



# WIND POWER

**OUTLOOK 2005**

## Burgeoning Wind Energy Market Generates New Investment, Jobs

**Wind power is a reality today** — a bridge that can be built now to a clean energy future while more distant technologies such as hydrogen are researched and developed. The American Wind Energy Association (AWEA) expects 2005 to be a record-breaking year for the industry, with up to 2,500 megawatts (MW) of new wind energy generating capacity likely to be installed in the U.S. These new facilities will bring:

- ▶ **clean power to the equivalent of 700,000 homes;**
- ▶ **\$2-3 billion of immediate investment in the power generation sector;**
- ▶ **an estimated 10,000 new job-years nationwide (that's 10,000 one-year jobs or 1,000 long-term, ten-year jobs)**

A growing number of energy companies and utilities now view wind power as an attractive business, and are expanding their operations in wind energy or considering moving into the market, adding new capital and capability to a rapidly expanding in-

dustry. In the U.S., recent examples include AES Corporation, a Virginia-based global energy developer which acquired California-based wind energy developer SeaWest Wind Power; and Goldman Sachs, which acquired Houston-based wind energy developer Zilkha Renewable Energy.

By 2020 wind energy technology could provide 6% of the nation's electricity—a share similar to hydropower today. The drivers are strong: proven technology, attractive cost, vast potential, investor interest, strong demand.

There are constraints to wind energy's growth, however, and these are regulatory and political. Inefficient, discriminatory transmission rules and lack of transmission capacity make it currently infeasible to ship large amounts of wind power from the heartland to market. The largest single constraint remains the cycle of short-term extensions and then expirations of the federal incentive for wind energy, the production tax credit (PTC). A stable planning horizon, and in particular a long-term extension of the PTC, is needed for businesses to plan for strategic



Courtesy TVIG © 2005

growth in the years ahead and expand their wind energy operations on a large scale.

The benefits from such an expansion include not only lower costs but more electricity to power our homes and offices, new high-tech jobs, cleaner air, additional income to farms and rural communities — all from a vast, inexhaustible, domestic source: the winds flowing over our continent.

## States Move to Develop More Clean Energy

One of the strongest drivers of new wind installations is state policy, and in particular the renewables portfolio standard (RPS), which requires that a minimum amount of electricity be supplied from renewable sources. As of January 2005, 18 states had some form of renewable power requirement, including **Arizona, California, Connecticut, Iowa, Maine, Massachusetts, Minnesota, Nevada, New Jersey, Texas, and Wisconsin**. Joining these in 2004

were **New Mexico, Maryland, Hawaii, Rhode Island, New York, Colorado, and Pennsylvania**, as well as the **District of Columbia**. In early 2005, **Illinois** Governor Rod Blagojevich called for an RPS ensuring that 8% of the state's power comes from clean, renewable energy by 2012.

Some of these laws are more effectively designed and implemented than others, but all recognize the public benefit of having a diverse resource mix drawing from

domestic, inexhaustible renewable resources.

States are also taking other actions to spur renewable energy development as a way to ensure cleaner air and slow emissions of carbon dioxide, the leading gas associated with global warming. Connecticut's state government, for example, is planning to purchase 20% of its electricity from renewable sources by 2010 and all of its electricity from renewables by 2050.

## More Wind, More Jobs

**Boosting U.S. wind energy** installations to approximately eight times today's levels would bring \$50 billion in new investment and could create 150,000 manufacturing jobs nationwide, with most being added in the 20 states that have lost the most jobs

over the past three years, according to a study by the Renewable Energy Policy Project (REPP).

Some 90 companies in 25 states currently manufacture wind turbine components. Over 16,000 companies in all 50 states have the techni-

cal potential to enter the wind turbine market, according to the study. Additional job creation would also flow into non-manufacturing sectors such as construction, transportation, marketing, financial, and other services.

