



 THE UNIVERSITY OF IOWA

Wind Power

A recent study indicates renewable energy sources could supply up to 25% of the nation's conventional energy by 2025 with little additional expense.¹ This report examines one such source, wind energy, and considers its increasing popularity, current production levels, and what incentives states are offering to encourage its production.

Background

Wind energy is produced when turbines harvest the kinetic energy of wind and transform it into a form of energy that can be used for everyday electric needs. Typically, wind energy is funneled into utility power lines where it is combined with electricity produced from other power plants and delivered to utility customers.²

Wind energy is the fastest growing energy source in the world.³ Within the past three years, wind energy production capacity has increased 61 percent nationwide and 56 percent in Iowa.⁴

¹ Fialka, John J. "Renewable Fuels May Provide 25% of U.S. Energy by 2025." *Wall Street Journal*. 13 Nov. 2006.

² "Wind Energy Basics." American Wind Energy Association. Accessed <http://www.awea.org/faq/wwt_basics.html>.

³ "History of Wind Energy." U.S. Department of Energy: Energy Efficiency and Renewable Energy. 12 Sept. 2005. Accessed <http://www1.eere.energy.gov/windandhydro/wind_history.html>.

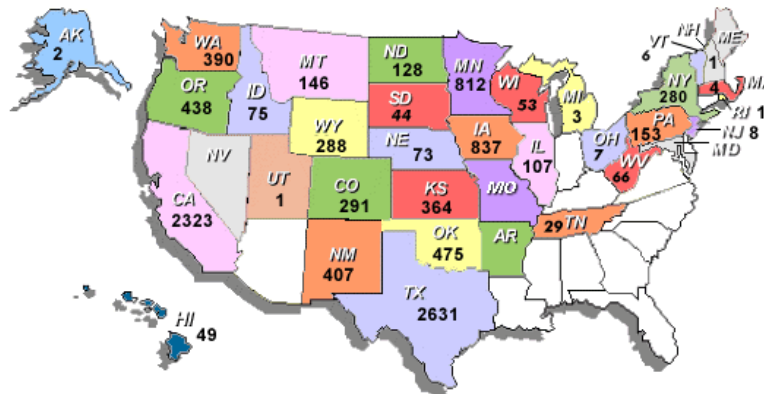
⁴ "Wind Power." Vermont Legislative Research Shop. 19 April 2004. Accessed <<http://www.uvm.edu/~vlrs/>>.

Although current wind energy production levels still meet less than one percent of the country's energy needs, wind energy is likely to increase because, among other factors, it can be produced without emissions, it can be produced domestically, and it is renewable.⁵

Comparison

Iowa is among the nation's leaders in wind power, ranking third in total wind energy production capacity and second in wind power production capacity per capita behind Wyoming. Figure 1 provides the wind energy production capacity for each state in megawatts (MW).

Figure 1: Wind Energy Production Capacity⁶



Effectiveness

A single MW of wind energy is enough to meet the energy needs of 240 to 300 average American homes annually.⁷ This means the 837 MW of current wind energy potential in Iowa is enough to meet the energy needs of 200,000 to 250,000 Iowa homes this year. These numbers will increase in the coming months as wind turbines currently under construction throughout the state are completed and ready for use. For example MidAmerican Energy Company, the largest utility in Iowa in ownership of wind power electric generation, expects its North Central Iowa projects for 2007 to increase the state's output by 237 MW.⁸

Costs

A major barrier to increased wind power production is costs. Wind turbines cost roughly \$1,000 for each kilowatt of potential production, meaning a modern one MW wind turbine costs around \$1 million. These costs are then passed on to consumers, making energy derived from wind power generally more expensive than energy from traditional fuels.⁹

⁵ "Wind Power Today." U.S. Department of Energy. May 2006. Accessed <<http://www.nrel.gov/docs/fy06osti/39479.pdf>>.

⁶ "Wind Energy Projects Throughout the United States of America." American Wind Energy Association. 23 Oct. 2006. Accessed <<http://www.awea.org/projects/>>. Note: Colored states without MW capacity listed have minimal wind power production capacity or have not yet completed construction on wind power facilities. Uncolored states have no wind power production capacity.

⁷ "Wind Industry Statistics." American Wind Energy Association. Accessed <http://www.awea.org/faq/wwt_statistics.html>.

⁸ Direct Source, MidAmerican Energy Company.

