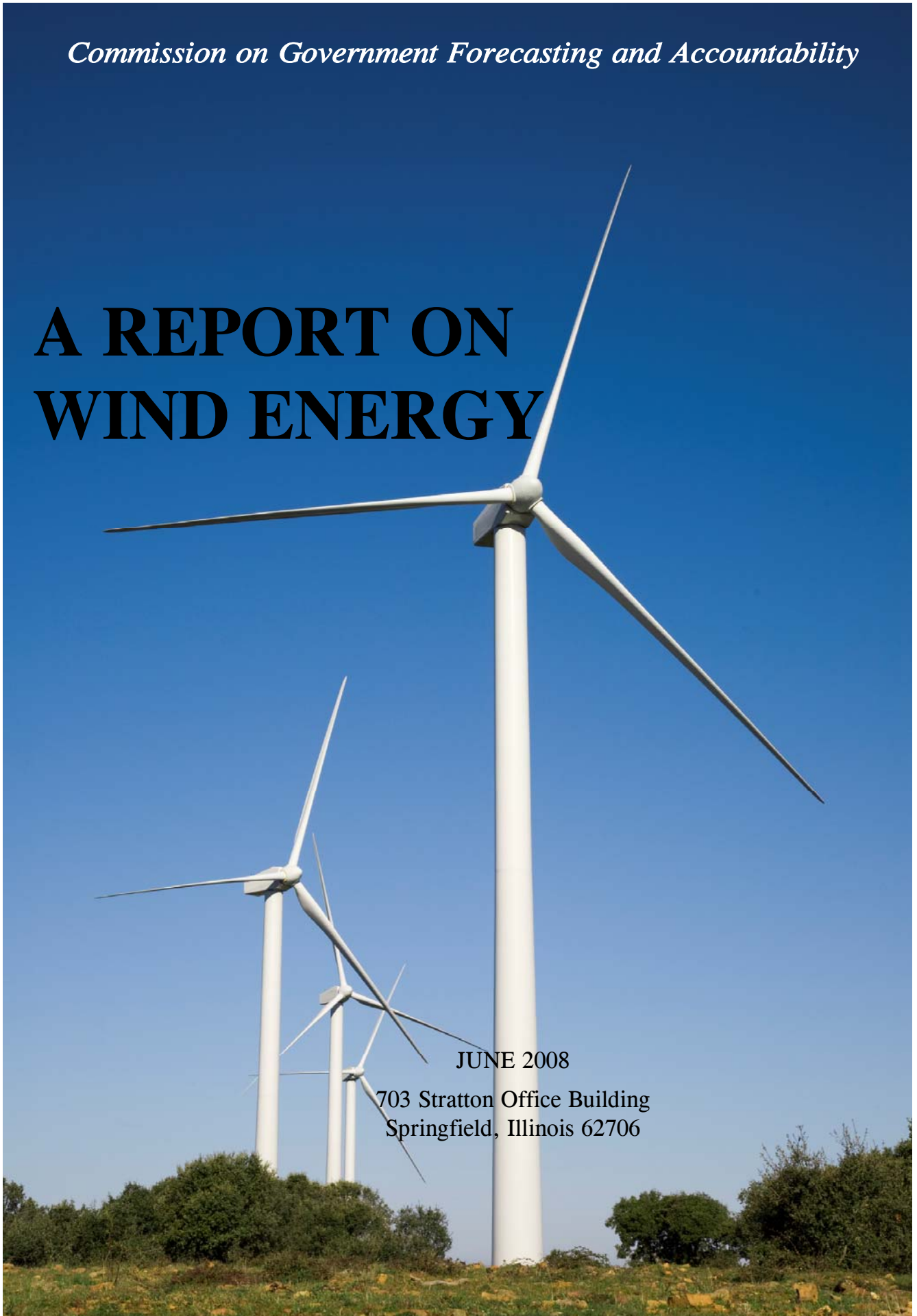


Commission on Government Forecasting and Accountability

A REPORT ON WIND ENERGY

JUNE 2008

703 Stratton Office Building
Springfield, Illinois 62706



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EXECUTIVE SUMMARY

As a clean and renewable energy source, wind energy is seen by many as a way to partially solve our nation's energy crisis. Wind energy has grown by leaps and bounds in recent years. With U.S. wind energy generation capacity growing by 45% in 2007, wind turbines are sprouting up on wind farms all over the country.

This report presents an overview of the wind energy industry. It begins with an explanation for how wind energy works. Then an analysis of the current state of the electric industry is presented, along with a discussion of wind energy's benefits that have led to the current expansion. Steps in building a wind farm and local issues that often arise are explored. The report concludes with a discussion of potential future developments in wind energy.

Some highlights of the report are:

- Wind is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and the rotation of the earth.
- There are two types of modern wind turbines: horizontal-axis and vertical axis.
- The average utility size wind turbine being installed today is 1.5 megawatts (MW).
- Coal is the leading source for electric generation (49%), followed by natural gas (20%) and nuclear power (19%). Wind energy accounted for just over 1% of total generation in 2007.
- U.S. wind energy generation capacity grew to over 16,800 MW in 2007. Over 5,200 MW were added in 2007 alone, which equaled 45% growth.
- The states with the highest wind energy capacity are Texas (4,356 MW), California (2,439 MW), and Minnesota (1,299 MW).
- Illinois had the seventh highest amount at 699 MW which was spread out over 7 wind farms and 3 projects with one turbine each.
- The benefits of wind energy include a reduction of greenhouse gases and significant economic benefit to local communities.
- Government support of the wind energy industry includes tax credits, research funding, energy standards, and development grants and loans. The most important government program is the Renewable Electricity Production Tax Credit which provides a 2.0¢/kWh tax credit.
- Some local issues that often arise with the development of a wind farm include affects on wildlife, noise created by the wind farm, the aesthetics, and shadow flicker.
- Wind energy's future in Illinois appears to be bright as over 35 projects are being proposed but this growth in the industry may be dependent upon the renewal of the Production Tax Credit.

I. How Wind Energy Works

Below is an explanation of how electricity is generated by wind turbines put forth by the U.S. Department of Energy's Wind & Hydropower Technologies Program.

How Wind Turbines Work

Wind is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth. Wind flow patterns are modified by the earth's terrain, bodies of water, and vegetation. Humans use this wind flow, or motion energy, for many purposes: sailing, flying a kite, and even generating electricity.

The terms wind energy, or wind power, describe the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity.

So how do wind turbines make electricity? Simply stated, a wind turbine works the opposite of a fan. Instead of using electricity to make wind, like a fan, wind turbines use wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

Types of Wind Turbines

Modern wind turbines fall into two basic groups: the horizontal-axis variety, as shown in the photo, and the vertical-axis design, like the eggbeater-style Darrieus model, named after its French inventor. Horizontal-axis wind turbines typically either have two or three blades. These three-bladed wind turbines are operated "upwind," with the blades facing into the wind.



