electricity from fossil-fueled power plants.[41] Additionally, wind energy also avoids the environmental costs of mining (including for uranium) or drilling, processing, and shipping the fuel.[42] There is no heavy use of

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36. *Id.*
37. *Id.*
38. Ryan Wiser & Edward Kahn, *Alternative Windpower Ownership Structures: Financing Terms and Project Costs* (Lawrence Berkeley Laboratory ed., May 1996).
39. AWEA, THE COMPARATIVE COST OF WIND AND OTHER ENERGY SOURCES, *at* http://www.awea.org/pubs/factsheets.html (last updated Mar. 6, 2001).
40. RICHARD OTTINGER ET AL., ENVIRONMENTAL COSTS OF ELECTRICITY 26 (1991).
41. *See generally* AWEA, WIND ENERGY FACT SHEETS, *at* http://www.awea.org/pubs/factsheets.html (last updated Mar. 6, 2001) (providing information on the comparative impacts of wind and other energy sources on wildlife and on comparative air emissions of wind and other energy sources); AWEA, MOST FREQUENTLY ASKED QUESTIONS ABOUT WIND ENERGY, *at* http://www.awea.org/pubs/factsheets/FAQ/1999.pdf (1999).
42. *See id.*

water to cool generators.[43] Wind energy's only "footprint" is from the manufacturing and installation of the turbines, which requires no more cement, metal, wiring, or even land per kWh than conventional electricity generation.[44] Conventional electricity generation requires land not only for the power plant itself, but also for mining and transport of fuel, for storage of radioactive and other wastes, or for flooding of rivers behind a dam.[45] Wind turbines, on the other hand, operate while causing little to no disruption to previously existing land use. It takes energy to make energy, and wind energy is more cost-effective on that count than coal or nuclear power plants, which must consume large amounts of electricity in order to mine, transport, and process fuel, as well as to run reactors, generators, and cooling stations. Wind energy uses energy only to build and maintain the turbines and towers.[46]

B. Untapped Wind Energy Potential in the United States: Three Times Total United States Demand

The wind energy potential of the United States is very large, and remains untapped. A federal study places the amount of electricity that could be generated from wind in the United States at 10,777 billion kWh.[47] That is more than the amount of electricity that would be needed to power the entire country, which in 1998, was 3620 billion kWh.[48] The top ten states for wind energy potential are North Dakota, which alone has an estimated annual potential of 1210 billion kWh, Texas, Kansas, South Dakota, Montana, Nebraska, Wyoming, Oklahoma, Minnesota and Iowa.[49] California, the state with the largest amount of wind energy generating capacity installed today, ranks seventeenth in wind energy potential and could generate a total of 59 billion kWh per year, according to the study.[50]

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43. *See id.*
44. *See id.*
45. *See generally* World Commission on Dams Website, *at* http://www.dams.org.
46. Scott White, Energy Balance and Lifetime Emissions from Fusion, Fission and Coal Generated Electricity (1995) (unpublished M.S. thesis, University of Wisconsin-Madison) (on file with author). The study uses one consistent method to evaluate the energy payback of different energy sources. Midwestern wind farms were found to generate between seventeen and thirty-nine times as much energy as they consume, while coal generates eleven times and nuclear energy sixteen times as much.
47. *Id.*
48. *See generally* U.S. ENERGY INFO. ADMIN., *supra* note 6 (discussing U.S. electricity consumption and generation).
49. *See* AWEA, WIND ENERGY: AN UNTAPPED RESOURCE, *at* http://www.awea.org/pubs/factsheets.html (last updated Feb. 22, 2001).
50. *See id.*

These figures show that wind energy could easily play a much larger role in the United States' energy portfolio—much larger in any case than the 5.5 billion kWh, or 0.2%, that it generates today.[51] The study also shows that many states have an excellent wind resource.[52] New projects in upstate New York, Pennsylvania, West Virginia, Oregon, and Washington, among others, are proof that some investors and utilities are beginning to recognize that fact.[53]

C. *Wind Energy's Environmental and Human Health Benefits*

The environmental and public health issues at stake in the development of wind energy in the United States are not negligible. Power plants are responsible for about three-fourths of the sulfur dioxide emitted in the nation, one third of carbon dioxide and nitrogen oxide emissions, and one-fourth of the particulate matter and toxic heavy metals such as lead and mercury released into the nation's environment.[54] These figures show the serious public health and environmental impacts from conventional energy plants.

In May 2000, the Harvard School of Public Health released a study estimating that two coal-fired power plants in Massachusetts were responsible for an estimated 43,000 asthma attacks, 1710 emergency room visits, and 159 deaths per year.[55] The study looked at emissions of particulate matter and other criteria pollutants and their dispersion patterns, using a damage model developed at the school.[56] The study also estimated that by reducing current emissions to the lower levels that would be reached by using the best available control technologies required for newer power plants under the 1990 Clean Air Act (CAA), from these two plants alone, an estimated 124 premature deaths would be averted per year, along with 1300 fewer emergency room visits, and 34,000 fewer asthma attacks.[57] Such data increases concerns among investors about liability risks and insurance costs of older, coal-fired, power plants, even if regulators do not require further clean-up.

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51. *See* U.S. ENERGY INFO. ADMIN., *supra* note 6. For electricity generation from wind, see generally AWEA Website, *supra* note 14.

52. *See* NAT'L RENEWABLE ENERGY LABORATORY, WIND ENERGY RESOURCE ATLAS OF THE UNITED STATES, *at* http://www.nrel.gov/wind/pubs/atlas (last visited May 11, 2001).

53. *See generally* AWEA Website, *supra* note 14.

54. *See generally* U.S. ENERGY INFO. ADMIN., *supra* note 6; United States Environmental Protection Agency Website, *at* http://www.epa.gov.

55. JONATHAN LEVY & JOHN D. SPENGLER, HARVARD SCHOOL OF PUBLIC HEALTH, ESTIMATED PUBLIC HEALTH IMPACTS OF CRITERIA POLLUTANT AIR EMISSIONS FROM THE SALEM HARBOR AND BRAYTON POINT POWER PLANTS (May 2000), *available at* http://www.hsph.harvard.edu/papers/plant/plant.pdf.

56. *See id.* at 3.

57. *Id.* at 6.

The Harvard study is one dramatic example of the public health impacts of pollution from power plants, but the range of impacts is much larger. A comprehensive list would include, but not be limited to, damage to forests, lakes, rivers, and buildings from acid rain; damage to wildlife and loss of habitat from strip and mountaintop mining for coal and mining for uranium; drilling and transport of oil, natural gas, and associated risks of spills, leaks, and fires; damming of rivers, and intakes from rivers, to cool reactors; and damage to human and wildlife reproductive systems from toxic metals such as mercury.[58]

As the nation faces the need for more power, it can turn to wind energy and new wind farms to help prevent further damage to air quality, human health, and ecosystems.[59] The following statistics[60] show the extent of the emissions that can be offset or prevented if wind energy is selected over fossil fuel generation: for carbon dioxide (CO_2), the leading greenhouse gas associated with global warming, comparative emissions during electricity generation are as follows:

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58. *See generally* NAT'L RESEARCH COUNCIL, NAT'L ACAD. OF SCI., TOXICOLOGICAL EFFECTS OF METHYLMERCURY (2000) (discussing dangerous effects of mercury). The National Academy of Science (NAS) study, requested by Congress, established that power plants that burn fossil fuels, particularly coal, generate the greatest amount of mercury emissions, which, once deposited in lakes, rivers, and oceans, is converted to methylmercury. *Id.* at 13-14. Humans are exposed to the chemical when they eat fish. *Id.* at 42. Fetuses are particularly vulnerable to methylmercury because of their rapid brain development, and some may currently be receiving exposures at levels that cause observable adverse neurological effects, according to the NAS. *Id.* at 162-63. Mercury emissions also pose a reproductive hazard to aquatic wildlife including frogs, rainbow trout, ducks, loons, and terns. *See* NAT'L WILDLIFE FED'N, MERCURY: IMPACTS ON WILDLIFE, *at* http://www.nwf.org/cleantherain/hginwildlife.html (last visited May 11, 2001).

59. Wind energy, just like any other form of electricity generation, is not without its own environmental impact. That impact, potential harm to birds, has been highly publicized because of the deaths of federally protected golden eagles in the Altamont Pass in California, an area where several thousand turbines are concentrated. Other sites in California and wind farms elsewhere in the nation have not caused similar harm to protected species. Wind farm sites today are carefully evaluated for potential impacts on birds, and the farms are monitored during operation. Avian collisions at most sites are few in number and pose no threat to the populations of the species involved. Another potential concern is the visual impact of wind turbines—a concern frequently voiced by the public prior to the installation of a wind farm. When the turbines are up and operating, however, residents and visitors often find that the clean silhouette of wind turbines and their slowly turning blades is a peaceful and reassuring sight. Some farmers who have new wind turbines on their land in Pennsylvania find the turbines almost mystical. *See* Rick Steelhammer, *Winds of Change: Modern Clean PowerSource Popular in Pa., Coming Soon to Tucket County*, CHARLESTON GAZETTE, Dec. 17, 2000, at 1A.

60. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY REVIEW 1998, *at* http://www.eia.doe.gov/aer (July 1999) [hereinafter ANNUAL ENERGY REVIEW]. The numbers for kWh generated and emissions for coal, natural gas, and oil are based on U.S. electric utility generation. The numbers for kWh generated and emissions for "U.S. Average Fuel Mix" are the totals for all U.S. generation.

Fuel	CO_2 Emitted Per Kilowatt-hour (kWh) Generated (in pounds)	KWh Generated, 1997 (billions)	CO_2 Emitted, Total Generation (billion pounds)
Coal	2.13	1804	3842
Natural Gas	1.03	283.6	292
Oil	1.56	77.8	121
U.S. (Average Fuel Mix)	1.52	3494	5312
Wind	—0—	3.5	—0—

For sulfur dioxide (SO_2), the leading precursor of acid rain:

Fuel	SO_2 Emitted Per Kilowatt-hour (kWh) Generated (in pounds)	KWh Generated, 1997 (billions)	SO_2 Emitted, Total Generation (million pounds)
Coal	0.0134	1804	24,173
Natural Gas	0.000007	283.6	2
Oil	0.0112	77.8	871
U.S. (Average Fuel Mix)	0.0080	3,494	27,952
Wind	—0—	3.5	—0—

For nitrogen oxides (NO_x), another acid rain precursor and the leading component of smog:

Fuel	NO_x Emitted Per Kilowatt-hour (kWh) Generated (in pounds)	KWh Generated, 1997 (billions)	NO_x Emitted, Total Generation (million pounds)
Coal	0.0076	1804	13,710
Natural Gas	0.0018	283.6	510
Oil	0.0021	77.8	163
U.S. (Average Fuel Mix)	0.0049	3,494	17,120
Wind	—0—	3.5	—0—

A single 750-kilowatt wind turbine, operated for one year at a site with Class 4 wind speeds (winds averaging 12.5 to 13.4 mph at 10 meters height), can be expected to displace a total of 2,697,175 pounds of carbon dioxide, 14,172 pounds of sulfur dioxide, and 8688 pounds of nitrogen oxides, based on the U.S. average utility generation fuel mix.

So, with such competitiveness, untapped potential, and clear environmental benefits, why has wind energy not been developed at a higher rate? Part of the answer lies in the reluctance of utilities and power generators to invest in a form of generation that is intermittent and has a low capacity factor.[61] Examples from European countries show that there is no technical downside to wind energy's intermittency. Wind turbines provide between 10% and 20% of the electricity used in Denmark and certain regions of Germany and Spain, without causing reliability problems, and probably can provide an even larger proportion with greater annual investments.[62] Moreover, the low capacity factor is not considered a problem in Europe, where every additional source of electricity counts.[63] The efficiency with which wind turbines operate, in the sense that they are not using up fuel or generating emissions, largely makes up for the fact that they generate less than they could or stand idle when the winds are not propitious. As more wind projects are developed in the United States and the public becomes more aware of the technology's potential, investors may again consider wind energy when evaluating investments in new power plants.

Up until now, however, the development of wind power in the United States has largely followed policy. The pattern of the development of wind energy in the United States suggests that federal and state policies can have a strong impact on the development of wind energy. The specific provisions of a policy and implementing regulations often spell success or failure in the achievement of the policy's intended goal. The Clean Air Act (CAA), at the federal level, and the Renewable Portfolio Standard, at the state level, as well as other policies, provide cases in point.

IV. FEDERAL POLICY DIRECTLY AFFECTING WIND ENERGY

A. *The Clean Air Act*

The CAA, enacted in 1970, sought to establish a comprehensive statute and regulatory framework to curb air pollution.[64] The CAA was amended in 1977, and again in 1990.[65] Looking at patterns of electricity generation over the period from 1970 to the present, the CAA's enactment does not correlate with the development of wind energy

61. Capacity factor compares a power plant's actual production over a given amount 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. A capacity of 35% is typical for wind turbines; for conventional plants it ranges from 40% to 80%.

62. *See* Flavin, *supra* note 4, at 56.

63. *See generally* AWEA, WIND ENERGY OUTLOOK 2000, *at* http://www.awea.org/outlook2000/index.html (2000) (describing wind energy's growth and potential worldwide).

64. *See generally* Murray Tabb, *Twenty-five Years of the Clean Air Act in Perspective*, NATURAL RESOURCES AND THE ENVIRONMENT 13 (American Bar Association ed., Fall 1995).

65. *See id.* at 15-16.

nationwide. For example, the growth of wind energy in California was triggered by an aggressive state policy, while states with a much larger wind energy potential have yet to begin to tap that resource.[66] Nor does the enactment of the CAA correlate with decreased use in the most polluting electricity generating technology, namely coal, which continues to be a leading cause of atmospheric pollution, even as the levels of certain pollutants have been successfully capped under the statute.[67]

The main reason for the continued high use and low price of electricity produced from coal in the United States is that the older power plants remain exempt from the performance standards applied to the new power generators regarding regulated pollutants. These exemptions, and the fact that some emissions have remained unregulated altogether until now, undercut the basis for fair competition between electricity sources, whether utilities enter into long-term contracts with power generators or purchase electricity from competing generators in the context of restructured electricity markets.

Moreover, renewable energy sources have not clearly benefited from the CAA's credit trading mechanisms. The CAA amendments of 1990 rely heavily on emissions trading, marketable permits, early reduction credits, and other market-based mechanisms to achieve its air-pollution control goals.[68] These mechanisms are designed to give industry greater flexibility in complying with the air pollution standards and allow industry to reduce pollution where the cost is lowest.[69] Although the increase in costs to polluting generators should, in theory, make wind energy economically more attractive, wind and other renewable energy projects do not benefit from the trade in pollution credits.[70]

The reason is that, while details in the mechanisms vary, credits are typically allocated according to formulas based on fuel inputs.[71] For example, if the currency used in a cap-and-trade system is an "allowance" after the cap is set, allowances are allocated to emissions sources on an annual basis.[72] Under the CAA acid rain provisions, a power plant in Ohio may thus be allowed to emit 2000 tons of sulfur

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66. *See id.* at 19.
67. *See* ANNUAL ENERGY REVIEW, *supra* note 60. *See generally* EPA Website, *supra* note 54.
68. *See* David Wooley, *A Guide to the Clean Air Act for the Renewable Energy Community*, ISSUE BRIEF NO. 15 (Feb. 2000), *at* http://www.repp.org/articles/issuebr15/caaRen.pdf.
69. *See id.*
70. *See id.*
71. *See id.* at 15-18.
72. *See id.*

dioxide over a year, based on an emission rate (1.2 lbs/mmBtu) applied to the plant's annual power production. The larger the polluting generator, the more allowances it receives.[73] If the plant exceeds its allowed emissions, it can then purchase emissions allowances from another plant that has emitted less than its assigned allowance.[74] In contrast, wind energy and other renewables, which do not generate emissions, typically do not receive tradable allowances unless there is a specific provision in the legislation requiring an allocation. Attempts to include renewables in credit trading schemes have not been successfully designed so far.[75] The environmental attributes in this case, the contribution to emissions reductions of wind energy and other renewables, remain uncompensated even in credit markets specifically set up under the CAA to achieve a pollution reduction goal.[76]

B. The Federal Wind Energy Production Tax Credit Helps Level an Uneven Playing Field

The federal government first adopted an investment tax credit for wind energy in 1978, as part of the Energy Tax Act, one of the five bills that made up the National Energy Act of 1978.[77] The business tax credit did not apply to public utility property, so it benefited nonutility investors.[78] Combined with California's wind energy investment incentives, the credit resulted in a rush to invest in California, leading to some 1200 MW of wind energy installed in the state by 1986.[79]

By the mid-1980s, after the energy crisis had abated and the California wind rush of the 1980s had run its course, federal legislators allowed the investment credit for wind energy to expire. A federal tax incentive for wind energy was not adopted again until 1992, when legislators were careful to design it as a production, rather than an investment credit.[80]

The federal wind and closed-loop biomass energy Production Tax Credit (PTC) was included as part of Title XIX of the Energy Policy Act

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73. *See id.*

74. *See id.*

75. *See* Acid Rain Program; General Provisions and Permits, 58 Fed Reg. 3590, 3695 (Jan. 11, 1993) (codified at 40 C.F.R. pt. 73).

76. *See* Wooley, *supra* note 68. Wooley explains ways in which the cap-and-trade regulation of pollutants can be modified to allocate emission credits directly to wind and other renewables.

77. *See* Consolidated Appropriations-FY2001, Pub. L. No. 106-554, 114 Stat. 2763 (2000) [hereinafter Consolidated].

78. *See id.*

79. *See supra* Part III.A.

80. *See* Consolidated, *supra* note 77; AWEA, THE WIND ENERGY PRODUCTION TAX CREDIT: A USER'S GUIDE 32 (2000) [hereinafter USER'S GUIDE].

of 1992.[81] The credit was an acknowledgement of the role that wind energy can play in the nation's energy mix. It also served as recognition that the federal energy tax code and other government statutes are skewed in favor of conventional energy technologies.