State	Potential Number of New Wind Manufacturing Jobs	New Investment (\$ Billions)	2001 Population	Rank in U.S.	Manufacturing Jobs Lost, Jan. 2001 - May 2004	Rank in U.S. by Job Loss
California	12,717	4.24	34,501,130	1	318,000	1
Ohio	11,688	3.90	11,373,541	7	165,500	3
Texas	8,943	2.98	21,325,018	2	169,600	2
Michigan	8,549	2.85	9,990,817	8	129,300	8
Illinois	8,530	2.84	12,482,301	5	131,500	6
Indiana	8,317	2.77	6,114,745	14	63,500	13
Pennsylvania	7,622	2.54	12,287,150	6	155,200	5
Wisconsin	6,956	2.32	5,401,906	18	68,300	10
New York	6,549	2.18	19,011,378	3	130,500	7
South Carolina	4,964	1.65	4,063,011	26	56,800	17
North Carolina	4,661	1.55	8,186,268	11	156,600	4
Tennessee	4,233	1.41	5,740,021	16	59,700	15
Alabama	3,571	1.19	4,464,356	23	45,300	19
Georgia	3,532	1.18	8,383,915	10	65,700	11
Virginia	3,386	1.13	7,187,734	12	57,500	16
Florida	3,371	1.12	16,396,515	4	56,800	18
Missouri	3,234	1.08	5,629,707	17	36,700	23
Massachusetts	3,210	1.07	6,379,304	13	84,900	9
Minnesota	3,064	1.02	4,972,294	21	38,800	21
New Jersey	2,920	0.97	8,484,431	9	65,400	12
<b>20 State Total</b>	<b>120,017</b>	<b>40</b>	<b>212,375,542</b>		<b>2,055,600</b>	
<b>U.S. Total</b>	<b>150,000</b>	<b>50</b>	<b>75%</b>		<b>76%</b>	

## ROLLING BACK CONSTRAINTS TO GROWTH: Bringing Wind Energy to Market

The U.S. Department of Energy estimates that approximately 600 gigawatts (GW) of wind energy, enough to easily provide 20% of U.S. power supply, are cost-effective at the wind plant “busbar” (that is, the point at which the wind farm connects to utility transmission lines) when natural gas prices exceed \$4 per thousand cubic feet (mcf). Most experts see gas prices staying above that level in the foreseeable future. Why then isn’t even more wind energy rushing to market today?

In addition to the uncertainty about the availability of the federal production tax credit, a discriminatory transmission system limits wind energy’s growth. The nation’s power markets are governed by a patchwork of rules and conditions for access to, and use of, the transmission network. Some charge heavy, unfair penalties against new market entrants or technologies with different operating characteristics. The result: artificially high costs and inefficient markets. Under the Western Area Power Administration’s old-style rules, for example, the cost for wind to use the network is about 2 cents per kilowatt-hour, a huge obstacle. In California, where the California Independent System Operator (Cal-ISO) has replaced inefficient, discriminatory penalties with a innovative requirement that wind generators provide forecasts for their power deliveries, the costs are 10 times lower.

The Federal Energy Regulatory Commission (FERC), which oversees wholesale electric power markets in the U.S., is promoting reforms to ensure fair access for all technologies so that customers can reap the benefits of competition. Where such reforms are in place, they are already helping remove barriers to market entry for wind. The agency is also standard-

izing utility system interconnection agreements and procedures for the entire electric industry, including wind energy. AWEA supports the proposed standards and procedures for wind with a detailed Guide on Wind Energy for the wind energy industry and for transmission owners/operators and utilities. Wind turbines meeting the new standards can ride through system faults, contribute reactive power and active voltage control, and communicate with grid operators—and thereby make the electricity transmission system more reliable.

Strategic upgrades to existing lines and investment in new transmission lines are also needed to tap the country’s vast wind energy potential. Lines that have long been bottlenecks are now being upgraded in Minnesota and California, and such successful precedents may spur similar action in other areas where they are needed. However, the nation has yet to see the development of



Courtesy Frank Collett, Palmdale Water District.

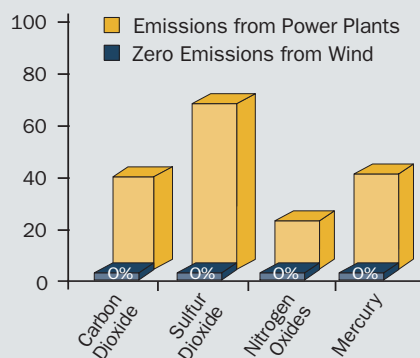
**“[Wind energy] will be the biggest generation investment in the next few years.”**

Federal Energy Regulatory Commission  
Chairman Pat Wood III

a national energy policy that includes, as a strategic goal, transmitting large amounts of wind energy from the windy heartland to fast-growing demand centers. Such a strategy would reduce dependency on natural gas imports and diversify the nation’s energy portfolio with a safe, clean, abundant, domestic resource.

