

# WINDPOWER OUTLOOK 2006

## Wind Energy's Growing Power Boosts Economy, Environment, & Energy Security

After shattering previous records with more than 2,400 megawatts (MW) of wind energy installed in 2005 (generating enough electricity to serve the equivalent of more than 650,000 American homes), the industry is on course to bring on line over 3,000 MW in 2006. This year, wind farms across the country will generate an estimated 25 billion kilowatt-hours (kWh) of clean, domestic, stably-priced electricity, serving the equivalent of 2.3 million homes and strengthening America's economy, environment, and energy security.

Zero-emissions, renewable power technology is now affordable and feasible on a large scale thanks to wind energy. In the 1990s, natural gas was the preferred choice for new generation, as gas-fired plants were easily built, low-cost, and cleaner than other fossil fuels. Today, with shortages of natural gas driving up its price, the technology of choice for new power plants is often wind.

Wind energy's expansion reflects the effectiveness of the production tax credit (PTC), a popular federal incentive that rewards wind plant productivity and that of other renewable energy technologies, benefiting consumers and the economy. A two-year extension of the PTC was included in the Energy Policy Act of 2005, well before the credit's expiration date of December 2005. This continuity in the availability of the PTC has allowed companies to dramatically ramp up installations (see chart) at least through December 2007, when the credit is again set to expire.



Courtesy FPL Energy

**"I recognize the importance of wind power..."**

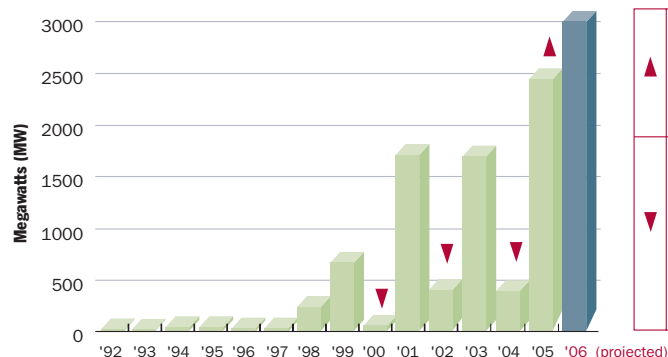
**It's possible we could generate up to 20% of our electricity needs through wind."**

**President George Bush**

With a stable incentive in place – as the current series of record-breaking years demonstrates – wind power's share in the nation's electricity supply could easily increase from less than 1% today to a level that is near that of conventional power sources. A steady planning horizon, and in particular a timely, long-term extension of the PTC, is needed for businesses to expand their wind energy operations in the years ahead.

Given America's enormous wind resource, wind energy's improving economics, and growing environmental awareness, the market could over time support new installations of 10,000 MW (serving the equivalent of 2.5 million homes) each year. The 20% level of contribution to the nation's electricity supply envisioned by President Bush in February 2006 is certainly achievable. Already, wind power is boosting energy security, reducing pollution, creating high-tech jobs, and revitalizing farms and rural communities in the vast, wind-rich American heartland.

### Annual Installed Wind Energy Capacity



▲ Continuity in the federal tax credit thanks to a timely extension ensures steady growth (2005, 2006)

▼ Expirations of the federal production tax credit (in 1999, 2001, 2003) wreak havoc on industry planning and cause drops in new installations (2000, 2002, 2004)

# Utilities Are Using More Wind Power

## Behind the thousands of

megawatts of wind energy now coming on line stand the utilities that, across the country, are purchasing or building this zero-emissions, stable-cost power for their customers.

In the Pacific Northwest, Puget Sound Energy completed the 150-MW Hopkins Ridge wind farm in 2005 and plans to build the 230-MW Wild Horse project in 2006. In the West and Midwest, Xcel Energy—already the country's largest buyer of wind power—announced its intention to increase its use of wind from about 1,100 MW in early 2006 to more than 2,300 MW by the end of 2007.

Iowa-based MidAmerican Energy Company, in addition to purchasing wind power, now owns and operates two wind projects completed in 2005, which together generate electricity for the equivalent of more than 100,000 homes. In Texas, utilities are purchasing the output from some 700 new megawatts built in 2005. In all, over 150 utilities, ranging from municipalities and co-ops to investor-owned utilities, now use some wind power.