The PTC provides a 1.5¢/kWh credit for electricity generated from wind at qualifying facilities.[82] The PTC is a business credit, and can be claimed by a taxpaying business that owns and operates an eligible wind turbine and sells the power to an unrelated party.[83] The credit can be claimed during the ten-year period beginning on the date the facility was placed in service.[84] Qualifying facilities are wind energy facilities placed in service after December 31, 1993, and before June 30, 1999.[85] In December 1999, President Clinton signed into law an extension of the tax credit allowing facilities placed in service through December 31, 2001, to qualify as well as allowing facilities that burn poultry waste to generate electricity to qualify.[86] The extension signed by President Clinton also included a provision preventing the PTC from applying to "repowering" wind plants in California under certain conditions.[87] The tax credit is adjusted for inflation every year.[88]

The passage of the PTC did not immediately result in the development of new wind farms in the United States. During the period from 1993 to 1998, U.S. wind energy generating capacity, concentrated in California, stagnated at about 1700 MW.[89] There are several reasons for this stagnation. First, bids for a full 1000 MW of new wind energy generating capacity in California under the state's Biennial Resource Plan Update (BRPU) were overturned by the Federal Energy Regulatory Commission (FERC)in 1995 upon petition by Southern California

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81. *See* USER'S GUIDE, *supra* note 80, at 1, 7.
82. *Id.* at 5.
83. *Id.*
84. *See id.* Like most credits, this is not refundable, therefore it can be used only to the extent that the holder owes other taxes; some wind energy producers do not claim all the credit they would be entitled to for that reason.
85. *See id.* at 6-7.
86. *See id.*
87. *See id.* at 19-20. The Tax Relief Extension Act of 1999 includes section 507(7), that in effect caps the price for electricity at the lower of avoided cost or stated contract price, in return for PTC eligibility for "repowering" wind plants (that is, wind plants where new wind turbines replace older ones). As California utilities do not own wind generating facilities (or any generating facilities), they cannot claim the PTC, so they sought inclusion of this provision to guarantee that they will pay a low price for electricity from repowering wind plants.
88. *See id.* at 14. The inflation adjustment factor is published every year by the Internal Revenue Service.
89. *See* AWEA, WIND POWER: U.S. INSTALLED CAPACITY (MEGAWATTS) 1981-2001, *at* http://www.awea.org/faq/instacap.html (last visited May 12, 2001).

Edison.[90] The details of this event are further discussed below. It should be noted, however, that the PTC allowed wind energy producers to bid competitively for the California contracts, at a low cost that took utilities by surprise.[91] Second, the fact remained that wind energy, while close to being competitive with conventional generating technologies due to the progress in the technology and to the PTC, was still not competitive enough to win all-source bids from utilities in the absence of policies that either created a steady assured market for renewable energy, or ensured that its environmental attributes were adequately captured and valued in the marketplace.[92]

It was only as the PTC's expiration date of June 1999 approached that it served as an accelerator for proposed projects that had been languishing in the offices of utilities in Iowa and Minnesota, and for other projects in Texas, Wyoming, Colorado, Oregon and Wisconsin.[93] Between June 1998 and June 30, 1999, the date of the expiration of the PTC, a total of more than $1 billion worth of new wind turbines were installed, bringing a total of 892 megawatts (MW) of new projects and 181 MW of repowering projects on-line.[94] Minnesota's 247 MW of new wind generating capacity resulted from a 1994 law requiring the state's largest utility to install 425 MW of wind energy by 2002 in return for the right to store nuclear waste from its power plants in the state.[95] Iowa's 240 MW of new wind energy resulted from a 1983 law requiring utilities to obtain two percent of their total electricity from renewable energy, the implementation of which had been successfully delayed by utilities.[96] Texas ranked third in the installation of new projects with 146 MW.[97] The new projects in Texas, Wyoming, Colorado, Oregon, and Wisconsin were driven not by state mandates, but mainly by growing customer demand for "green" power.[98]

A similar deceleration-acceleration effect is being felt in anticipation of the expiration of the PTC's extension on December 31, 2001. During the latter part of 1999, very few projects were proposed for

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90. *SCE Asks Federal Commission to Overturn California's BRPU*, WIND ENERGY WKLY., Jan. 16, 1995, at 1 [hereinafter *California's BRPU*].

91. *See Wind Receives Large Share of BRPU Preliminary Bid Auction*, WIND ENERGY WKLY., Dec. 20, 1993, at 1.

92. *See* WIND ENERGY PROJECTS, *supra* note 17. The clickable state-by-state map of wind projects shows date of completion of projects in those states.

93. AWEA, U.S. WIND INDUSTRY FINISHES BEST YEAR EVER BY FAR, *at* http://www.awea.org/news/wpa14.html (July 3, 1999).

94. *Id.*

95. *Id.*

96. *Id.*

97. *Id.*

98. *Id.*

construction during 2000 because it was unclear until the end of October 1999 whether the PTC would be extended or not. As a result, only 53 MW of new generating capacity were installed in 2000, mainly in New York, Pennsylvania, Minnesota, and Wyoming.[99] In 2001, however, the United States wind energy industry will set a record for new installed capacity as a total of 1500 MW of proposed projects are in the pipeline and are expected to boost total generating capacity from wind energy to 4000 MW by the end of the year.[100]

The federal wind energy PTC enjoys solid bipartisan support. A PTC extension bill was sponsored in the Senate in the 106th Congress by Senators Grassley (R-IA), Jeffords (R-VT), Conrad (D-ND), and in the House by Representatives Thomas (R-CA) and Matsui (D-CA).[101] Extension of the PTC was one of the very few specific environmental provisions included in both the Democratic and the Republican Party platforms in the 2000 Presidential elections.[102] Although the outlook for an extension appears good, the vagaries of the political process, particularly in the divided 107th Congress, are likely to prevent an extension of the PTC from being adopted early in the legislative process, thereby casting uncertainty once again upon proposals for the installation of new wind plants in 2002.

Forbes Magazine is of the opinion that wind energy in the U.S. market "would still be a loser but for the federal subsidy of 1.5 cents per kWh in the form of a tax credit given since 1994."[103] There is no doubt that the PTC enhances wind energy's competitiveness. But such critics of the wind energy federal subsidy fail to note that other forms of electricity generation have received generous taxpayer support over the years, and still do today even though they are mature energy technologies. In fact, wind energy has delivered swift, high returns on the taxpayer dollars that have supported its development.[104] For example, cumulative subsidies for nuclear, wind, photovoltaic, and solar thermal energy totaled almost $151 billion from 1943 to 1999.[105] Of that

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99. *See* AWEA, GLOBAL SURVEY FINDS WIND ENERGY'S EXPLOSIVE EXPANSION CONTINUING, *at* http://www.awea.org/news/news010209.html (Feb. 9, 2001) (explaining why so little new generating capacity was installed in the United States while growth continued worldwide).

100. *See id.* (including projections for 2001).

101. S. 414, 106th Cong. (2000); H.R. 750, 106th Cong. (2000).

102. Christine Real de Azua, *Texas Wind Rush*, RENEWABLE ENERGY WORLD 34 (Jan.-Feb. 2001).

103. David Armstrong, *Blow Hard Wind-generated Power Is Back: Will It Make Money This Time Around?*, FORBES, Jan. 2001, at 217.

104. *See* Marshall Goldberg, *Federal Energy Subsidies: Not All Technologies Are Created Equal*, REPP RESEARCH REPORT NO. 11 (July 2000), *at* http://www.repp.org.

105. *Id.*

amount, $145.4 billion, amounting to over 96%, supported nuclear energy.[106] Yet, as the California Energy Commission Energy Technology Status Report shows, the levelized cost of nuclear energy remains at 11¢ to 14¢/kWh, more than twice that of wind energy today.[107]

C. *Accelerated Depreciation*

In order to cushion the impact of the recession, the federal government enacted the Economic Recovery Tax Act in 1981. This act allows most capital investment to qualify for accelerated depreciation under the Accelerated Cost Recovery System for personal and business income tax purposes.[108] Although it is not specifically targeted to wind energy, accelerated depreciation makes the economics of a capital-intensive technology like wind more favorable. Some members of Congress supported a targeted application of accelerated depreciation, to investments in renewable energy, upgrades beyond minimal environmental performance standards, and in areas of high unemployment.[109]

D. *The Public Utility Regulatory Policies Act of 1978: Not As Effective As Intended*

The Public Utility Regulatory Policies Act (PURPA)[110] was enacted by Congress as part of the 1978 National Energy Act, which itself was enacted in response to the energy crisis triggered by spiraling oil prices.[111] PURPA was designed to encourage the development of independent electric producers to reduce dependence on foreign fuel sources and ensure energy security through greater diversity, as well as through the development of renewable energy sources.[112] PURPA broke the utility monopoly over power generation by establishing a framework allowing independent power producers to sell their electricity and by establishing the conditions under which utilities were required to purchase that electricity.[113] Prior to the enactment of PURPA, purchase