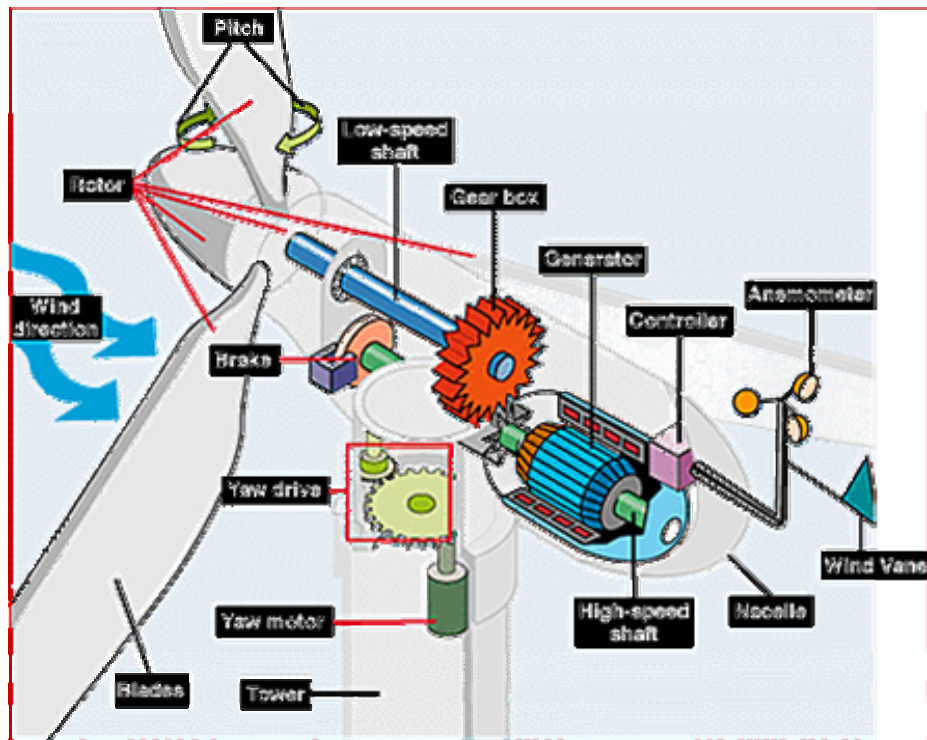
Sizes of Wind Turbines

Utility-scale turbines range in size from 100 kilowatts to as large as several megawatts. Larger turbines are grouped together into wind farms, which provide bulk power to the electrical grid. The average size wind turbine being installed at wind farms currently is approximately 1.5 MW.

Single small turbines, below 100 kilowatts, are used for homes, telecommunications dishes, or water pumping. Small turbines are sometimes used in connection with diesel generators, batteries, and photovoltaic systems. These systems are called hybrid wind systems and are typically used in remote, off-grid locations, where a connection to the utility grid is not available.

Inside a Wind Turbine

Below is a diagram of the inside of a wind turbine, along with descriptions of each part.



Anemometer:

Measures the wind speed and transmits wind speed data to the controller.

Blades:

Most turbines have either two or three blades. Wind blowing over the blades causes the blades to "lift" and rotate.

Brake:

A disc brake, which can be applied mechanically, electrically, or hydraulically to stop the rotor in emergencies.

Controller:

The controller starts up the machine at wind speeds of about 8 to 16 miles per hour (mph) and shuts off the machine at about 55 mph. Turbines do not operate at wind speeds above about 55 mph because they might be damaged by the high winds.

Gear box:

Gears connect the low-speed shaft to the high-speed shaft and increase the rotational speeds from about 30 to 60 rotations per minute (rpm) to about 1000 to 1800 rpm, the rotational speed required by most generators to produce electricity. The gear box is a costly (and heavy) part of the wind turbine and engineers are exploring "direct-drive" generators that operate at lower rotational speeds and don't need gear boxes.

Generator:

Usually an off-the-shelf induction generator that produces 60-cycle AC electricity.

High-speed shaft:

Drives the generator.

Low-speed shaft:

The rotor turns the low-speed shaft at about 30 to 60 rotations per minute.

Nacelle:

The nacelle sits atop the tower and contains the gear box, low- and high-speed shafts, generator, controller, and brake. Some nacelles are large enough for a helicopter to land on.

Pitch:

Blades are turned, or pitched, out of the wind to control the rotor speed and keep the rotor from turning in winds that are too high or too low to produce electricity.

Rotor:

The blades and the hub together are called the rotor.

Tower:

Towers are made from tubular steel (shown here), concrete, or steel lattice. Because wind speed increases with height, taller towers enable turbines to capture more energy and generate more electricity.

Wind direction:

This is an "upwind" turbine, so-called because it operates facing into the wind. Other turbines are designed to run "downwind," facing away from the wind.

Wind vane:

Measures wind direction and communicates with the yaw drive to orient the turbine properly with respect to the wind.

Yaw drive:

Upwind turbines face into the wind; the yaw drive is used to keep the rotor facing into the wind as the wind direction changes. Downwind turbines don't require a yaw drive; the wind blows the rotor downwind.

Yaw motor:

Powers the yaw drive¹.

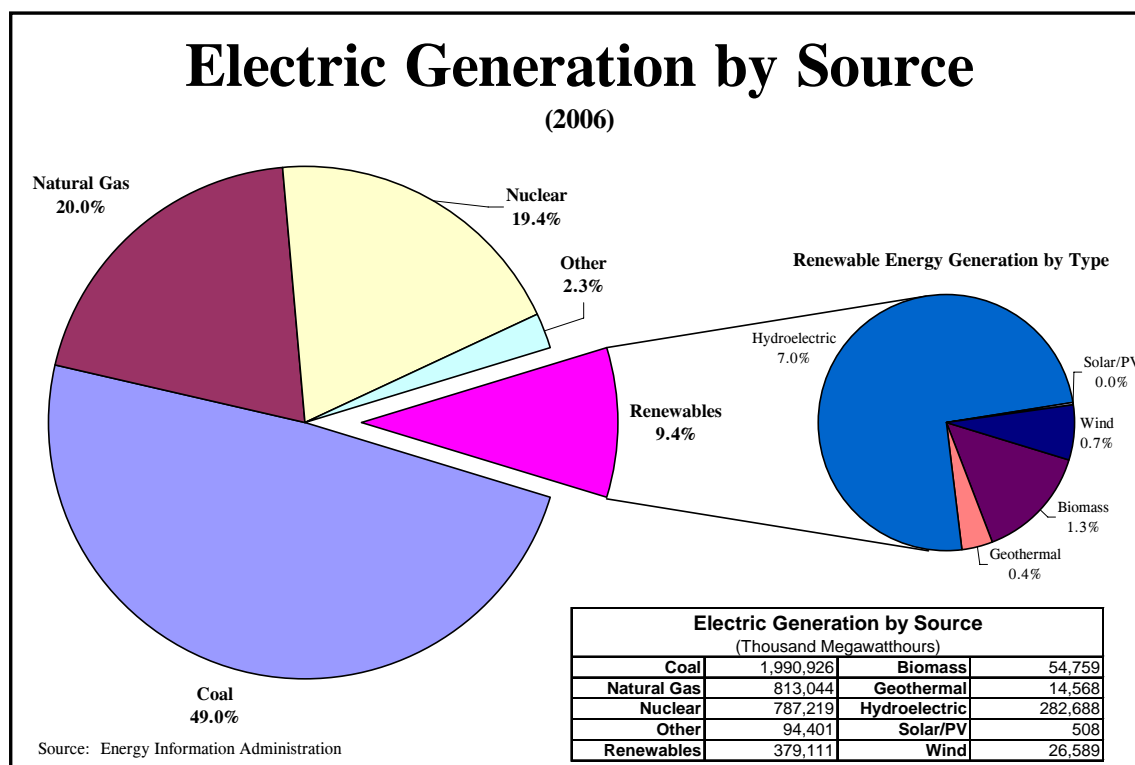
¹ U.S. Department of Energy. Wind and Hydropower Technologies Program.
http://www1.eere.energy.gov/windandhydro/wind_how.html#types

II. The Electric Industry

This section of the report will examine the current state of electricity generation in the United States and the growth in the wind energy sector in recent years. As highlighted in Chart 1, electricity generated through coal burning power plants was the most abundant source of electricity in the United States in 2006. Coal accounted for 1.99 billion megawatt hours or just below 50% of all electricity generated. A megawatt is equal to one million watts. Coal was followed by natural gas (20.0%) and nuclear power (19.4%).