### WIND ENERGY IN PERSPECTIVE

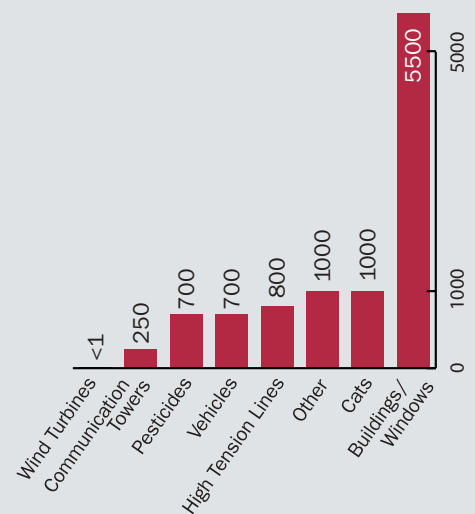
#### Leading U.S. Emissions: Percent from Power Plants



Data Sources: Energy Information Administration, US Environmental Protection Agency. Emissions data is for 2002, mercury data for 1999.

#### Causes of Bird Fatalities

Number per 10,000 fatalities



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

## Utility Interest in Wind Rises

The escalating and volatile price of natural gas — a fuel that now accounts for some 20% of U.S. electricity generation — has put a damper on the rate of investment in natural gas power plants. Building new coal plants that meet modern pollution abatement standards is expensive and comes with the risk of new or tightening regulations to curb emissions of carbon dioxide, the leading gas associated with global warming, and of mercury and other pollutants. Utilities seeking to manage such costs and risks are finding that wind energy is an attractive option for new generation.

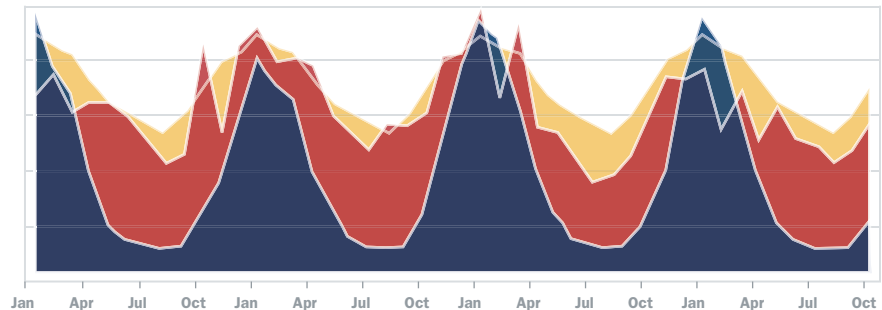
Wind energy provides stable, affordable insurance against the risk of increases in the price of natural gas and other fuels over time. Wind energy development can also cut consumers' bills by lowering demand for natural gas — particularly during winter peak demand — and by extending its supply.

The 2,500 megawatts of wind scheduled to be built in 2005 will generate new, clean, predictably-priced energy for a growing number of utilities and customers across the nation — from the West Coast where Puget Sound Energy, for example, is adding close to 400 MW of wind to its portfolio, to Texas where CPS Energy, the municipal utility of San Antonio, will purchase energy from the new 100-MW Cottonwood Creek Wind Farm near Sweetwater, Tex. under a 20-year contract, and to the East where in upstate New York the first 198 MW of the Maple Ridge wind energy project are expected to start up by the end of the year.

New studies find that utilities can significantly expand wind power in their portfolios without major adjustments in the planning, operations, or reliability of their systems — a concern sometimes expressed by utilities. The expansion can in some cases increase operational reliability, as the

### Wind Energy: A Good Match for Natural Gas

Seasonal peaks in wind power generation correspond to peaks in natural gas use.



- U.S. Residential Gas Usage from Energy Information Administration
- Plains wind from Platte River Power Authority
- Eastern wind from NYSERDA and Vermont Department of Public Service

Note: This is data has been scaled for display. Individual sites are used to represent the entire region.

two studies referenced below demonstrate.