⁹ "Comparative Costs of Wind and Other Energy Sources." American Wind Energy Association. <<http://www.awea.org/pubs/factsheets/Cost2001.PDF>>.

Incentives

Government incentives directly offset the costs associated with constructing wind energy facilities, and indirectly offset the increased energy costs for consumers of wind energy. The only federal incentive, called the Production Tax Credit (PTC), provides a tax credit to wind power plant owners of 1.8 cents for each kWh of energy they produce.

States use a variety of incentives to encourage the development of wind energy facilities. These incentives include sales tax exemptions, property tax exemptions, loan programs, and tax credits. Additionally, some states require utility companies to purchase the net excess energy generated (NEG) by wind turbines. The table below provides a comparison of the incentives among the ten states with the highest wind energy production potential. As can be seen, Iowa and Minnesota are the only states within our survey that provide all five types of incentives.

Wind Energy Production Incentives in the Windiest States¹⁰

State (Energy*)¹¹	Sales Tax Exemption	Property Tax Exemption	Loan Program**	NEG Requirement	Tax Credit***
North Dakota (1,210)	X	X		X	X
Texas (1,190)		X			
Kansas (1,070)		X			
South Dakota (1,030)		X			
Montana (1,020)		X	X	X	X
Nebraska (868)					X
Wyoming (747)	X			X	
Oklahoma (725)					X
Minnesota (657)	X	X	X	X	X
Iowa (551)	X	X	X	X	X

*Annual wind energy production potential measured in billion kWh.

**Loan programs vary greatly. Iowa's loan program provides loans for 50% of construction costs, up to \$250,000, at 0% interest. Montana offers loans up to \$40,000 at 5% interest. Minnesota provides loans for 50% of construction costs, up to \$500,000, at 0% interest only to schools, local governments, and hospitals. However, Minnesota also provides low-interest loans for 45% of construction costs to individuals purchasing wind turbines with less than 1 MW of capacity.

***Tax credits break down into three general types: Production Tax Credit: Minnesota and Iowa both have tax credits of 1.0-1.5 cents for each kWh produced from wind turbines. Nebraska provides a tax credit of .075 cents/kWh and Oklahoma provides a tax

¹⁰ Database of State Incentives for Renewables and Efficiency. North Carolina State University. 22 November 2006. <<http://www.dsireusa.org>>.

¹¹ "An Assessment of the Available Windy Land Area and Wind Energy Potential in the Contiguous United States." Pacific Northwest Laboratory. August 1991. American Wind Energy Association. <http://www.awea.org/faq/wwt_potential.html>.

credit of .005 cents/kWh. Expenditure Tax Credit: North Dakota provides a tax credit worth 15% of the costs associated with purchasing and installing wind turbines. Investment Tax Credit: Montana provides a tax credit to individuals worth 35% of their investment in wind turbines and wind power plants.

Other Noteworthy Considerations for Wind Power Production

- Some locations are unsuitable for wind power production because wind must travel at a considerable speed for power production to be cost-effective. Wind maps show Iowa to be ideal for wind power production, especially in the northwest corner.¹²
- Wind energy cannot be stored. Since wind speed fluctuates, the amount of wind energy produced fluctuates as well. If wind speeds are low for a period of time, other sources of energy are required to continue meeting energy needs.¹³
- The large, metal turbines are not visually appealing.
- Turbines may affect migratory birds through collision or loss of habitat. However, most researchers feel such effect should be negligible if turbine construction takes into account the flight path and habitat of migratory birds in the area.¹⁴

This report was prepared in December, 2006 by the Iowa Civic Analysis Network (I-CAN), a non-partisan public policy undergraduate research group at the University of Iowa. For additional research on this or other issues, please visit our website at <http://www.uiowa.edu/~ican> or contact us at studorg-i-can@uiowa.edu

¹² “Wind Energy Resource Potential.” U.S. Department of Energy. 14 September 2005. <http://www1.eere.energy.gov/windandhydro/wind_potential.html>.

¹³ “Advantages and Disadvantages.” U.S. Department of Energy. 30 August 2005. <http://www1.eere.energy.gov/windandhydro/wind_ad.html>.

¹⁴ Osborn, Robert G., et al. “Bird Mortality Associated with Wind Turbines at the Buffalo Ridge Wind Resource Area, Minnesota.” The American Midland Naturalist. 143.1 (2000): 41-52.