Renewable energy sources accounted for 379 million megawatt hours, or 9.4% of all generation. At 283 million megawatt hours, hydroelectric power plants accounted for the lion's share of this amount. Electricity generated from biomass was the next biggest renewable energy source at 55 million megawatt hours. Wind energy accounted for 27 million megawatt hours, or just less than 1% of all generation. Geothermal and solar power makes up the remainder.

CHART 1. Electric Generation by Source, 2006



U.S. Wind Energy Capacity

Though the wind sector of the electricity market is small today, it has grown quickly in recent years. According to the American Wind Energy Association (AWEA), 5,244 megawatts (MW) of wind energy capacity was installed in 2007. This was an increase of over 45% in total energy generation capacity compared to 2006. As shown in Chart 2, wind energy generation capacity has grown from only 10 megawatts in 1981 to over 16,800 megawatts in 2007. This amount of energy serves the equivalent of 4.5 million average households. As shown in the chart, the industry's recent high level of growth began in approximately 1999. The U.S. is second to only Germany (22,300 MW) in total wind energy production in the world. As of May 2008, the industry had continued to grow to over 18,000 MW.

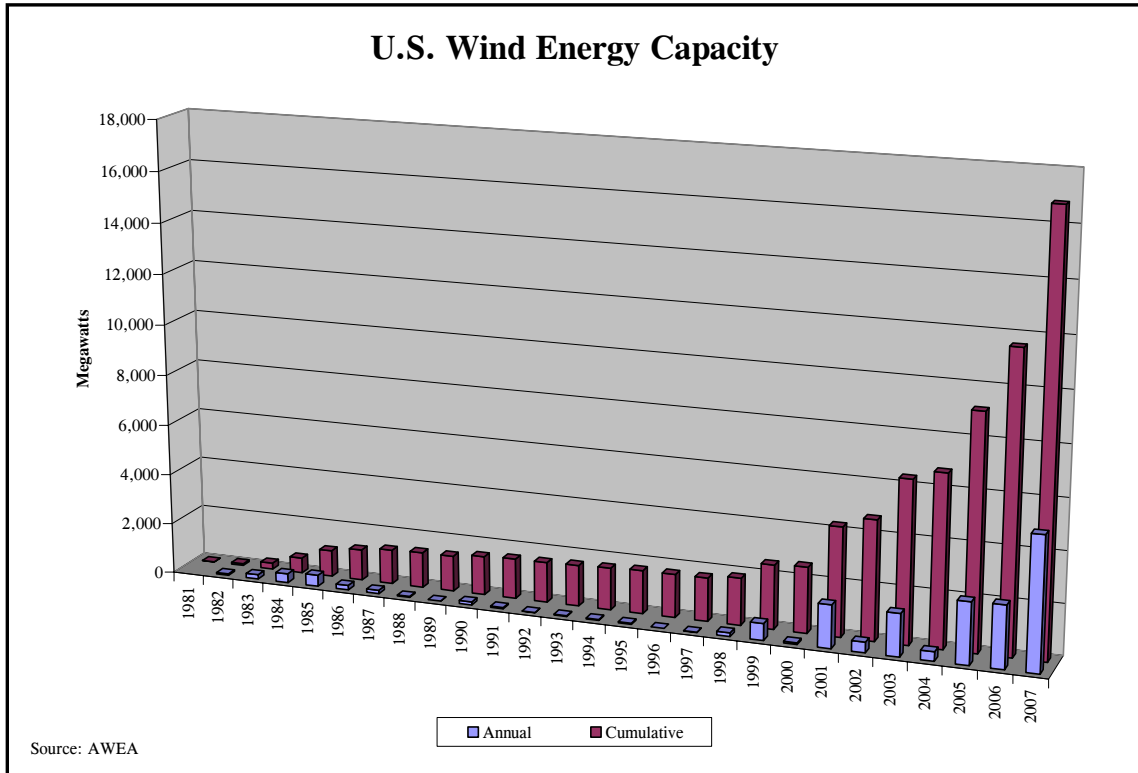


An average U.S. household uses about 10,655 kilowatt-hours (kWh) of electricity each year. One megawatt of wind energy can generate from 2.4 to more than 3 million kWh annually. Therefore, a megawatt of wind generates about as much electricity as 225 to 300 households use. The 18,000 MW of total wind energy in the country could supply 4.0 to 5.4 million households. It is important to note that since the wind does not blow all of the time, it cannot be the only power source for that many households without some form of storage system.

One factor that has greatly affected the amount of new wind energy capacity in recent years is the federal Renewable Electricity Production Tax Credit (PTC) for wind energy. This allows utility-scale wind turbine owners to take a 2 cent per kilowatt-hour tax credit against their federal income taxes. This credit has significantly impacted the development of new wind energy projects. As can be seen in Chart 2, in years

following the years that the tax credit has been allowed to lapse (2000, 2002, and 2004), investments in new wind energy capacity has been curtailed drastically.

CHART 2. U.S. Wind Energy Capacity



Wind Energy Capacity by State

Though small scale wind mills have been around for hundreds of years, large-scale “wind farms” began being developed in California in the late 1970’s and early 1980’s. Today, 34 states have at least 1 MW of wind energy capacity. As of 2007, Texas had the largest amount of installed wind energy capacity at 4,356 MW. California had the second highest amount at 2,439 MW. Minnesota (1,299 MW), Iowa (1,273), and Washington (1,163 MW) rounded out the top five. Illinois had the 7th highest amount at 699 MW, which was a huge increase over 2006 when it had only 107 MW. At 592 MW, Illinois installed the 3rd highest amount of wind energy capacity in 2007 behind Texas (1,618) and Colorado (776 MW). Chart 3 illustrates wind energy capacity around the country.

Chart 4 shows a map of the United States’ wind resources based on wind studies conducted by the National Renewable Energy Laboratory, a part of the U.S. Department of Energy. One point that stands out on this map is that much of the

countries wind resources are located offshore. Offshore wind energy generation is a developing technology that is in early development stages and beyond the scope of this report. Much of the land based wind resources are in the Great Plains region and in more mountainous terrains in the western and eastern portions of the country. The southeast portion of the country does not appear to have many wind resources though detailed studies in some of these states have not been conducted.