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106. *Id.*
107. *See* CEC STATUS REPORT, *supra* note 30.
108. *See* 26 U.S.C. § 168 (1994).
109. H.R. 3, 97th Cong. (1981).
110. 16 U.S.C. § 824 (1994).
111. Thomas Starrs, *Legislative Incentives and Energy Technologies: Government's Role in the Development of the California Wind Energy Industry*, 15 ECOLOGY L.Q., 103, 103-04 (1998).
112. AWEA, PURPA HANDBOOK FOR INDEPENDENT ELECTRIC POWER PRODUCERS 5 (1992) [hereinafter PURPA HANDBOOK].
113. *See id.*

of power from an independent producer was at the discretion of the utility.[114]

PURPA encourages two types of energy producers, or "qualifying facilities" (QF): (1) cogenerators, which are steam-producing plants that use the excess heat created from generating electricity to power an on-site industrial process; and (2) small power producers, which generate electricity from one or any combination of renewable resources including wind, solar, biomass, geothermal, hydro, and waste.[115]

According to section 201 of PURPA, size, fuel use, and ownership determine which small power producers "qualify."[116] Size was originally limited to 80 MW, but Congress temporarily removed that size limit for wind, solar, geothermal, and waste projects temporarily for QFs installed before 2000.[117] A QF is allowed to generate power using nonqualifying sources, such as coal or natural gas, for up to 25% of the energy produced.[118] This provision was intended to allow QFs to use such fuels to "firm up" their renewable resources, which could as in the case of wind, be intermittent.[119] "However, despite clear language in the regulations implementing PURPA, FERC [has interpreted this provision] to deny use of nonqualifying fuels to firm up generation except in the case of solar thermal energy."[120] In addition, "[n]o electric utility, utility holding company, or utility subsidiary can own more than a 50% interest in a QF."[121]

Section 210 of PURPA established the rules under which QFs can operate and sell electricity to utilities. It requires FERC to establish rules under which electric utilities are required to interconnect with QFs.[122] The intent of PURPA's interconnection requirement is to ensure that a QF can request and receive a connection with any rural electric cooperative, municipal utility, investor-owned utility, or federal power marketing agency.[123] This was to avoid the possibility that a utility may discriminate against potential competitors by refusing an interconnection.

Section 210 of PURPA also requires FERC to set standards for the state regulatory commissions to use in determining the rates that utilities

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114. *Id.*
115. *See* 16 U.S.C. § 824a-3.
116. *See* 16 U.S.C. § 796(17)(C)(D).
117. *See* PURPA HANDBOOK, *supra* note 112, at 5.
118. *See id.* at 5-6.
119. *Id.* at 6-7.
120. *Id.*
121. *Id.*
122. *See id.*
123. *Id.*

must pay for the power generated by QFs.[124] The intent of PURPA's purchase rate requirement is to ensure that a QF can sell its power to a utility at a rate that meets the following three criteria: (1) the purchase rate must be just and reasonable to the consumer and utility; (2) it must be in the public interest; and (3) it must not discriminate between cogenerators and small power producers.[125] To implement this provision of PURPA, "FERC created a benchmark for the rate called 'avoided cost,' the cost a utility would have incurred to purchase power from another source, or to construct and maintain a generation project if a QF did not supply the power."[126] State regulatory authorities determine the method for avoided cost calculation.[127] Utilities calculate the rate from the method set forth by the state, and submit it to the state regulatory commission.[128]

PURPA specifies that a utility shall sell power to a QF as if it were any other customer.[129] Prior to PURPA, some utilities charged small power producers high rates for low use in an effort to discourage their operations.[130] Furthermore, PURPA exempts QFs from utility regulatory laws, in particular from the majority of the Federal Power Act, the Public Utility Holding Company Act, and state laws, all aimed at regulating a utility's corporate structure and their rate of return on investment.[131] Together, these provisions were intended to offer QFs a guaranteed market for their electricity, at a set price, and without the regulatory constraints imposed on utilities as a counterpart for their monopoly position.[132]

Electric utilities were swift to challenge PURPA, and two of these challenges reached the Supreme Court: *FERC v. Mississippi* in 1982[133] and *American Paper Inst. v. American Electric Power Service Corp.* in 1983.[134] The Supreme Court upheld PURPA in both cases.[135] However, the challenges initially succeeded in delaying the development of QFs for several years, as investors and utilities alike were unwilling to commit to investments or contracts as long as issues surrounding the implementation of PURPA were not resolved. The issues surrounding

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124. *See id.*
125. *Id.*
126. *Id.*
127. *Id.*
128. *Id.*
129. *Id.* at 7.
130. *Id.*
131. *Id.*
132. *See generally* PURPA HANDBOOK, *supra* note 112.
133. 456 U.S. 742 (1982).
134. 461 U.S. 402 (1983).
135. *See FERC*, 456 U.S. at 758; *Am. Paper*, 461 U.S. at 423.

the implementation were also a signal of difficulties to come in the application of PURPA.

In spite of the Supreme Court rulings, PURPA has not resulted in the widespread development of renewable energy and independent producers that was intended by Congress. This has been due to inadequate regulatory oversight, problems in determining the level of avoided cost, and institutional barriers to utility adoption of new technologies like wind energy.[136] In some instances these problems have altogether turned the intent of PURPA on its head causing the legislation to be used not to promote, but to strike down state policies promoting renewable energy.[137]

The issue of the rate at which power must be purchased from QFs is the central issue on which PURPA design and implementation has failed in its intent to promote the development of an indigenous renewable energy source. Because each jurisdiction uses a different calculation and each utility has different costs for purchasing and building power plants, avoided costs vary widely, and the rate at which they are set are open to challenge.[138] Many of the avoided costs submitted by utilities and approved by state public utility commissions are very low, which do in effect create a strong incentive for the development of QFs.

The low avoided cost, which PURPA thus established for renewable power from QFs, can be contrasted to the guaranteed "tariff" that some European countries have established for renewable power from independent power producers. In Germany, for example, the federal electricity "feed-in" law seeks to guarantee a market for renewable energy sources by ensuring that up to 90% of the retail cost is paid to the renewable energy power producer.[139] Combined with aggressive regional incentives, this policy has turned Germany into the world's largest wind energy market to date.[140] Germany overtook the United

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136. *See* PURPA HANDBOOK, *supra* note 112, at 3-4.

137. *See id.*; *see also, e.g.*, *FERC Overturns Largest Wind Acquisition of the Decade*, WIND ENERGY WKLY., AWEA, Feb. 27, 1995, at 1. Edison and other California utilities challenged the state's Biennial Resource Planning Update, which required them to develop new generating capacity and auction a certain amount of this capacity to renewable energy bidders, by claiming that the bids offered were higher than their avoided cost. In Iowa, utilities have used PURPA to challenge a ruling by the Iowa Utilities Board requiring them to provide net metering for customers who had requested such an arrangement. *See* IES Utils. Inc., No. TF-00-19, 2000 WL 373962 (Iowa Utils. Bd. 2000).

138. *See* PURPA HANDBOOK, *supra* note 112, at 13-14.

139. For more information on the German wind energy market, see the website of the German Wind Energy Association at http://www.wind-energie.de (last updated Apr. 26, 2001).

140. *See* MARKET REPORT, *supra* note 11; *see also* German Wind Energy Association Website, *supra* note 139; BTM CONSULT APS, WORLD MARKET UPDATE 1999, *at* http://www.btm.dk (last updated Apr. 1, 2000).

States in 1997 as the country with the largest installed wind capacity in the world and its total installed generating capacity at the end of 2000 came close to reaching 6000 MW.[141] Similarly, Spain adopted in 1994, and revised in 1998, a policy similar to the German feed-in law ensuring a payment equivalent to 80% to 90% of the retail rate to wind energy producers.[142] Spain has since evolved into one of the world's fastest growing wind energy markets. At the end of 2000, Spain's installed wind energy capacity totaled some 2250 MW, which is very close to the U.S. total of 2550 MW.[143] The Spanish government intends to continue to foster the development of wind energy, primarily to diversify its energy portfolio and to hedge against costly fuel imports.[144]

Combined with aggressive state incentives adopted in California, PURPA was a major factor in creating the market for renewable energy projects in California in the 1980s. When those incentives expired, however, it became apparent that neither PURPA, nor the CAA, as designed and implemented, would stimulate further growth in the wind energy industry. The loopholes in the CAA and slow enforcement of the clean air standards continued to ensure that electricity from grandfathered power plants would out-compete cleaner power in the market. Meanwhile, in 1995, PURPA's avoided cost provisions would be used by utilities to overturn an aggressive plan to develop renewable energy power plants in California for the 1990s.

V. STATE POLICIES: WHY CALIFORNIA WAS BUILT UP IN THE 1980S, AND WHY TEXAS IS LEADING TODAY'S WIND POWER SURGE

State laws and regulations play a determining role in the development of wind energy in the United States. An overlay of a map of the nation's wind resources with that of the locations of existing wind farms provides a clear demonstration of that point. California, the state with the largest installed wind energy generating capacity today, is the state with the seventeenth largest wind energy potential.[145] California has obtained its leading position because of an aggressive renewable energy state policy beginning in the 1980s. Texas is the hottest wind energy market in the United States, expected to leap into the number two

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141. *See id.*
142. *See id.*
143. *See id.*
144. PLAN DE FOMENTO DE LAS ENERGIAS RENOVABLES EN ESPANA, MINISTERIO DE INDUSTRIA Y ENERGIA, Y INSTITUTO PARA LA DIVERSIFICACION Y AHORRO DE LA ENERGIA (Madrid, Dec. 1999).
145. *See generally* AWEA, SHOCKED IN CALIFORNIA?, *at* http://www.awea.org/faq/ca_shock.html (2001).

position after California by the end of 2001, as a result of an effective renewable energy provision included in its electricity restructuring legislation signed in 1999 by then-Governor George W. Bush.[146] Iowa and Minnesota, the states with the third and fourth largest installed capacity, saw large new wind farms come into existence in 1998 and 1999 as the result of legislation passed in 1983 in Iowa and in 1993 in Minnesota.[147] States have used different policies over the years, in different combinations and with varying degrees of effectiveness.