Utilities' reasons for buying wind energy vary, but the benefits are clear:

▶ **Predictable electricity cost:** once a wind farm is built, the cost of the electricity it generates remains stable because there are no fuel price increases or volatility. Acquiring wind power allows utilities to lock in stable-priced electricity for as long as 20 years.

▶ **No pollution:** wind power is one of the most environmentally friendly forms of power generation.



Courtesy Iowa Lakes Community College

▶ **Customer preference and satisfaction:** surveys show overwhelming support for more wind power, even if it might increase rates.

**The wind power used by Xcel Energy on its Colorado system (PSCo) yielded a net \$9.75 million in savings in 2005.**

▶ **Insurance against environmental risk:** with zero-emissions wind power, there are no liability risks or costs associated with radiation, or with sulfur dioxide, nitrogen oxides, carbon dioxide, mercury, and other emissions—no matter how stringent environmental regulations may become.

▶ **Secure supply:** wind energy taps a domestic source of power, removing worries about the future supply of natural gas.

▶ **Rural economic development:** wind energy is a powerful economic engine for the American heartland, providing income for the farmers, ranchers, and communities that many utilities serve.

▶ **No water use:** to generate the same amount of electricity as one megawatt of wind power using either fossil fuels or nuclear technology requires 60 million gallons of water a year for cooling purposes, of which nearly 1 million are lost to evaporation. Where water conservation is important, wind has a clear advantage.

By contrast, operational issues involved with wind are typically modest. Wind forecasting can help utility system managers accommodate wind's natural variability. Integration costs vary with size of region, transmission rules and capacity, and flexibility of other generation sources, but are often easily offset by fuel savings. For example, the wind power used by Xcel Energy on its Colorado system yielded \$9.75 million in net benefits to the system in 2005, according to the company.

# Fuel-Free Economics: Savings for Consumers

## Because the price of wind is

always zero, the cost of wind power, once a wind farm is installed, is steady over time. Using more wind energy therefore insures against volatility in the price of natural gas and other fuels used for electricity generation.

Fuel costs have been rising: Natural gas (which accounts for about 18% of U.S. electricity generation) and oil (3%) have seen the most dramatic increases. Coal (50%) is entering a period of higher prices as well—even Powder River and Uinta Basin coal from Wyoming is expected to rise in price because of higher demand for its low sulfur content. The price of uranium for nuclear power generation has also increased considerably over the past five years. Platts, a major market analysis firm, “conservatively estimates that generating electricity from renewable sources can ultimately save consumers more than 0.5 cent/kWh by eliminating fuel price risk.” That is approximately 10% of wholesale electricity price.

Wind power development helps ease the natural gas shortage in particular (wind power often displaces gas-fired power because that is currently the most expensive). In 2006, U.S. wind farms will generate an estimated 25 billion kWh, saving over half a billion cubic feet of natural gas per day (0.5 Bcf/day). The U.S. currently burns about



Courtesy American Electric Power

13 Bcf/day for electricity generation, so wind power is already reducing natural gas used for power generation by about 5%.

Boosting wind power fivefold to 50,000 MW (about 3% of electricity supply) could help save about 3 Bcf/day, or about as much natural gas as the states of Colorado and Alaska produce today. Expanding wind power to 20% of U.S. electricity generation (the share envisioned by the President) would provide dramatic savings for customers and the entire economy, as well as create jobs, strengthen energy security, and reduce pollution. Rapid growth of wind power provides one of the most cost-effective supply-side solutions for our nation’s energy challenges.