CHART 3. Wind Energy Generation Capacity by State

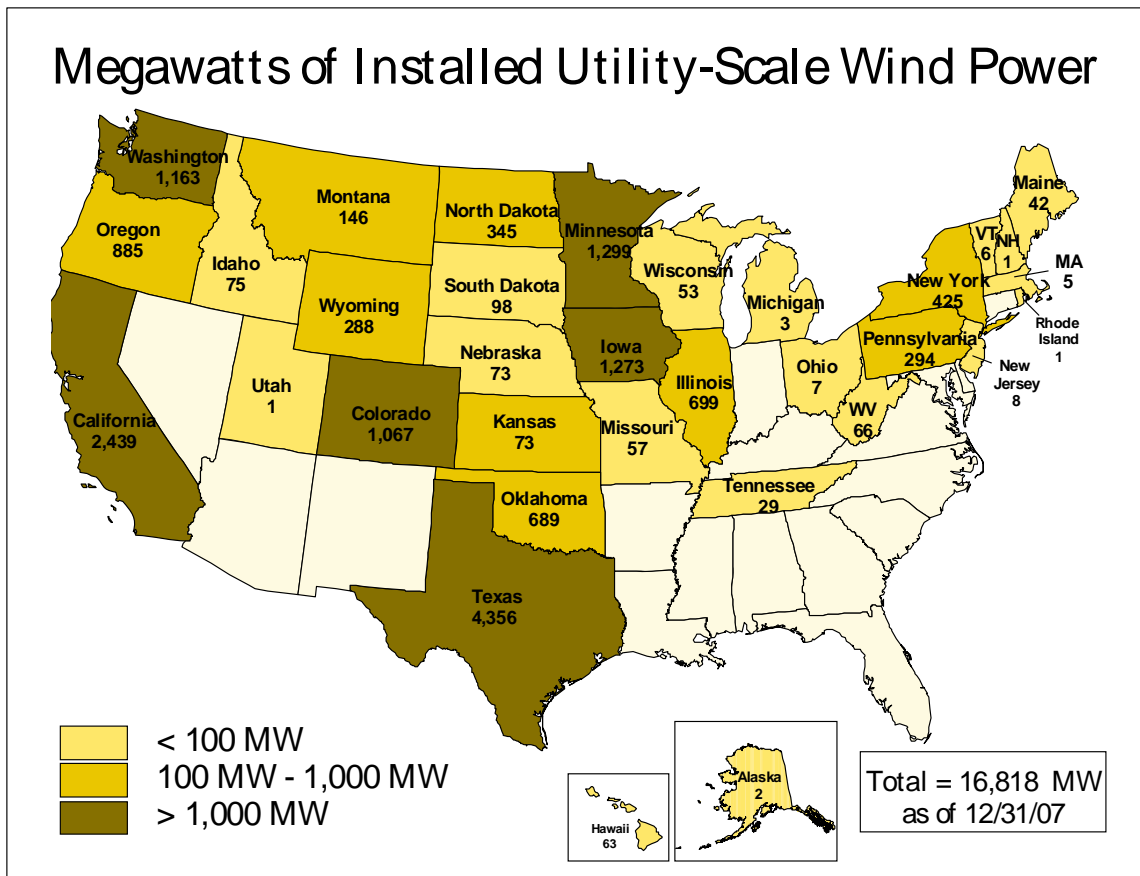
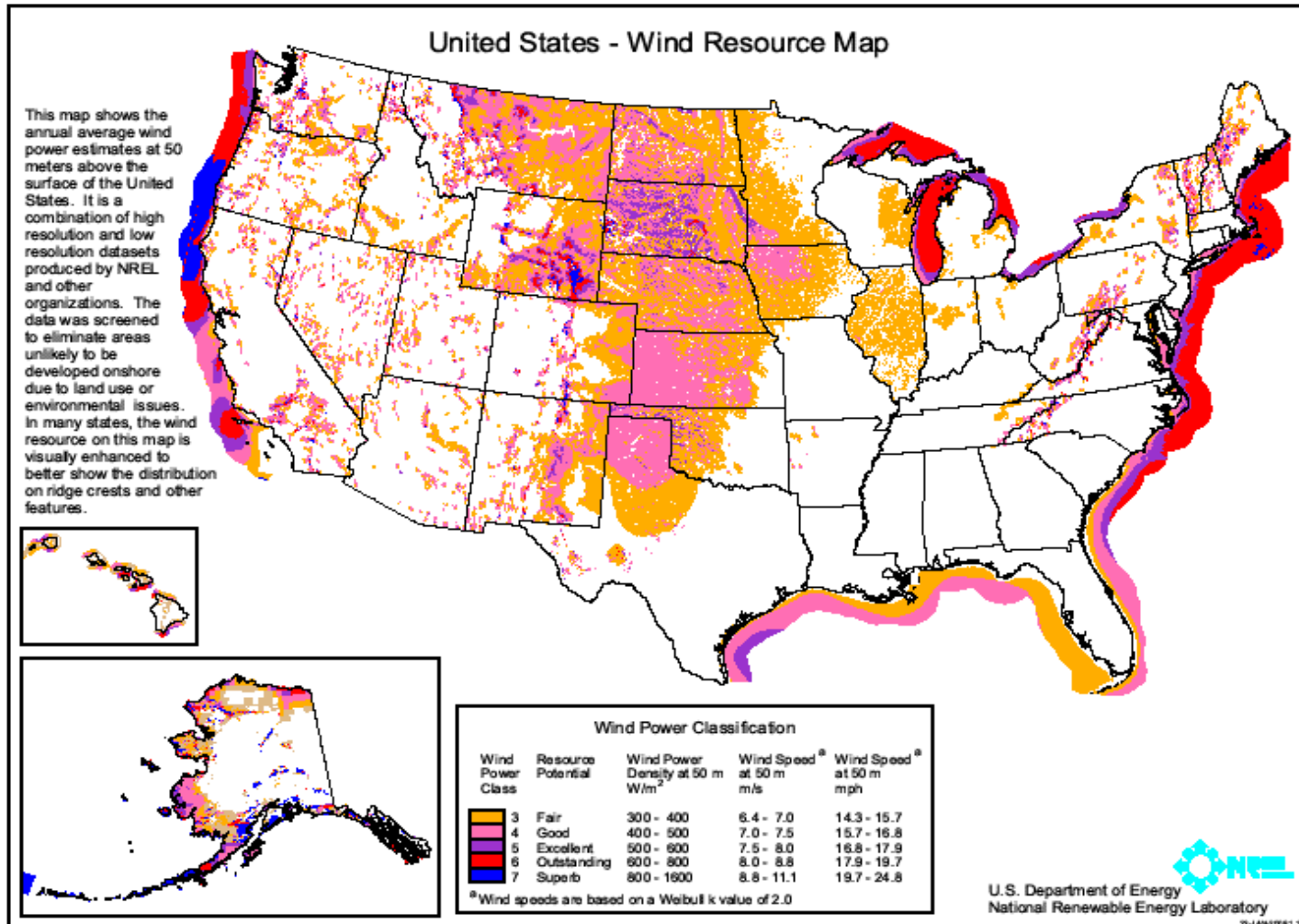


CHART 4. Wind Resources in the United States



Wind Energy in Illinois

As of April 2008, Illinois had approximately 735 MW of wind energy capacity, the majority of which was located at six wind farms located around the state. The largest wind farm is the Twin Groves I and II wind farms located in McLean County which came online in 2007 and 2008. The wind farms each have 120 turbines that total 198 MW in total capacity. Other major wind farms include Camp Grove Wind Farm (150 MW), GSG Wind Farm (80 MW), Crescent Ridge (54.45 MW), and Mendota Hills (50.4 MW).