Xcel Energy, a large energy company serving Western and Midwestern states, is expecting to supply electricity from 1,500 MW of wind power within its northern operation area by 2010, in

**“Wind energy is a cost-competitive resource that helps diversify our power-supply portfolio and reduce the risk to our customers from a volatile short-term energy market.”**

Stephen P. Reynolds, President and CEO,  
Puget Sound Energy

compliance with Minnesota state laws. A report released by the Minnesota Department of Commerce found that the cost of integrating those 1,500 MW of wind would be less than one-half cent per kilowatt-hour, and could be further reduced with improved scheduling, forecasting, and markets. The study also concluded the 1,500 MW

of wind generation contributes the equivalent of 400 MW of conventional generation (27% of the wind power nameplate capacity) in terms of system reliability. Although some wind opponents have claimed that each MW of wind added to the system requires a MW of new fossil backup, the Minnesota study revealed that 1,500 MW of new wind would only require 7.8 MW of new backup power. The entire study is available at <http://www.commerce.state.mn.us>.

The New York Independent System Operator (NYISO) and New York State Energy Research and Development Authority (NYSERDA) have released a report concluding that a 10% penetration level of wind can be accommodated by existing processes and resources in the state's bulk power system. Ten percent, measured as nameplate wind capacity divided by system peak load, would equate to about 3,300 MW of installed wind power capacity.

These studies confirm what has long been the experience in Europe, where Denmark and certain regions of Germany and Spain generate 20% or more of their electricity from wind without costly adjustments or detriment to the reliability of their systems.

## ROLLING BACK CONSTRAINTS TO GROWTH: Industry Calls for Long-term Incentive

The wind energy industry is calling on Congress to extend the federal production tax credit (PTC) this year as soon as possible and for a minimum of five years, so that businesses can plan for growth, put more people to work, and deliver more clean, safe power to the American economy.

Record-breaking installations are planned or under construction across the country following renewal of the credit in October 2004. However, the short duration of the extension — only until December 31, 2005 — did not give manufacturers sufficient lead time to provide enough turbines, and will spell another boom-and bust cycle for the industry, unless Congress moves quickly this year to extend the valuable incentive.

Enacted in 1992, the PTC currently provides a 1.9 cent per kilowatt-hour credit for electricity produced commercially from a wind energy facility during the first 10 years of its operation. The incentive was expanded in 2004 to include other sources such as solar, geothermal, small irrigation hydroelectric power, open-loop biomass, refined coal, agricultural livestock waste, municipal solid waste, and landfill gas. In order to qualify, a wind farm must be

completed and start generating power while the credit is in place.

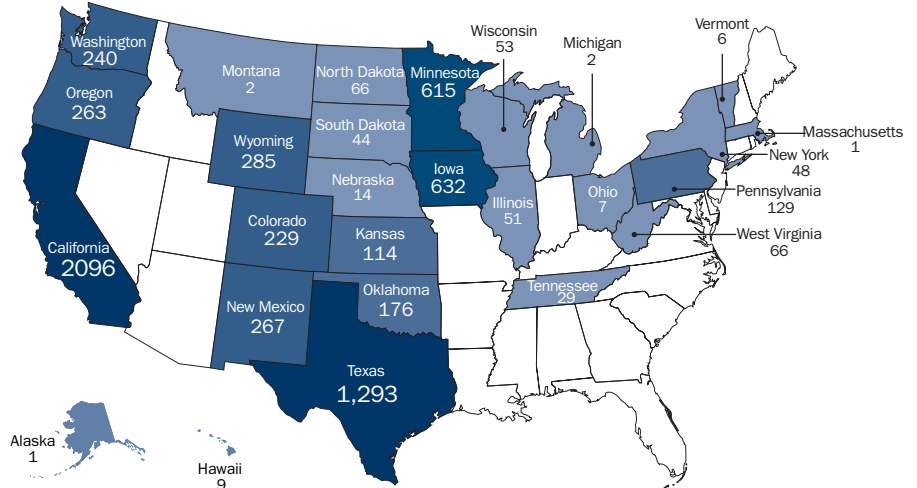
When the credit expires, as it has three times now over the past six years, contracts are put on hold, investments trickle to a halt, and jobs are lost or foregone. During the long months following the PTC's expiration in December 2003 until its extension in October 2004, thousands of jobs were lost and over \$2 billion in investment were put on hold. By December 2004, fol-

lowing the credit's renewal, the industry brought into service only 389 MW of new equipment — well under what would have otherwise been installed.