A. Before Restructuring: State Integrated Resource Planning and Renewables Set-Asides

Until they started debating electricity-restructuring legislation, most states sought to promote energy efficiency and the development of renewables through integrated resource plans and set-asides.[148] An integrated resource planning (IRP) process requires utilities to evaluate supply and demand options on a consistent basis to meet future demand reliably at the lowest system cost.[149] IRPs typically require or provide incentives for utilities to invest in demand side management of electricity and to consider the benefits of the diversification of energy sources.[150] In the case of set-asides, a certain percentage of new power purchases are required to be reserved for renewable resources.[151] However, few states have successfully introduced an aggressive renewable energy development plan through set-asides largely because utilities have been successful in fending off implementation of renewable energy mandates.[152] California

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146. *See* Goal for Renewable Energy, TEX. CODE ANN. § 39.904 (2001).

147. *See* IOWA CODE ANN. § 476.41-476.45; *see also* MINN. STAT. ANN. § 216B.2423, 24. In Minnesota, the legislature has required Northern States Power (NSP) to build or contract out for 225 MW of wind power by Dec. 31, 1998. NSP must build or contract out an additional 200 MW by Dec. 31, 2002, and NSP must build or purchase 50 MW of electric energy from farm grown closed-loop biomass systems by Dec. 31, 1998 and an additional 75 MW by Dec. 31, 2002. MINN. STAT. ANN. § 216B.2423, 24.

148. *See* AWEA, WIND ENERGY IN THE U.S., A STATE BY STATE SURVEY 9-10 (1994), *available at* http://www.awea.org/pubs/st.html.

149. *See* U.S. ENERGY INFO. ADMIN., *supra* note 6.

150. *See id.*

151. *See id.*

152. *See* Jeff Smith, *More Pressure on Xcel*, ROCKY MOUNTAIN NEWS, Jan. 30, 2001. For example, efforts by local organizations and citizens to require Public Service of Colorado (PSCo, now Xcel) to develop wind energy were successfully blocked during the 1990s. Only when a local organization, the Land and Water Fund of the Rockies, proposed to partner with PSCo to market wind energy at a higher price to interested customers did the company agree to develop some wind energy. The green power product, WindSource, even though it is sold at a premium, has been popular with Colorado customers and has resulted in about 20MW of wind energy generating capacity. The Colorado Public Utilities Commission is currently looking into whether to order Excel to develop a 162 MW wind farm along with its plan to purchase power from

provides an example of how an ambitious state renewable energy plan was overturned by a utility, which in its efforts, invoked federal legislation (PURPA) ironically intended to foster the development of renewable energy.

California developed in the early 1990s what was one of the most ambitious plans for the development of renewable energy as part of its integrated resource planning process. This planning process resulted in the BRPU set forth by the state's Public Utility Commission (CPUC).[153] The BRPU that was finalized and adopted in 1993, after more than a year of delay caused by reluctant utilities, called for utilities to issue bids for more than 1000 MW of renewable energy.[154] The resulting bids provided a powerful demonstration of wind energy's newly found competitiveness. Wind power projects ranked high among renewable bidders in resource auctions held by Pacific Gas & Electric Co. and San Diego Gas & Electric (SDG&E), which awarded contracts for approximately 690 MW of wind energy, while Southern California Edison suspended its bid allocation for 624 MW due to concerns about the bidding process.[155]

Utilities focused on concerns about the bids, despite their low cost, out of concern about mandatory set-aside policies and, in their view, the questionable value of investments in renewable energy.[156] Throughout the process Edison, the biggest player in the auction, also claimed that it had no need for new generating capacity until the year 2005, a position that would haunt them in 2001, when rolling blackouts hit California because of a shortage of in-state power plants.[157] The process was delayed again by the utilities until the CPUC decided in December 1994 to proceed with all "firm" BRPU contracts.[158]

At that point, Edison petitioned FERC to overturn California's BRPU, raising the avoided cost issue.[159] "[D]espite bids from independent power producers that are significantly lower than its benchmark identified deferrable resources, the utility claimed that the

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natural-gas power plants, in spite of Xcel's opposition. Colorado has a wind energy potential of 480 billion kWh. *Id.*

153. *See California PUC Calls for 1,451 MW, 572 MW in Renewable IDRs*, WIND ENERGY WKLY., Mar. 22, 1993, at 1.

154. *See id.*

155. *Wind Receives Large Share of BRPU Preliminary Bid Auction*, WIND ENERGY WKLY., Dec. 20, 1993, at 1.

156. *See* Andy Pasztor, *Who Will Make Electric Power in California?*, WALL ST. J., Feb. 17, 1994, at B1 (providing a summary of the opposing views in the BRPU controversy).

157. *See* Susan Sward, *A Lost Opportunity That Worsened Crisis: Utilities and Federal Regulators Shut the Door on Renewable Power in California*, S.F. CHRON., Feb. 12, 2001, at A1.

158. *See* Michael Parrish, *Electric Power Auction 'Last Stand' for Renewables*, L.A. TIMES, Feb. 14, 1994, at D1.

159. *See California's BRPU*, *supra* note 90, at 1-2.

prices for winning power contracts under the BRPU will exceed its avoided cost."[160] The FERC ruled February 22, 1995, that California's BRPU violated PURPA because the CPUC did not properly determine avoided cost.[161] Legislation that was intended to encourage the use of renewable energy was, ironically, being used to throttle the domestic market for wind and other renewables.[162]

Regulators and independent power producers immediately challenged the controversial decision. "Sources close to the issue argued that winning BRPU bid prices were not above avoided cost."[163] Furthermore, "[s]ince winning QF bidders uniformly underbid the avoided cost benchmarks, the resulting second prices are clearly not above the utilities' avoided cost.'"[164] The Independent Energy Producers Association (IEP) found that the BRPU auction not only complied with the rules, but that the results of the competitive auction were "unequivocally spectacular."[165] The IEP, the National Association of Regulatory Utility Commissioners, and the United States Department of Energy filed comments in opposition to the petitions by Southern California Edison and SDG&E.[166]

FERC stood by its decision. As a result, virtually no new power plants and no new wind energy plants were developed in the following two years.[167] California lives with the consequences of that 1995 FERC decision to this day, because no new power plants were added after the electricity restructuring legislation was passed in 1997, leading to the energy crisis that grabbed state and national headlines in 2000 and 2001. Few states have adopted ambitious renewable energy set-asides since the overturn of the California BRPU, either because they were discouraged by California's example and the powerful role played by the utilities in the process, or because they were themselves preparing to restructure their electricity market.

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160. *Id.* at 2.
161. *FERC Overturns Largest Wind Acquisition of the Decade*, *supra* note 137, at 1.
162. *See id.*
163. *Id.* at 3.
164. *See id.* (quoting Jerry Bloom, an attorney with Morrison & Foerster).
165. *Id.*
166. *See FERC Reaffirms Decision Overturning California BRPU*, WIND ENERGY WKLY., June 5, 1995, at 1.
167. *See* U.S. ENERGY INFO. ADMIN., STATE ELECTRICITY PROFILES, *at* http://www.eia.doe.gov/cneaf/electricity/st_profiles/california.pdf (1999).

B. Economic and Financial Incentives: A Panoply of Potentially Effective Tools

Economic and financial incentives, effectively designed and applied, provide one set of tools for states to use to level a playing field skewed in favor of conventional power technologies. Financial incentives for wind and renewable energy have waxed and waned over the years, with many of the incentives adopted in response to the energy crisis of the late 1970s being allowed to lapse in subsequent years. The funding basis for such incentives usually comes from system benefit charges, or small charges levied on electricity sales to consumers.[168]

More than twenty states currently provide some form of tax incentive or low interest loan for wind energy.[169] The majority of these incentives are targeted towards small wind systems, and usually take the form of an income tax credit, a sales tax credit, or a low-interest loan.[170] These incentives begin to offset the cost of a residential wind system, which, like that of solar systems and energy-saving appliances, is higher up-front even if it generates savings over the long term. The most effective incentive for small wind systems remains the rebates, or "buy-downs," currently offered in California and Illinois, which cut the cost of a new wind system by up to 50% in California and 60% in Illinois.[171] However, few states currently provide economic or financial incentives for utility-scale wind energy, in spite of their potential effectiveness.

California provides perhaps the most dramatic example of the results that can be obtained with such incentives.[172] The wind energy investment tax credit adopted in the early 1980s, combined with a federal investment tax credit, triggered the California wind rush that brought 1200 MW of wind energy generating capacity to the state in a period of

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168. *See generally* Kevin Porter & Ryan Wiser, *A Status Report on the Design and Implementation of State Renewable Portfolio Standards and System Benefits Charge Policies*, Windpower 2000 Conference (2000) (explaining and survey of system benefits charge policies) [hereinafter Windpower 2000].