In addition to the existing projects, the Illinois Department of Commerce and Economic Opportunity (DCEO) has indicated that four other projects are currently being constructed. These projects include a 72 MW project in Bureau County developed by Community Energy called Providence Heights. Midwest Wind Energy is currently developing two projects in Illinois. The first project is called Big Sky Wind Farm which will be a 239 MW wind farm in Lee and Bureau Counties when completed. The other project will be Crescent Ridge II which will be a 74 MW farm also in Bureau County.

Considerable growth by the wind energy industry appears to be on the horizon for Illinois. Over 35 wind projects are currently being proposed in Illinois. These projects are in the planning stages and have been compiled by the DCEO based on newspaper accounts and discussion within the industry. These projects may never go beyond the planning stage but are presented here to highlight the high level of interest by the industry. This high level of interest is largely due to Illinois' available transmission capacity, which can be problematic in other areas of the country where transmission lines can be scarce. A list of these proposed wind projects in Illinois can be seen in Table 2.

TABLE 1. Existing Illinois Wind Energy Projects

Existing Illinois Wind Energy Projects						
Name	County	Capacity (MW)	Units	Owner	Power Purchaser	Year Online
Twin Groves II (08)	McLean	36.3	22	Horizon Wind Energy	Constellation Energy	2008
Camp Grove Wind Farm	Marshall & Stark	150	100	OEG (Orion Energy Group)	AEP-Appalachian Power	2007
Twin Groves II (4Q07)	McLean	161.7	98	Horizon Wind Energy	Constellation Energy	2007
GSG Wind Farm	Lee and LaSalle	80	40	Babcock & Brown	N/A	2007
Sustainable Technologies Museum	Lee and LaSalle	2.5	1	GSG 3, LLC	ComEd	2007
Twin Groves I	McLean	198	120	Horizon Wind Energy	N/A	2007
Crescent Ridge	Bureau	54.45	33	Babcock & Brown/Eurus	Exelon	2005
Illinois Rural Electric Cooperative	Pike	1.65	1	Illinois Rural Electric Cooperative	Electric Cooperative	2005
Bureau Valley School District	Bureau	0.66	1	Bureau Valley School District	Bureau Valley School District	2004
Mendota Hills	Lee	50.4	63	Babcock & Brown	Exelon	2003

Source: AWEA

TABLE 2. Proposed Wind Projects in Illinois

Proposed Wind Projects in Illinois			
Project	Developer	County	MW
Baileyville Wind Farm	Navitas Energy	Ogle	80
AgriWind	AgriWind, LLC	Marshall	8.4
Grand Ridge Energy Center	Invenergy Wind LLC	La Salle	100
White Oak Energy Center	Invenergy Wind LLC	McLean	200
Lancaster Farm	Navitas Energy	Stephenson	70
Oak Prairie Wind Farm	EcoEnergy LLC	Jo Daviess	10.5
GSG6 Wind	FPC Services	Lean and LaSalle	120
Boone Heritage Wind Farm	Gutrie Wind, LLC	Boone	4.95
Pike County Wind Energy	Rabe Winds, LLC	Boone	100
Benson Wind	Navitas Energy	Woodford	160
Boone Heritage Wind Farm	Rabe Winds, LLC	Boone	6.6
Stewardship Energy	Stewardship Energy, LLC	McLean	9.9
Stewardship Energy II	Stewardship Energy, LLC	Marshall	20
Alexis Wind Farm	BP Alternative Energy	Warren	200
Blackstone Wind Farm	Horizon Wind Energy	Livingston	500
Abingdon Wind Farm	Abingdon Wind Consortium	Knox	8.75
Rail Splitter Wind Farm	Horizon Wind Energy	Logan and Tazewell	100
Hillcrest Wind Farm	BP Alternative Energy	Henry	100
Unnamed	BP Alternative Energy	Knox	100
Unnamed	BP Alternative Energy	Ford	60
Galva/Kewanee Wind	CPV Wind Ventures LLC	Henry	125
Wind Spring Creek	CPV Wind Ventures LLC	Henry	200
EcoByrn Windfarm	EcoEnergy LLC	Lee	100
EcoChelle Windfarm	EcoEnergy LLC	Lee	10
EcoGrove Wind LLC	EcoEnergy LLC	Stephenson	100
EcoGrove Wind LLC	EcoEnergy LLC	Stephenson	200
EcoRock Windfarm	EcoEnergy LLC	Hancock	100
Boone County	enXco Inc.	Boone	126
Whistling Wind Project	Horizon Wind Energy	Stephenson	130
Illinois State University Wind	Illinois State University	McLean	1.5
Mercer County Wind	Invenergy Wind LLC	Mercer	150
Pleasant Ridge Wind Farm	Invenergy Wind LLC	Livingston	266
Unnamed	Invenergy Wind LLC	Knox and Henry	500
El Paso Wind	Navitas Energy	Woodford	80
Mattoon Wind Farm	Navitas Energy	Shelby	80
Cayuga Ridge	PPM Energy	Livingston and LaSalle	600
Unnamed	PPM Energy	Unspecified	300
University of Illinois Wind	University of Illinois	Champaign	4.5
Walnut Ridge	Midwest Wind Energy	Bureau	315

Source: DCEO

III. Wind Energy's Benefits and Government Actions

Wind energy has expanded greatly in recent years. This expansion is largely due to political backing brought forth by both Federal and State governments. Governments have seen wind energy as an energy source that is both environmentally friendly and as a way to revitalize economies in rural areas that have been lagging in recent decades. This section will discuss the environmental and economic impacts of wind energy and the legislative efforts at both the Federal level and in the State of Illinois that have encouraged this expansion.

Environmental Impacts

Wind energy is considered economically friendly because it is a renewable resource. Renewable resources are defined by Webster's as any natural resource (such as wood or solar energy) that can be replenished naturally with the passage of time. The AWEA points out that wind energy generation doesn't involve the use of mining, drilling, transportation of fuel, or water usage, and does not generate radioactive or other hazardous or polluting waste. It was also estimated by the Midwest Independent System Operator (MISO) that the release of approximately 1,300 pounds of carbon dioxide, a greenhouse gas, are avoided for every mega-watt-hour of wind generation².

Economic Impacts

The economic impacts of the building of a wind farm are felt both in the construction and operational phases of the project. A case study by researchers at Northern Arizona University estimated the economic results of the construction of wind farms of various sizes in two northern Arizona counties, Coconino County and Navajo County. The case study found that economic activity increased by \$10.29 - \$12.43 million during the construction phase in Coconino County and by \$9.91 - \$12.51 million in Navajo County. Economic activity would increase between \$0.74 and \$1.00 million per year during the operation and maintenance phase in Coconino County. Navajo County was thought to have increased activity of \$1.24-\$1.67 million per year. A median estimate of 142 and 152 additional jobs were created during the construction phase, while full-time equivalent jobs equaled 29 and 26³.