# States Tackle Climate Change, Promote Renewable Energy

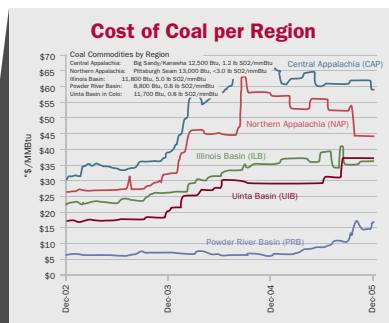
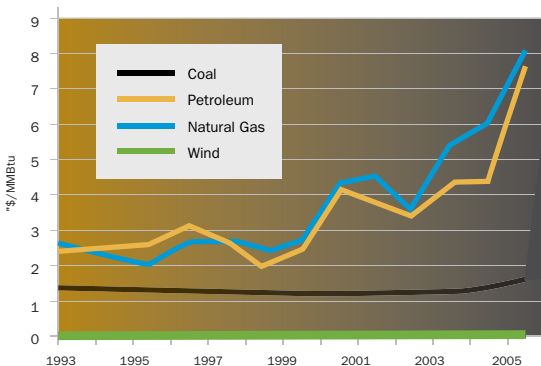
Many states, concerned about rising energy prices, pollution, and global warming, are taking the lead in promoting renewable energy. Wind power, a low-cost renewable, helps reduce the cost of achieving both clean air and global warming goals.

**Renewable energy:** As of early 2006, 20 states and the District of Columbia had adopted a “renewables portfolio standard” (RPS) requiring that utilities generate a minimum amount of electricity from renewable energy sources. The Texas RPS adopted in 1999 has been so successful that the state in 2005 increased the renewable energy requirement from 2,000 MW by 2009 - already nearly achieved - to 5,880 MW by 2015.

**Global warming:** In December 2005, seven northeastern states reached a landmark agreement to reduce global warming pollution from power plants. The Regional Greenhouse Gas Initiative (RGGI) aims to reduce emissions of carbon dioxide, the leading greenhouse gas, and to create the nation’s first multi-state emissions trading program for carbon dioxide. California has since moved to join this initiative. Using more wind power lowers the cost of achieving such global warming and pollution reduction goals.

**Clean air:** A group of 28 Eastern and Midwestern states will, under a broad new rule issued by the US Environmental Protection Agency in 2005, seek ways to reduce emissions of sulfur dioxide and nitrogen oxides (the primary cause of acid rain and smog) from power plants. Wind projects are eligible for clean air credits in some of these states. The Clean Air Interstate Rule (CAIR), when fully implemented, is expected to save 17,000 lives each year and prevent the loss of millions of workdays missed annually because of pollution-related heart attacks, asthma and other health problems.

## Cost for Fuel for Electric Utilities



Source: Federal Energy Regulatory Commission, Energy Information Administration

**Wind power helps protect against fuel price volatility**

# Bringing Wind Power to Market

## For wind energy to contribute

to U.S. electricity supply at or near the level of conventional power sources such as hydropower and natural gas, one of the major hurdles to overcome will be transmission to bring that wind power to market.

Two broad sets of steps are needed:

- ▶ “Using more of the grid”—adoption of efficient, non-discriminatory market rules at the national and regional levels; and
- ▶ “Getting more grid to use”—upgrades to existing lines and construction of major high-voltage lines from the wind-rich Great Plains to energy-hungry urban areas. Neither is an easy task, as the nation’s electric power markets are governed by a patchwork of regional rules and by electric industry practices that are often outdated.

The National Energy Policy Act of 2005 provides potentially helpful guidance in both areas.

- ▶ First, the Act requires that new utility system rules be “non-discriminatory.” This requirement should help ensure fair market access in a growing number of areas for wind and other new power technologies.
- ▶ Second, the Act provides incentives to encourage construction of new and upgraded transmission lines. To that effect, it directs the U.S. Department of Energy (DOE) to conduct a study of transmission congestion and designate “national interest electric transmission corridors.”



Courtesy Minnesota Department of Commerce

This classification is based on the need for reasonably priced electricity, the need to access more supply and diversify energy sources, and effects on energy independence, national defense and homeland security—all goals that accelerated wind energy development can help achieve.

The U.S. wind energy industry has also successfully completed a two-year effort to establish interconnection standards for utility-scale wind turbines. These standards, which are sometimes referred to as the wind energy “grid code,” ensure that the wind energy industry does its share to support electric system reliability. The standards were approved in late 2005 by the U.S. Federal Energy Regulatory Commission (FERC).

At the regional level, the rubber is already meeting the road. In the West, wind is part of the

new energy buzz: the Western Governors’ Association has issued renewable energy goals and a set of draft recommendations on how to improve transmission in the region. Efforts to include wind in transmission planning are also under way in the Western Area Power Administration, starting with a new transmission line between Colorado and Wyoming. In the East, which is primarily divided into large power pools that are less discriminatory toward new technologies, wind power projects are lining up for transmission access in New York and the Mid-Atlantic. The wind energy industry and allied groups are also active in the Midwest and Great Plains, California, Texas—all areas with huge wind energy potential whose level of development will largely be determined by transmission issues.