169. *See* AWEA, INVENTORY OF STATE INCENTIVES FOR WIND ENERGY IN THE U.S.: A STATE BY STATE SURVEY, *at* http://www.awea.org/pubs/inventory.html (Mar. 2001).

170. *See* ARIZ. REV. STAT. §§ 43-1083 (2000) (providing a credit against the state's personal income tax in the amount of 25% of the cost of a solar or wind energy device; the credit has a maximum allowable limit of $1000); VT. STAT. ANN. tit. 32, § 9741(46) (1991) (exempting the purchase of small renewable energy systems for homes and businesses from the state's five percent sales tax); MO. REV. STAT. § 640.653 (2000) (Missouri makes available low-cost loans for energy efficiency and renewable energy projects including wind energy to schools, local governments, small businesses, and hospitals).

171. CALIFORNIA ENERGY COMM'N, EMERGING RENEWABLES BUYDOWN PROGRAM, *at* http://www.energy.ca.gov/greengrid/background.html (last updated Sept. 1, 1999); ILLINOIS DEP'T OF COMMERCE & COMMUNITY AFFAIRS, RENEWABLE ENERGY RESOURCES PROGRAM, *at* http://www.commerce.state.il.us/resource_efficiency/Energy/rerp.htm (2001).

172. *See* Starrs, *supra* note 111, at 103-10, 119.

only three to four years.[173] While investments often flowed into the installation of machines that were not yet ready to go to market and sometimes failed, the rush did in effect create the U.S. wind energy industry and establish the United States as the country with the leading wind energy market during that period. Some companies launched at the time have since disappeared, but others have grown into American and worldwide leaders.[174] For example, Zond continued to develop projects in California, developed its own wind turbine design, opened a manufacturing facility in Tehachapi, and started bidding out-of-state.[175] The growing company was purchased by Enron and is now known as Enron Wind Corporation. Enron Wind's turbines accounted for close to half of the generating capacity installed in the United States at the end of 1999 and the company is actively investing in overseas markets.[176] SeaWest, another company that owes its initial growth to the California wind rush, is now the nation's third largest developer, with operations that remain concentrated in California.[177]

Shaken perhaps by the sight of wind turbines that were not generating electricity as expected, and failing to acknowledge the overall positive legacy of the rush, other states have not adopted incentives on a similar scale. Existing incentives for utility-scale energy include a production tax credit in Minnesota that mirrors the federal PTC.[178] The Minnesota credit of 1.5¢/kWh of electricity generated from wind over a period of ten years goes to qualifying projects of less than 2 MW in capacity.[179] The incentive is intended to promote distributed, or dispersed, wind generation rather than single large wind farms.

Another form of economic incentive at the disposal of state governments is the requirement placed on investor-owned utilities to consider and monetize environmental externalities in the evaluation of the costs of a potential resource. Requirements to consider monetized externalities were adopted in a variety of forms in about seventeen states

173. *See* CALIFORNIA ENERGY COMM'N WIND ENERGY IN CALIFORNIA: FAST FACTS, *at* http://38.144.192.166/wind/windfacts.html (last updated Sept. 1, 1998).

174. *See generally* PETER ASMUS, REAPING THE WIND, HOW MECHANICAL WIZARDS, VISIONARIES, AND PROFITEERS HELPED SHAPE OUR ENERGY FUTURE 174-83 (2000). Kenetech Windpower, a leading developer and manufacturer and the only wind energy company to be publicly traded, filed for bankruptcy in 1997. There were several reasons for the company's demise, including the overturning of California's BRPU, which cancelled about 1000 MW of new projects for which Kenetech was a leading bidder. *Id.*

175. *See id.* at 203-04.

176. Kenneth C. Karas, President and CEO of Enron Wind Corp., Presentation at Windpower Conference (June 21, 1999) (on file with author).

177. *Id.*

178. *See* MINN. STAT. § 216C.41 (2000).

179. *Id.*

by the early to mid-1990s.[180] The requirements were usually incorporated within the framework of the integrated resource planning process. Externalities requirements were opposed vigorously by utilities and organizations representing the interests of fossil fuels producers and the rules issued by state Public Utility Commissions often were either void of provisions that would have made such a requirement effective, or were overturned.[181]

Massachusetts provides a case in point. In December 1989, the Massachusetts Department of Public Utilities directed electric utilities to include environmental externalities for certain pollutants in their criteria for evaluating all-source solicitations.[182] Monetized values were set in 1990 and reaffirmed in 1992 after a challenge.[183] Electric utilities filed their first integrated resource management plan using the externalities requirement in 1994, which resulted at the time in a shift toward natural gas.[184] The process was nonetheless challenged, and the new integrated resource management procedures issued in 1995 no longer included the externality requirement.[185] Massachusetts has since restructured its electricity markets and has not sought to incorporate an externalities requirement into that process.[186]

Minnesota provides an example of a state that has adopted a monetized externality requirement that is still in effect today and has resulted in a wind energy project being selected as the least cost option for new power generation in an all-source bid. In 1993, Minnesota passed a law requiring the state's Public Utility Commission (PUC) "to the extent practicable, quantify and establish a range of environmental costs associated with each method of electricity generation," develop interim values by 1994, and requiring each utility to use the values in conjunction with other external factors when evaluating resource options.[187] Reaching consensus proved an arduous process, with various parties raising constitutional challenges to the statute, objecting to the inclusion or exclusion of elements of the record and to specific values proposed. The PUC decided not to attempt to quantify full upstream and downstream costs (such as costs to the environment from the extraction

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180. *See* U.S. ENERGY INFO. ADMIN., ELECTRICITY GENERATION AND ENVIRONMENTAL EXTERNALITIES: CASE STUDIES (Sept. 1995) (conducting a survey of externalities requirements), *available at* http://www.eia.doe.gov/cneaf/electricity/external/external_sum.html.

181. *Id.*

182. *Id.* at 31.

183. *Id.* at vi.

184. *Id.*

185. *See id.*

186. *Id.*

187. MINN. STAT. § 216B.2422 (1993).

and transportation of fuel, or cost to the environment of disposal wastes) and to focus only on the damage cost of certain emissions.[188] The PUC issued an order in 1997 establishing the following values for the following emissions:[189]

Environmental Cost Values	Urban	Metropolitan Fringe	Rural	Within 200 miles of Minnesota
Sulfur dioxide $/ton	112-189	46-110	10-25	10-25
Particulate Matter 10 $/ton	4462-6423	1987-2886	562-855	562-885
Carbon monoxide $/ton	1.06-2.27	0.76-1.34	0.21 – 0.41	0.21 – 0.41
Nitrogen oxide $/ton	371-978	140-266	18-102	18-102
Lead $/ton	3,131-3,875	1652-1995	402—448	402-448
Carbon dioxide $/ton	0.30-3.10	0.30-3.10	0.30-3.10	0.30-3.10

The values largely reflect those established in a Triangle Economic Research Study sponsored by Northern States Power, Minnesota's largest utility.[190] Environmental cost values for mercury were not established, although the PUC in its order acknowledged that coal burning is the leading source of mercury emissions in the air in Minnesota.[191]

The ruling did not initially result in a significant shift in the resource planning process toward renewable energy like wind. However, the requirement is beginning to make a difference now that wind energy is more competitive and there is an increased demand for new generating capacity. In 1999, two wind energy companies were among seven finalists in an all-source bid for new power by Northern States Power, and one of the two was awarded a contract.[192] Enron Wind Corp. proposed an all-wind project and Northern Alternative Energy proposed a combination of natural gas and wind power plants to provide the requested generation.[193] Northern Alternative Energy won a contract for a 350 MW natural gas and wind energy project.[194] Ironically, the recent

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188. MINN. PUB. UTIL. COMM'N, IN THE MATTER OF THE QUANTIFICATION OF ENVIRONMENTAL COSTS PURSUANT TO THE LAWS OF MINNESOTA, No. E-999/CI-93-583, 12 (Jan. 3, 1997).

189. *See id.* at 5.

190. *See id.* at 17-18.

191. *See id.* at 28-31.

192. *Enron Wind Corp., Northern Alternative Energy Among NSP All-Source Finalists*, WIND ENERGY WKLY., Dec. 16, 1999, at 1.

193. *See id.*

194. *See* AWEA, WIND GROUP WELCOMES SELECTION OF WIND-GAS PLANT IN BIDDING COMPETITION, *at* http://www.awea.org/news/new000407wng.html (Apr. 7, 2000).

spike in the price of natural gas now constitutes that company's biggest risk in this investment.

As evidence of damage from mercury accumulates and as the federal government prepares to regulate emissions of mercury from power plants, it is possible that the Minnesota PUC will feel bound to revisit its externalities ruling to incorporate an environmental cost value for mercury. Requirements to internalize externalities can provide a powerful market-friendly tool to ensure fair competition among electricity sources. A requirement to consider externalities in a restructured market could be designed and applied in various ways, such as a surcharge by pollutant on the electricity supplied by power providers. Requirements for power providers to disclose electricity sources and emissions could provide a simple basis on which to apply such surcharges and make such surcharges readily understood by the public.