In its Wind Energy Fact Sheet entitled "Wind Energy: The Difference Wind Makes", the AWEA highlights several empirical examples of the local economic benefits of wind

² American Wind Energy Association, "The Difference Wind Makes."
http://www.awea.org/pubs/factsheets/The_Difference_Wind_Makes.pdf

³ Williams, Susan K., Tom Acker, Marshall Goldberg, and Mega Greve. 2008. Estimating the Economic Benefits of Wind Energy Projects Using Monte Carlo Simulation with Economic Input/Output Analysis. *Wind Energy*. Published online in Wiley Interscience.

farms. In New York, the 322-MW Maple Ridge Wind Farm adds over \$8 million in property tax revenue and \$1.65 million in lease payments each year. In the State of Washington, it was estimated that with the 1,000 MW of installed wind capacity over 2,600 construction jobs and 400 long-term jobs were created. Additional local jobs are created in industries that supply turbine components to the wind energy industry like the recent opening of the Trinity Structural Towers plant in Clinton, Illinois⁴.

Government Support of Wind Energy

Government backing of wind energy has had a significant role in the high growth rates in recent years. Governments at the Federal, State, and Local levels have taken steps to encourage investment in wind energy. These steps have included tax credits, research funding, energy standards, development grants and loans, and inclusion in tax increment financing (TIF) districts. A few examples of these include the Renewable Electricity Production Tax Credit (PTC), the Wind and Hydropower Technologies program, state renewable portfolio standards, the Illinois Wind Energy Development Grant Program, and net metering requirements.

Renewable Electricity Production Tax Credit (PTC)

The Renewable Electricity Production Credit (PTC) is a per kilowatt-hour tax credit for electricity generated by qualified energy resources. Enacted as part of the Energy Policy Act of 1992, the credit expired at the end of 2001, and was subsequently extended in March 2002 as part of the Job Creation and Worker Assistance Act of 2002 (H.R. 3090). The tax credit then expired at the end of 2003 and was not renewed until October 2004, as part of H.R. 1308, the Working Families Tax Relief Act of 2004, which extended the credit through December 31, 2005. The Energy Policy Act of 2005 (H.R. 6) modified the credit and extended it through December 31, 2007. In December 2006, the credit was extended for yet another year (through December 31, 2008) by Section 201 of the Tax Relief and Health Care Act of 2006 (H.R. 6111). An extension of the tax credit is currently being worked on but has not been able to pass in the U.S. Senate.

As mentioned previously, the PTC is a major factor in wind energy development. As analyst Stow Walker of Cambridge Energy Research Associates stated to USA Today, “The main reason for the robust growth is a federal tax credit of 2 cents per kilowatt hour of energy produced. The tax credit lowers a developer's costs to about 7 cents per kilowatt hour, placing wind costs on par with coal-fired plants.” The inconsistent manner in which this credit has been implemented has led to high levels of variability in wind energy investment in recent years as highlighted in Chart 2.

⁴ American Wind Energy Association, “The Difference Wind Makes.”
http://www.awea.org/pubs/factsheets/The_Difference_Wind_Makes.pdf

REPC now applies to the following resources:

- wind
- closed-loop biomass
- open-loop biomass
- geothermal energy
- small irrigation power (150 kW - 5 MW)
- municipal solid waste
- landfill gas
- refined coal
- hydropower
- Indian coal

The PTC provides a tax credit of 1.5¢/kWh (in 1993 dollars and indexed for inflation) for wind, closed-loop biomass and geothermal. Currently, the PTC for these technologies is 2.0¢/kWh. Electricity from open-loop biomass, small irrigation hydroelectric, landfill gas, municipal solid waste resources, and hydropower receive half that rate -- currently 1.0¢/kWh.

The duration of the credit is 10 years. However, open-loop biomass, geothermal, small irrigation hydro, landfill gas, and municipal solid waste combustion facilities placed into service after October 22, 2004, and before enactment of EPAct 2005, on August 8, 2005, are eligible for the credit for a five-year period. Refined-coal facilities will receive \$4.375 per ton (indexed for inflation) for a 10-year term. Indian coal production facilities will receive an increase in tax credit during the seven-year period beginning January 1, 2006, in the amount of \$1.50/ton through 2009, and \$2.00/ton after 2009⁵.

“The main reason for the robust growth (in wind energy) is a federal tax credit of 2 cents per kilowatt hour of energy produced”

**Stow Walker
Cambridge Energy Research Associates**

⁵ Database of State Incentives for Renewables & Efficiency,
http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=US13F&State=Federal%C2%A4tpageid=1

Wind and Hydropower Technologies Program

The Wind and Hydropower Technologies Program is a research funding program administrated by the U.S. Department of Energy (DOE). The Wind and Hydropower Technologies Program is leading the Nation's efforts to improve wind energy technology so that it can generate competitive electricity in areas with lower wind resources, and to develop new, cost-effective, advanced hydropower technologies that will have enhanced environmental performance and greater energy efficiencies.

Through program-sponsored research and development activities, the Wind and Hydropower Technologies Program enables greater use of two abundant domestic resources for electric power generation, helping stabilize energy costs, enhancing energy security, and improving our environment.

Competitively selected, cost-shared research and development projects with industry, performed in partnership with federal, state, industry, and other stakeholder groups, are the primary mechanisms for program execution.

Most wind energy research is carried out at world-class facilities located at DOE's National Wind Technology Center at the National Renewable Energy Laboratory, in cooperation with Sandia National Laboratories. Hydropower research is conducted at Idaho National Energy and Environmental Laboratory, Oak Ridge National Laboratory and Pacific Northwest National Laboratory.

Illinois' Renewable Portfolio Standard

In August 2007, Illinois enacted legislation (Public Act 095-0481) creating the Illinois Power Agency. The purpose of this agency is to develop electricity procurement plans for state utilities supplying over 100,000 Illinois customers to ensure “adequate, reliable, affordable, efficient, and environmentally sustainable electric service at the lowest total cost.” The Agency is charged with competitively procuring energy supply according to the plans (as appropriate), and with meeting a renewable portfolio standard of 25% by 2025 according to the following schedule:

- 2% by June 1, 2008
- 4% by June 1, 2009
- 5% by June 1, 2010
- 6% by June 1, 2011
- 7% by June 1, 2012
- 8% by June 1, 2013
- 9% by June 1, 2014
- 10% by June 1, 2015
- 11.5% by June 1, 2016
- 13% by June 1, 2017
- 14.5% by June 1, 2018
- 16% by June 1, 2019

- 17.5% by June 1, 2020
- 19% by June 1, 2021
- 20.5% by June 1, 2022
- 22% by June 1, 2023
- 23.5% by June 1, 2024
- 25% by June 1, 2025

According to the Act, a minimum of 75% of the renewable energy must come from wind power, and the remaining amount (25%) can come from other eligible renewables. These resources include solar thermal (both heat and electricity), photovoltaics, dedicated crops grown for energy production, untreated and unadulterated organic waste biomass, trees and tree trimmings, in-state landfill gas, biodiesel, hydropower that does not involve the construction of new dams or significant expansion of existing dams, and "other such alternative sources of environmentally preferable energy," which may include (among other resources) waste heat from industrial processes. Several means of energy production are specifically excluded from standard eligibility: the incineration of tires; garbage; general household, institutional and commercial waste; industrial or office waste; railroad ties; utility poles; landscape waste other than trees and tree trimmings; and construction or demolition debris other than untreated and unadulterated waste wood.