Courtesy Basin Electric

**Wind power development creates jobs and income, often in rural areas. Wind projects also contribute significantly to the local tax base, boosting funding for schools and other services.**

# Wind Energy: A Popular Energy Source

## **Public opinion surveys reveal**

strong support for wind power development. Americans are deeply concerned about the country's current energy policies and want to see government action to develop clean energy sources such as wind power, according to a national poll undertaken in May 2005 by Yale University. Almost nine out of ten Americans (87%) support expanded wind farms; and 86% want increased funding for renewable energy research. A poll conducted in early 2006 by the Opinion Research Corporation (ORC) tallied similar responses, and noted that "we don't see the party-line polarization that is so evident on many other national issues."

Eight out of every ten Vermonters (81%) would consider wind turbines on Vermont mountain ridges beautiful or acceptable, according to a January 2006 poll conducted by ORC Macro. This is a 12% increase from a 2002 poll that asked the same question, and shows that despite strident criticism from a small group of opponents, the overwhelming majority of Vermonters support wind energy development.



AP Images

**The wind turbines in Atlantic City, New Jersey, installed in 2005, are becoming "a helluva tourist attraction" according to Atlantic County Executive Dennis Levinson. Officials are planning a visitor center and overlook.**

In Nebraska, a rural poll taken in August 2005 showed rural residents strongly favor harnessing Nebraska's seemingly ceaseless winds: more than 70% of respondents agreed 10% of Nebraska's electricity should come from alternative energy sources. That widespread support for wind energy comes despite Nebraska's relatively low electric rates and the ready availability of coal.

Enthusiasm for wind energy is also now being voiced through Wind Energy Works!, a broad national coalition launched in 2005 by several organizations including AWEA ([www.windenergyworks.org](http://www.windenergyworks.org)). The coalition unites groups that support wind power development for its clean air, rural development, health, and other benefits. Wind Energy Works! has become the largest pro-wind alliance in the U.S., actively engaging in the public conversation over the merits of wind energy and acting as a counterbalance to the misinformation spread by opponents. Coalition members include a diverse array of national, regional and local agricultural, economic development, environmental, and faith-based advocacy groups.

## Green Power Programs: Sold Out!

### **Homeowners, businesses,**

municipalities and other electricity customers are eagerly purchasing wind and renewable energy from "green power" programs—especially if the product is exempt from fuel increase surcharges and allows them to lock in the stable price of wind power.

In the West and Midwest, utility Xcel Energy signed up 15 times more Windsource customers and chalked up a waiting list of more than 1,100 after

receiving publicity about the fact that the price for its wind power product - which does not reflect fuel price surcharges - would dip below that of conventional electricity due to higher natural gas prices. Other utilities with popular, fixed-price, largely wind-based green power programs include Austin Energy, OG&E in Oklahoma, and We Energies in Wisconsin.

The number of large companies, organizations, and agencies purchasing

green power also continues to grow: the Starbucks coffee chain announced a large wind power purchase in 2005, and in early 2006 the grocery chain Whole Foods Market purchased wind power for 100% of its operations. According to the EPA Green Power Partnership, as of January 2006, the U.S. Air Force was the largest purchaser of green power, followed by Whole Foods, the U.S. Environmental Protection Agency, Johnson & Johnson, and the U.S. Department of Energy.

# Wind Energy: Committed to Environmental Stewardship

## Wind energy is beneficial for

wildlife because it does not emit any pollutants. There is no need to mine, drill, or transport fuel for electricity generation, or to dispose of radioactive or other hazardous byproducts. But beyond the built-in advantage of its product, the U.S. wind energy industry continues to focus on environmental performance. Stewardship highlights from 2005 include:

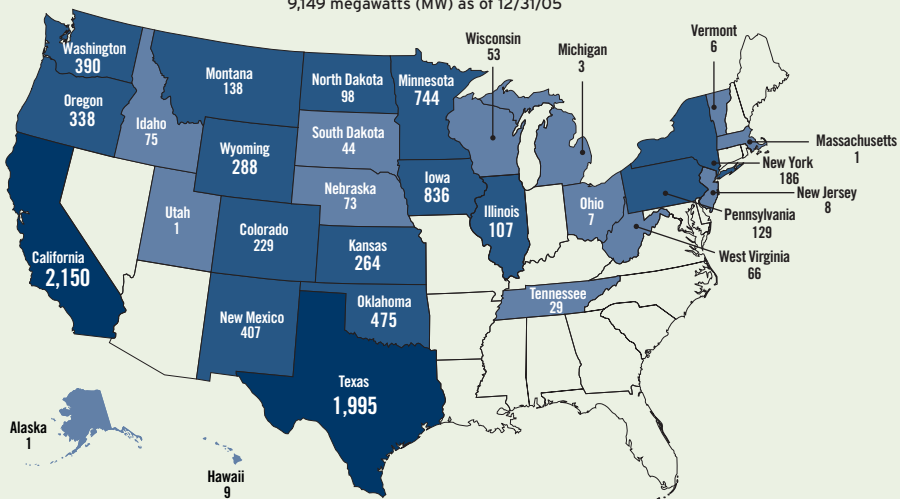
- ▶ Commitment to researching solutions to bat collisions with wind turbines through the Bats & Wind Energy Cooperative (BWEC). In 2004, the industry began working in collaboration with the U.S. government and the world's leading bat conservation organization to study bat behaviour at some newly-constructed wind farms. BWEC's ongoing research is testing ways to prevent and reduce fatalities where they might occur.

- ▶ Bureau of Land Management (BLM) Best Management Practices to ensure responsible wind energy development on BLM lands. As part of its biological opinion to BLM, the U.S. Fish & Wildlife Service found that the nine species identified that could be affected would not suffer significant adverse impacts, allowing BLM "to significantly expand its

**A clean energy source such as wind, that produces no air pollution, no global warming pollution, and no waste, and requires no mining or drilling, is tremendously valuable to our society and beneficial to the environment.**

## U.S. Installed Wind Power Capacity

9,149 megawatts (MW) as of 12/31/05



Wind farms will generate an estimated 25 billion kWh in 2006 (about 0.6% of U.S. electricity generation), enough to serve more than 2.3 million households. Some 15 million tons of carbon dioxide, the leading global warming pollutant, would be emitted if that amount of electricity were instead generated from conventional power plants.

wind energy program on public lands while ensuring the conservation of threatened and endangered species and migratory birds.”

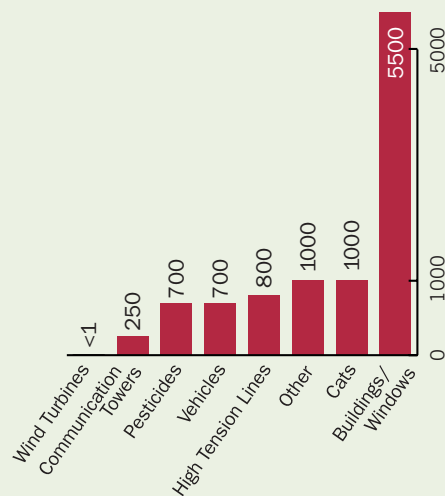
- ▶ U.S. Fish and Wildlife Service (USFWS) voluntary guidelines for wind energy: the wind energy industry is working with the USFWS and conservation and other stakeholder groups to improve guidelines for the siting of wind farms. AWEA welcomes the opportunity to work on such guidelines and help set high environmental standards for the energy sector as a whole: currently, there are no USFWS guidelines (either existing or proposed) for conventional power plants or for associated mining, drilling, and waste disposal operations.

- ▶ New Web resource launched by AWEA – [www.ifnotwind.org](http://www.ifnotwind.org) – to serve as an information clearinghouse. The site features fact sheets, photos, statistics, links and a resource library.

It provides detailed information about wind energy technology, environmental aspects of wind energy development, and the economic, environmental and energy contributions of this clean, renewable, domestic resource.

## Wind Turbines: Compatible with Birds

Causes of Bird Fatalities, Number per 10,000 fatalities



Data Sources: Erickson et al., 2002. Summary of Anthropogenic Causes of Bird Mortality.