C. The Renewables Portfolio Standard: An Effective Tool to Promote Renewable Energy

Midway through the 2000 presidential campaign, the *Wall Street Journal* published, on its front page, a short news item indicating that "an electricity law in Texas partially engineered by Governor Bush created the nation's largest collection of wind farms."[195] That law is the renewable energy section, or Renewables Portfolio Standard (RPS), of the state's electricity restructuring legislation.[196] Six other states have adopted an RPS as part of restructuring or other legislation, but none so far with the stunning results of Texas. By the end of 2001, high-tech wind turbines there may be reaping well over three billion kWh annually from the state's high winds, close to the 3.5 billion kWh generated in California today, according to estimates from AWEA.

Texas' electricity restructuring legislation, intended to open the state's electricity market to competition, and includes a requirement that a RPS (a requirement that 2000 megawatts (MW) of new renewable energy capacity generating approximately three percent of the state's power), be developed by 2009. Eligible technologies include wind, solar, geothermal, wave or tidal energy, biomass, and methane gas from landfills, and, tallied in a separate category, hydropower.

The RPS is essentially a minimum content requirement that grows over time and allows the market to choose which renewable energy

195. *Blowing Less Smoke*, WALL ST. J., Sept. 1, 2000, at A1.

196. The following discussion of Texas's electricity restructuring legislation is excerpted from a prior article by the author. Christine Real de Azua, *Texas Wind Rush*, RENEWABLE ENERGY WORLD 34 (Jan.-Feb. 2001).

technologies are the most cost-effective. Specifically, the Texas RPS calls for 400 MW of new renewables by 2003, another 450 MW by 2005, another 550 MW by 2007, and a final installment of 600 MW by 2009.

Texas started by paying attention to both process and product as it developed the legislation. The process ensured from the outset that consumer opinion would be taken into account. Utilities were required by the state's Public Utility Commission to undertake in-depth consumer surveys, or "deliberative polling," with customer focus groups. Extensive polling effort revealed to utility management and to policy-makers the extent of public support for renewable energy, throughout the state and among Texans from all walks of life. Utilities realized that they would do better in a competitive retail market if they were delivering a product that was closer to meeting their customers' expectations and that the RPS could be a cost-effective way of creating the larger renewable energy market desired by consumers.

Legislators then worked with a variety of organizations, interested utilities, and the renewable energy industry to resolve problems such as how to account for existing renewable energy capacity and which sources would qualify as renewable. The negotiations resulted in legislation that included the following key provisions, which AWEA recommends for any RPS:

- First, that the requirement for renewable energy as defined in the Texas RPS is set high enough (2000 MW of new renewable energy) above the existing level of such energy (880 MW) to trigger market growth. Setting an ambitious yet achievable level for an RPS is a critical first step, and this should be done taking into consideration both the RPS's definition of renewable energy and its existing level. Failure to do so can result in a meaningless requirement. For example, Maine's 30% RPS may sound ambitious, but about 50% of Maine's electricity already comes from hydropower, a form of energy that qualifies as renewable under that state's RPS.
- Second, that the Texas requirement applies across the board to all retail electricity providers. However, municipal and cooperative utilities can opt out. Failure to include an universality requirement distorts the very markets that are to be opened to competition. For example, in Connecticut, default service providers, companies providing electricity to customers who decide not to choose once a choice of power providers is available, are exempt from the RPS. The RPS applies only to new

competitors, in effect discouraging new energy providers from entering the market.

- Third, that the Texas requirement is in the form of tradable renewable energy credits, which ensure flexibility and least-cost implementation of the requirement. Credits favor development of the least-cost renewable energy source. They allow utilities to meet the RPS at the lowest cost to them. Credits also provide a simple accounting system for tracking new generating capacity and monitoring compliance with the RPS. Texas is the only state so far to clearly base the RPS obligation on credit trading from the outset.
- Fourth, that there is an effective, automatic penalty. Electricity providers in Texas will have three months after each compliance period during which they can make up any shortfall in the required credits, but there is an automatic penalty for noncompliance after that period and it is set high enough to at least exceed estimated compliance costs. Penalties are absent from other states' RPS legislation, although some may eventually be set as part of implementing regulations.

In Texas, this effective RPS, superb wind energy potential, low technology costs, and fair transmission policy have come together to create a vibrant new market for wind energy. As a result, several utilities are investing in wind energy at a pace that exceeds all initial expectations, even before the first phase of the RPS requirement goes into effect in 2003.

In July 1999, six months after RPS implementing regulations were finalized, Dallas-based TXU Electric & Gas (TXU) announced it would purchase electricity from a 160 MW wind farm (larger than the record-breaking 107 MW wind farm of Storm Lake, Iowa) to be developed with the nation's largest wind energy producer, FPL Energy LLC, and Renewable Energy Systems (RES). The project, scheduled for completion in July 2001, is located in Pecos County, south of Odessa. Reliant Energy followed suit in August with the announcement of plans for a 208 MW wind farm to be built by RES. The plant will consist of 160 wind turbines of 1.3 MW each.

Project announcements have cascaded since then, with a total of close to 800 MW of new wind energy generating capacity being proposed for completion by the end of 2001. The surge in investments puts Texas on track to becoming the state with the second-largest installed wind energy generating capacity by the end of 2001.

Wisconsin provides the example of a state that has adopted an RPS without restructuring its electricity market. The state adopted a requirement that 2.2% of the state electricity demand in 2011 be met by renewable energy resources as part of a law to increase electricity reliability.[197] This RPS could lead to the development of 400 MW of new renewable generating capacity—a very achievable amount given the state's renewable energy resource potential.[198] Wisconsin's wind energy potential is estimated at 58 billion kWh per year, or some 6000 MW of average power.[199]

Minnesota is considering a plan to pass an RPS without enacting restructuring legislation. Three major energy bills are set to be introduced in the 2001 session.[200] While no single bill is likely to be adopted as introduced, a new coalition, People Organized for Workers, the Environment and Ratepayers (POWER) is hopeful that many elements of its version, the "Energy Reliability and Affordability Act of 2001," will become law.[201] The proposal includes an RPS for Minnesota, which would require that 10% of the state's electricity come from renewable energy sources by the year 2010.[202] Current projections are that Minnesota will be short 3000 MW of capacity by 2006, and the additional capacity could be provided by a mix of renewable energy (primarily wind power), energy efficiency, distributed generation and by repowering old coal plants with cleaner fuels.[203]

VI. UNLEASHING CONSUMER DEMAND FOR GREEN POWER

When restructuring legislation does not include provisions like an RPS, or a minimum renewable energy requirement, is retail competition sufficient to unleash consumer preference for clean power and to create a niche market for wind energy and other renewables? Conversely, is electricity restructuring necessary to tap those consumer preferences? The evidence from the states that have restructured and those that have not indicates that it all depends on a number of factors. Pennsylvania shows that restructuring can, if care is given to encourage fair competition and market rules, provide customers with an opportunity to switch to "clean energy" providers. Colorado provides the example of a local utility offering a green power product in the absence of retail competition. In many other states, neither regulated or restructured

197. *See* WIS. STAT. ANN. § 196.378(z)(6) (2000).

198. *See* AWEA, WIND ENERGY: AN UNTAPPED RESOURCE, *at* http://www.awea.org/pubs/factsheets/top202001.pdf (last updated Feb. 22, 2001).

199. *Minnesota Coalition Backs Renewables Portfolio Standard of 10% by 2010*, WIND ENERGY WKLY., Jan. 26, 2001.

200. *Id.*

201. *Id.*

202. *Id.*

203. *Id.*

electricity markets have facilitated the marketing and development of green power.

The growth of green power marketing tends to benefit wind energy. Because wind power is the least-cost renewable energy resource, it often provides the bulk of renewable energy in a green power offering. Some green power marketers offer an all-wind product instead of, or along with, a green power "mix."

A. A Patchwork of Restructured Markets and Green Power Offerings at the State Level

Electricity restructuring is proceeding in a patchwork fashion in the nation. Those states that have enacted restructuring legislation have often chosen to accomplish the transition over a period of several years. In those states that have proceeded with electricity market restructuring, the impact on the development of green power marketing has been mixed.[204]

California and Pennsylvania are the states with the most active competitive green power marketing. Other states that restructured electricity markets at about the same time, such as Massachusetts and Rhode Island, have not seen growth in green power marketing, largely because low-priced "default" service and other factors have discouraged competition and limited the ability of green power providers to offer competitively priced products. California, a state that did not include an RPS or minimum requirement for renewable energy in its restructuring legislation, has had growth in renewable energy sources driven by consumer demand for green power. Approximately 2% of customers there have switched to a green power provider.[205]

In Pennsylvania, customers believe that electricity choice is succeeding in contrast to customers in California hit by rolling blackouts and rising prices. Moreover, as they shop around for electricity services, about one-fifth of those who switch opt for green power, according to a recent study of green power marketing by Xenergy.[206] "If the name of the game is customer satisfaction, then Pennsylvania is winning," according to a survey undertaken by Power Perceptions, a firm specializing in electricity

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204. *See* Blair Sweezey & Lori Bird, *Green Power Marketing in the United States: A Status Report*, NAT'L RENEWABLE ENERGY LABORATORY, Aug. 2000, at 8. Green power marketing refers to the sale of green power in competitive markets, where multiple and differentiated suppliers and service offerings generally exist. *Id.*

205. *See id.* at 9-12.