The Act permits renewable energy to be procured either through energy bundled with renewable energy credits, or through the purchase of tradable renewable energy credits on their own. Utilities must retire credits that they use for compliance⁶.

Illinois Wind Energy Development Grant Program

The focus of the Wind Energy Development Grant Program, through the Renewable Energy Resources Program, is to support the development of utility scale wind projects with a nameplate capacity greater than 0.5 MW. Projects that develop and expand wind energy production in Illinois thereby increasing domestic renewable energy production, while improving the economy of the state through new business development are being targeted.

Under the Wind Energy Production Development Program, the Department of Commerce and Economic Opportunity may provide a \$25,000 grant award to support the development of utility scale wind projects with a nameplate capacity greater than 0.5 MW. Eligibility is limited to the development of business plans, engineering designs and drawings, advanced market studies and financial analyses, technical assistance, development of educational and informational materials, dissemination of information, and other business development activities.

⁶ Database of State Incentives for Renewables & Efficiency,
http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=IL04R&state=IL&CurrentPageID=1&RE=1&EE=0

Net Metering (P.A. 95-0420)

Illinois enacted S.B. 680 in August 2007, requiring investor-owned utilities in Illinois to begin offering net metering by April 1, 2008. In May 2008 the Illinois Commerce Commission (ICC) adopted final rules for net metering, effective May 15, 2008.

In Illinois, net metering is available to electric customers that generate electricity using solar energy, wind energy, dedicated energy crops, anaerobic digestion of livestock or food processing waste, hydropower, and fuel cells and microturbines powered by renewable fuels. Systems up to 40 kilowatts (kW) in capacity that are intended primarily to offset the customer's own electrical requirements are eligible.* While Illinois's investor-owned utilities must offer net metering, the state's municipal utilities and electric cooperatives are generally not required to do so⁷.

Other Illinois Wind Energy Programs and Regulations

- Renewable Energy Resources Trust Fund
- Green Power Purchasing
- Commercial Wind Energy Property Valuation

⁷ Database of State Incentives for Renewables & Efficiency,
http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=IL13R&state=IL&CurrentPageID=1&RE=1&EE=0

IV. Steps to Building a Wind Farm

Below are 10 steps to developing a wind farm produced by the AWEA⁸. Some of the data in this fact sheet appears to be dated though the general information still applies, updated numbers are provided in parenthesis when available.

10 Steps to Building a Wind Farm

1. Understand Your Wind Resource

The most important factor to consider in the construction of a wind energy facility is the site's wind resource. A site must have a minimum annual average wind speed in the neighborhood of 11-13 mph to even be considered. Local weather data available from airports and meteorological stations may provide some insight as to averages. You can also check the wind maps for your state on the National Renewable Energy Laboratory Web site, at <http://rredc.nrel.gov/wind/pubs/atlas/>. In time; you will want to install your own monitoring devices to record the site's wind characteristics.

2. Determine Proximity to Existing Transmission Lines

A critical issue in keeping costs down in building a wind farm is minimizing the amount of transmission infrastructure that has to be installed. High voltage lines can cost thousands of dollars per mile. (An article from the USA Today on 2/26/08 cited high voltage line cost at \$1.5 million per mile.) Whenever possible, availability and access to existing lines should be considered in selecting a site.



⁸ American Wind Energy Association. 10 Steps to Developing a Wind Farm Fact Sheet. http://www.awea.org/pubs/factsheets/10stwf_fs.PDF

3. Secure Access to Land

Landowners, both private and public, will expect to be compensated for any wind energy development that occurs on their land. Royalty or lease agreements will need to be discussed with all parties involved. Roads, transmission equipment, maintenance infrastructure, turbines, and the like all need to be considered. Moreover, the construction of a wind farm necessitates the use of heavy industrial equipment. Developers will need to invest in roads capable of accommodating significant weight. To do so will require the cooperation of landowners and, in some case, the local community.

4. Establish Access to Capital

Building a wind farm is not cheap. On average, wind power development costs around \$1 million per megawatt of generating capacity installed. To take advantage of economies of scale, wind power facilities should be in excess of 20 MW. Assuming the average turbine is rated at 750 kilowatts (kW) in capacity, this means at least 26 turbines and an initial investment of \$20 million.

(In the first quarter of 2008, 1,479 MW of capacity was added to the U.S. market from 955 turbines. This averages to 1.55 MW of capacity per turbine. The average size of the wind projects was 61.6 MW, which would equate to approximately 40 turbines. Investment costs in wind turbines has risen to over \$2.1 million per MW recently, which would mean that a 61.6 MW wind project would cost over \$129 million)

5. Identify Reliable Power Purchaser or Market

To date, wind energy is the most cost competitive renewable energy option on the market. In fact, wind energy's cost has declined so much that it rivals many traditional power generation technologies. However, utilities will tend to purchase power from what they consider to be the cheapest and most reliable technology. In most cases today, that is natural gas. That does not mean there is not a market for wind, though. Demand for "green power" (electricity from clean sources like wind that is sold to customers at a premium price) and environmental requirements are creating buyers for wind energy and competitive rates. Before investing thousands of dollars into wind resource assessments, permitting, and pre-construction activities, a developer will secure tentative commitments from one or more buyers for the wind plants output over 10 to 30 years of its operational lifetime.

6. Address Siting and Project Feasibility Considerations

The fact that a site is windy does not mean it is suitable for wind power development. A developer needs to consider many factors in siting a project. Is there high raptor activity in the area? Are there endangered or protected species that could be jeopardized by the presence of the facility? Is the site's geology suitable and appropriate for industrial development? Will noise and aesthetics be issues for the local community? Will the turbines obstruct the flight path of local traffic? There are quite a few environmental and social issues that will need to be addressed in the siting of a wind power facility. Wind farms can make great neighbors, but it is the obligation of the developer to work to ensure that a project proceeds in a fashion that is acceptable to regulators and the local community.

7. Understand Wind Energy's Economics

There are many factors contributing to the cost and productivity of a wind plant. For instance, the power a wind turbine can generate is a function of the cube of the average wind speed at its site, which means that small differences in wind speed mean large differences in productivity and electricity cost. Additionally, the swept area of a turbine rotor is a function of the square of the blade length (the radius of the rotor's swept area). A modest increase in blade length boosts energy capture and cost-effectiveness. Financing methods can make a major difference in project economics as well. Securing significant investment capital or joint ownership of a project can cut costs significantly. Furthermore, there are federal and state incentives for which a project may qualify and which could reduce costs and encourage more favorable investment.

8. Obtain Zoning and Permitting Expertise

Siting any power project can be a daunting task due to the dizzying array of social and environmental factors at play. A wind power developer would be well served to obtain the services of a professional familiar with the regulatory environment surrounding wind power development. Additionally, legal counsel familiar with the local political climate may be able to help navigate the permitting process.

9. Establish Dialogue with Turbine Manufacturers and Project Developers

Every wind turbine is different despite seemingly similar power ratings. Some machines are designed to operate more efficiently at lower wind speeds, while others are intended for more robust wind regimes. A prospective wind power

developer would be wise to investigate all the various considerations and compare the performance of existing machines. Moreover, anecdotal information and even the professional services of wind power developers may prove helpful.