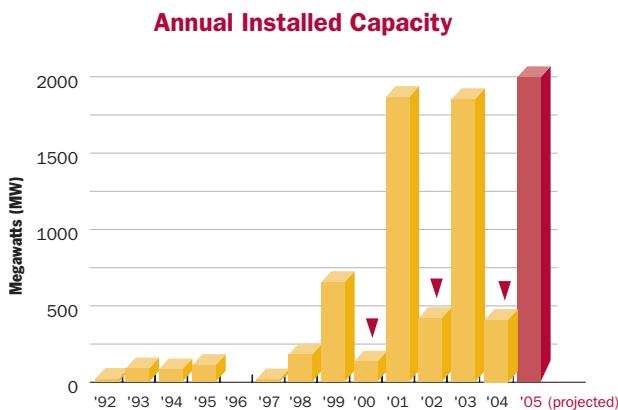
The cycles of short-term extensions and then expirations of the production tax credit play havoc with industry planning and increase company costs. Billions of dollars of capital investment, particularly related to manufacturing, are on the sidelines waiting for a longer term policy commitment.

### United States Wind Power Capacity (MW)

6,740MW as of 12/31/04



Wind farms across the U.S. are expected to produce close to 18 billion kWh in 2005 (about 0.5% of U.S. electricity generation), enough electricity to serve more than 1.6 million households.



Expirations of the federal production tax credit (in 1999, 2001, 2003) cause drops in new installations (2000, 2002, 2004.)



Courtesy GE Energy, © 2005, General Electric Company.

## Global Wind Energy Installations Climb Steadily

**Worldwide, wind power generation** has more than tripled over the last five years, expanding from 13,500 MW at the end of 1999 to over 47,000 MW today, generating enough electricity to serve over 9 million American homes.

Most of that capacity is concentrated in Europe. The countries with the highest total amounts of installed wind power are Germany (16,629 MW), Spain (8,263 MW), the United States (6,740 MW), Denmark (3,117 MW) and India (3,000 MW). These top five countries account for over 67% of

the new wind power capacity added in 2004, and nearly 80% of total wind energy generating capacity worldwide. A number of countries, including Italy, the Netherlands, Japan, and the UK, are above or near the 1,000-MW mark. In the Americas, Canada enjoyed a record year in 2004 with 122 MW of new installations. The Canadian Wind Energy Association (CanWEA) expects that this record will be shattered in 2005.

As the global wind energy market expands, leading wind energy associations from around the world

formed in early 2005 the Global Wind Energy Council (GWEC) to share information, coordinate industry views and support a global wind industry agenda.

Global energy demand is growing fast. The International Energy Agency (IEA) estimates that by 2030 some 4,800 gigawatts (GW) of new power generation capacity will be needed. Wind energy can help meet that demand without an increase in fossil fuel consumption—it is a clean, high-tech energy source with which to power the 21st century.

## Wind Farm Buoy Local Economy

**Rural counties such as Sherman County, Oregon, are reaping the wind** and, along with it, an economic windfall. Sherman County is a “one-crop” county in Eastern Oregon that depends on dryland wheat farming. The county ranks last out of the state’s 36 in per capita income, and has an unemployment rate of 11.9%. During its first year of operation, the local 24-MW Klondike Wind Farm generated:

- ▶ **clean power for approximately 6,100 homes in the Pacific Northwest**

- ▶ **\$321,205 in property tax revenues (a 10% increase), including \$113,198 for schools**
- ▶ **annual royalty payments to landowners of \$2,000-\$4,000 for each turbine sited on their land**
- ▶ **80 to 100 temporary jobs during project construction, and 3 full time technical positions. Workers patronized local motels, restaurants and stores.**

Klondike is being expanded by an additional 75 MW in 2005, with the community’s full support.



Courtesy GE Energy, © 2005, General Electric Company.

**“Wind helped to diversify the economy. It’s another crop we can harvest, [and] it helps fill gaps in the county budget.”**

Mike McArthur, Sherman County Judge.