206. *See* POWER PERCEPTIONS, THE ENERGY CONSUMER, SUMMER 2000, *at* www.powerperceptions.com/ec2000/ec2000home.htm (2000).

consumer research.[207] Nearly a third of Pennsylvanians declared themselves completely satisfied with their electric service in a survey of over 2000 residential customers, compared to 24% nationwide.[208]

One of the reasons for this success lies with Pennsylvania's default service pricing. The default price, the price charged to customers who remain with the previously existing supplier, is set high enough to make it worthwhile for companies to compete against that supplier.[209] By contrast, many other states, including California, have set the default price so low that it discourages customers from switching and companies from competing, unless there is additional, targeted support for green power.[210]

Even in states that have not proceeded with restructuring, utilities are waking up to the potential of green power marketing. Many utilities now offer green pricing (an optional service, offered at a premium price, that gives customers the opportunity to support renewable energy) to build customer loyalty and enhance their public image. To date, 193 utilities in twenty-three states, including states that have restructured, offer green pricing for renewable energy including or entirely comprised of wind energy.[211]

Green power marketing and pricing tend to set the price of electricity from wind and other renewables at a price that is higher than that of electricity from conventional sources in spite of the public benefits it offers. Such pricing turns sound economics on its head, as a correct pricing system would internalize to the extent possible the environmental costs, or externalities associated with electricity production, thereby increasing the cost and price of conventional power sources. State and federal policies that seek to bring down the cost of green power, as in California, or impose surcharges on the electricity from polluting sources, help eliminate such distortions in the market and ensure fair competition among electricity sources.

B. *Small Wind Systems and Net Metering: Sleeping Giant*

This Essay focuses on utility-scale wind energy, but a mention of small-scale wind energy systems (under 100 kW in nameplate capacity)

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207. POWER PERCEPTIONS, ELECTRICITY DEREGULATION SUCCEEDING IN PENNSYLVANIA, ACCORDING TO NEW STUDY, *at* http://www.powerperceptions.com/news/prpenn.htm (Nov. 30, 2000).

208. *Id.*

209. *Id.*

210. *Id.*

211. AWEA maintains a database of green pricing programs. For information contact Kathy Belyeu at AWEA, (202) 383-2520.

and net metering must be made again here, in the context of customer demand.

The rolling blackouts in California and the rising cost of electricity have whipped up nationwide consumer interest in and demand for residential and small business energy systems, such as solar panels and small wind energy systems. Many consumers can become discouraged from investing in a small wind system because of high up-front costs, local zoning ordinances, and difficulties in securing an interconnection and net metering agreement with their local utility. As a result, the large potential demand for small wind turbines has scarcely been tapped.

Unless a customer lives off-grid or seeks to disconnect his home or business from the grid, a home or business can be served simultaneously by the wind turbine it installs and a local utility. If the wind speeds are below cut-in speed (7 to 10 m.p.h.) there will be no output from the turbine and all of the needed power is purchased from the utility.[212] As wind speeds increase, turbine output increases and the amount of power purchased from the utility is proportionately decreased.[213] When the turbine produces more power than the house needs, the extra electricity is fed to the utility.[214] All of this is done automatically. There are no batteries in a modern residential wind system.

The up-front capital costs of a small wind system can be high. These can be off-set by rebates or "buy-downs," such as the ones that already exist in California and Illinois. Such state or federal rebates can be justified by the public service rendered in terms of reduced demand on the local electricity system and clean power generation. Wind turbines produce no pollution and by using wind power they offset pollution that would have been generated by the utility. Over its life, a small residential wind turbine can offset approximately 1.2 tons of air pollutants and 200 tons of carbon dioxide and other gases that cause climate change.[215]

In addition, "net metering" can improve the payback of the investment in a small wind system. "Net metering" is a simplified method of metering the energy consumed and produced at a home or business that has its own renewable energy generator, such as a wind turbine. Under net metering, excess electricity produced by the wind turbine will spin the existing home or business electricity meter backwards, effectively banking the electricity until the customer needs

212. *See* AWEA, SMALL WIND: STATE BY STATE, *at* http://www.awea.org/smallwind/index.html (last updated July 14, 2000).

213. *Id.*

214. *Id.*

215. *Id.*

it.[216] This provides the customer with the full retail value for all the electricity produced.

Under existing federal law (PURPA section 210) utility customers can use the electricity they generate with a wind turbine to supply their own lights and appliances. If the customer produces any excess electricity (beyond what is needed to meet the customer's own needs) and net metering is not allowed, the utility purchases that excess electricity at the wholesale or "avoided cost" price, which is much lower than the retail price.[217] The excess energy is metered using an additional meter that must be installed at the customer's expense.[218]

Net metering simplifies this cumbersome and costly arrangement by billing the customer only for the net energy consumed during the billing period.[219] Net metering provides a variety of benefits for both utilities and consumers. Utilities benefit by avoiding the administrative and accounting costs of metering and purchasing the small amounts of excess electricity produced by small-scale wind energy facilities. Consumers benefit by getting greater value for some of the electricity they generate and by being able to interconnect with the utility using their existing meter.

Revenue losses to the utility from lower purchases of electricity by the customer are partially offset by administrative and accounting savings. These savings can exceed $25 per month because absent net metering, utilities have to separately process the accounts of customers with wind turbines and issue the monthly checks. In practice, these checks can be for as little as 5¢.[220]

Nonetheless, utilities have traditionally not looked favorably upon the use of net metering by homes, schools, and businesses. In Iowa, utilities have fought the efforts of residential customers and of two schools that are pioneering the use of electricity from wind to serve as a science demonstration project and help power their facilities.[221] The utility company sought and won a reversal of the Iowa Utilities Board's (IUB) order to allow the customers to interconnect and operate their wind facilities as authorized by Iowa law.[222] The district court agreed with the company finding that both the Iowa law and the IUB were

216. *See id.*
217. *See id.*
218. *See id.*
219. *See id.*
220. *See id.*
221. *See* Brief of Amici Curiae Renewable Energy Advocates, MidAm. Energy Co. v. Iowa Util. Bd., 576 N.W.2d 381 (Iowa 1997).
222. *See id.*

preempted by PURPA.[223] One of the schools has had to take its case all the way to the IUB for a ruling, and neither school has obtained a net metering agreement with the utility.[224]

State and federal legislation to require utilities to provide net metering to customers who request it would help promote this simple, inexpensive, and easily-administered mechanism for encouraging the use of small-scale wind energy systems that provide environmental and fuel security benefits to the local and national economy.

VII. CONCLUSION

With policies such as those outlined above, this nation could provide a substantial portion of its additional electric energy needs and replace much of its dirtiest sources with completely clean and safe power at no cost beyond that which is projected for the current mix. This would greatly reduce pollution, habitat degradation, and human disease, creating a net savings for society.

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223. *See id.*

224. *See* IES Utils. Inc., No. TF-00-19, 2000 WL 373962 (Iowa Utils. Bd. 2000). The Eldora-New Providence School District, with a total of 760 students, decided three years ago to look into wind power as an educational project and a way to save on its electricity bills, which run from $60,000 to $70,000 a year. When the school inquired about interconnection terms and requirements, Alliant (then IES), maintained that all the electricity generated by the school's wind turbine should be sold to the utility at the very low, federally-approved avoided cost rate—a rate 6¢ lower than the rate the school actually pays Alliant for its electricity. When the school instead proposed that only excess electricity generated by the turbine be purchased by IES at the avoided cost rate, the utility refused. The school district then took the case to the Iowa Utilities Board. The Iowa Utilities Board ruled that the utility must allow the Eldora New Providence School District to interconnect its turbine to the grid under the school's proposed formula, referred to as a power offset agreement.

The Spirit Lake Community Schools, in Iowa, began studying the use of wind as a renewable source of energy in September 1991. The Spirit Lake Schools installed a 250 kW wind turbine for the elementary school in 1993. Under the net metering agreement terms, when the school uses less than what is produced IES (now Alliant) purchases the excess electricity for 6.02¢/kWh. If the school uses more than is produced by the turbine, the school pays about 8¢/kWh for the electricity it purchases from the utility. The turbine proved a smashing educational, technical, and financial success. The school therefore proposed in 1995 to install a second, larger turbine to meet the electrical needs for the district's middle school and high school. By then, however, the utility did not want to extend to a second turbine the net metering arrangement covering the first turbine. IES instead insisted on a host of unnecessary or onerous conditions, and effectively stonewalled the school's efforts, for five years. Since the Iowa Utilities Board ruling in favor of the Eldora/New Providence Schools, Alliant has said it will agree to interconnection for Spirit Lake, but will pay only 1.82¢/kWh (the avoided cost rate) for excess electricity generated. As with Eldora New Providence, however, the Spirit Lake school had yet to see the final agreements in writing from the utility as of November 2000. *Id.*