10. Secure Agreements to Meet Operation and Maintenance Needs

Wind turbine technology has made great strides in the recent years. Today's machines are more efficient and cost-effective than ever. However, they are also more complex. Turbine availability (reliability) is a major factor in project success, and the services of professionals familiar with the operation and maintenance of wind turbines can prove to be invaluable. Also, turbine manufacturers may offer more favorable product guarantees knowing that qualified project operators will be on site to maintain the equipment.

IV. Local Issues Related to Wind Energy

Wind energy developers always face local issues when developing new projects. Issues related to wildlife, noise, aesthetics, shadow flicker, and N.I.M.B.Y.ism create obstacles that developers must overcome to successfully develop a new wind farm. This section will briefly discuss each of these topics.

Wildlife

One issue that often arises when building a new wind farm is the potential affect on local wildlife. The development of wind farms necessitates the building of new roads and other infrastructure in areas that were previously undeveloped. This changes the habitat of any wildlife living in the area.

One case in point that is often pointed to is the affect to migratory birds at the Altamont wind farm in California. The Altamont Pass is known for high winds and is on an important bird-migration route. The California Energy Commission found that 880 to 1,300 raptors were killed at Altamont every year. To avert legal proceedings, the owners of the wind farm agreed to shut down half of their turbines for four months of the year.

Wind energy proponents argue that bird kills related to wind farms is very insignificant. They point to research on bird mortality that shows that for every 10,000 birds killed by human activities, less than one death is caused by a wind turbine, while buildings/windows are responsible for 5,500 deaths. This issue is most likely not as large of an issue in Illinois as wildlife habitat has already been significantly affected by the conversion of a large percentage of the State's acreage to agricultural purposes previously.



Noise

Another issue that is brought up in trying to stop the development of wind projects is that wind turbines are noisy. Wind energy proponents claim that an operating modern wind farm at a distance of 750 to 1,000 feet is no noisier than a kitchen refrigerator or a moderately quiet room. Industry studies estimate wind turbine noise levels to be around 45 decibels.

They do acknowledge that two situations can occur where wind farms can be louder. The first situation is when older turbines are in operation. Older turbines from the 1980's tended to be louder. The other situation occurs in hilly terrain with modern turbines. Homes located in sheltered dips or hollows downwind from a wind farm could experience a noisier environment due to noise carrying further. The second situation can often be anticipated and avoided in the development process through adequate setbacks.

Aesthetic

Some opponents find the thought of dozens of wind turbines to be an eyesore on the landscape. Other people find a wind farm to be beautiful. This complaint is somewhat subjective. One thing that developers can do is to virtually depict what the finished wind farm will look like from different vantage points to allow local stakeholders to assess the situation prior to development.

Another aesthetic problem is lighting on wind turbines. The Federal Aviation Administration (FAA) recommends lighting for most structures more than 200 feet in height to ensure aviation safety. This lighting can be irritating to some people. The wind industry is currently working with the FAA on lighting setups that would limit the amount of lights needed for a given wind project.

Shadow Flicker

Shadow flicker is the term used to describe what happens when rotating turbine blades come between a viewer and the sun, causing a moving shadow. Shadow flicker can be annoying to people trying to read or watch television. In the U.S., shadow flicker should not be a problem as the sun's angle is not very low in the sky due to the U.S.'s latitude (except in Alaska). This problem is rare today due to better project planning and larger setbacks. If there is an affect, it is generally for a few hours total over a year's time.

N.I.M.B.Y.ism

N.I.M.B.Y. stands for **Not In My Back Yard**. N.I.M.B.Y.ism occurs when a new idea or plan is thought to be a good idea by the general population until it is decided to be developed in the area that the population lives. Renewable energy is generally thought to be a good idea by many Americans but often this opinion changes when a new project is planned in their area. To overcome this problem, developers need to take actions to keep local residents and communities fully informed. These actions need to be done early and often. The benefits of a wind farm are often seen as larger than the potential negatives but this process can be hindered if the local community feels that they are not being included in the process and that their voices are not being heard by the developers and the owners.

Other Issues

- Opponents claim wind turbines interfere with television and other communication signals, industry counter that this is rare and easily avoided
- Wind farms depress home values, proponents say this is unfounded
- Turbines are dangerous due to ice throws and blade throws, proponents reply that new designs have basically eliminated this problem

V. Wind Energy's Future

Wind energy's future appears to be bright. Annual growth rates of almost 30% over the last five years indicate that the industry has been growing by leaps and bounds. This growth could potentially be hindered if the Production Tax Credit is not renewed for 2009. Industry participants view the future as unlimited. Julius Steiner, CEO of Gamesa USA, declared that "The future horizons are truly limitless in terms of wind energy development in the U.S." Roby Roberts, Vice President of Government Relations for Vestas, agreed stating that "We believe that the U.S. is the world's greatest wind market."

The industry continues to conduct research to make wind energy more efficient. Governments continue to promote the industry through grant programs and subsidies. These efforts may lead to technological breaks in off-shore wind energy and more efficient land-based wind energy, which may lead to greater energy independence and a lessening affect on the environment by the American people. A recent study by the U.S. department of Energy found that a scenario where wind energy would achieve a 20 percent contribution to the U.S. electricity supply is feasible.

BACKGROUND

The Commission on Government Forecasting and Accountability (CGFA), a bipartisan, joint legislative commission, provides the General Assembly with information relevant to the Illinois economy, taxes and other sources of revenue and debt obligations of the State. The Commission's specific responsibilities include:

- 1) Preparation of annual revenue estimates with periodic updates;
- 2) Analysis of the fiscal impact of revenue bills;
- 3) Preparation of "State Debt Impact Notes" on legislation which would appropriate bond funds or increase bond authorization;
- 4) Periodic assessment of capital facility plans;
- 5) Annual estimates of public pension funding requirements and preparation of pension impact notes;
- 6) Annual estimates of the liabilities of the State's group health insurance program and approval of contract renewals promulgated by the Department of Central Management Services;
- 7) Administration of the State Facility Closure Act.

The Commission also has a mandate to report to the General Assembly ". . . on economic trends in relation to long-range planning and budgeting; and to study and make such recommendations as it deems appropriate on local and regional economic and fiscal policies and on federal fiscal policy as it may affect Illinois. . . ." This results in several reports on various economic issues throughout the year.

The Commission publishes several reports each year. In addition to a Monthly Briefing, the Commission publishes the "Revenue Estimate and Economic Outlook" which describes and projects economic conditions and their impact on State revenues. The "Bonded Indebtedness Report" examines the State's debt position as well as other issues directly related to conditions in the financial markets. The "Financial Conditions of the Illinois Public Retirement Systems" provides an overview of the funding condition of the State's retirement systems. Also published are an Annual Fiscal Year Budget Summary; Report on the Liabilities of the State Employees' Group Insurance Program; and Report of the Cost and Savings of the State Employees' Early Retirement Incentive Program. The Commission also publishes each year special topic reports that have or could have an impact on the economic well being of Illinois. All reports are available on the Commission's website.

These reports are available from:

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<http://www.ilga.gov/commission/cgfa2006/home.aspx>