

U.S. Department of Energy - Energy Efficiency and Renewable Energy
Project Management Center

EERE-PMC News

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Wind turbines near Lake Benton, Minn. exemplify the rapid growth of wind power in the Midwest.

This month PMC-News explores wind energy, the role of [Wind Powering America](#), the challenges facing the [National Wind Technology Center \(NWTC\)](#) and new opportunities for wind power development.

Wind energy is well established and affordable; many states are adopting its power to meet the demands of renewable energy standards. The national average cost of wind energy per kilowatt hour (kWh) now stands at 4-6 cents, compared to around 40 cents in the early 1980s.

As wind turbines are built ever larger, testing capacity at the NWTC is stretched to the limit. To keep up with the demand, DOE and the [National Renewable Energy Laboratory \(NREL\)](#) are seeking to form a [Cooperative Research and Development Agreement](#) to build a new testing and data collection facility.

All this and more is examined in this issue of PMC-News.

As a reminder, [archived issues of PMC-News](#) are available online. Topics include:

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- 03/2007... Solar Program
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News

DOE offers \$200 million for small-scale cellulosic biorefineries

DOE has announced that it will provide up to \$200 million over five years to support the development of small-scale cellulosic biorefineries in the U.S. The projects will involve designing, building and operating biorefineries at one-tenth of commercial scale.

The small-scale biorefineries will convert cellulosic biomass — trees, grasses, and agricultural residues — into liquid transportation fuels such as ethanol, as well as biobased chemicals and products.

See the [DOE press release](#) and the full [funding opportunity announcement](#).

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DOE invests \$19 million in advanced vehicle technologies

DOE has announced that five next-generation vehicle research projects will receive up to \$19 million to further the development of plug-in hybrid electric vehicles, hybrid electric vehicles and fuel cell vehicles. Projects will focus on reducing the cost, weight, and size of electric drive and power conversion devices while increasing vehicle efficiency.

Industry teams based in California, Michigan, New York and Virginia will share the cost of the projects, bringing the total investment to \$33.8 million over the life of the award. The teams will be led by Delphi Automotive Systems, General Electric Global Research, General Motors Corporation, U.S. Hybrid Corporation and Virginia Polytechnic Institute and State University. Team members include DOE's Argonne National Laboratory and Oak Ridge National Laboratory as well as four universities.

[DOE press release](#)

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Funding available for Energy Efficient Building Centers

The National Energy Technology Laboratory (NETL) has announced a funding opportunity open until July 3 for pilot Energy Efficient Building Technologies Application Centers.

[The proposal](#) is designed to accelerate the widespread market adoption of energy efficient building technologies and practices, including advanced building standards, codes and zero energy buildings.



Oberlin College's Adam Joseph Lewis Center for Environmental Studies in Ohio incorporates energy efficient technologies with attractive design.

Residential and commercial buildings consume almost 40 percent of U.S. energy, including 55 percent of primary natural gas consumption and 71 percent of the electrical load.

Applicants must be able to form a team that includes nonprofit organizations, state and local governments, universities, regional energy efficiency partnerships and/or utilities that are representative of the multi-state region proposed.

It's also essential the applicant is effective in delivering information on both commercially-available and Building Technologies Program-developed technologies, processes and tools that meet DOE priorities and align with efficiency goals of states, utilities and Energy Efficiency Partnership-based programs.

Approximately \$1 million is expected to be available for new awards in FY '07, with an additional \$3 million in FY '08 through FY '10.

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DOE awards \$22.7 million for basic solar energy research



A solar collector concentrates the sun's energy, opening the future to utility-scale generating plants producing clean, renewable electric power.

DOE has announced that it has awarded \$22.7 million to 27 projects aimed at improving the capture, conversion and use of solar energy. These basic research projects will help increase the amount of solar power in the nation's energy supply and will focus on two technical areas: the conversion of solar energy to electricity and the conversion of solar energy to chemical fuels.

Directly converting sunlight into chemical fuels will help store energy at night and provide energy to be used in transportation, residential and industrial applications.

DOE selected projects at 23 universities and two DOE national laboratories; Brookhaven National Laboratory and Lawrence Berkeley National Laboratory.

[DOE press release](#)

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Los Angeles hosts Windpower 2007, June 3-6

More than 6,000 participants and 400 exhibitors are expected at [Windpower 2007](#) in Los Angeles June 3-6, making it the largest such conference in the world. This year's event will focus on actions required to build wind energy into a significant supplier of U.S. electricity. The conference will address how to achieve this goal by identifying major issues and challenges and discussing solutions for the advancement of the wind energy industry.

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NREL wind resource information available on web

Several publications are released each week by NREL, the current batch are helpful guides about small wind electric systems that can provide all or part of the energy needed for homes or businesses based on wind resources, energy needs and economics.

Topics include how to: make a home more energy efficient, choose the current turbine size, determine whether enough wind resources exist, choose the best site for a turbine, connect a system to the utility grid and whether it's possible to become independent of the utility grid using wind energy. These examples observe small wind projects in Alaska, North Dakota, South Dakota and Vermont.

Small Wind Electric Systems: An Alaska Consumer's Guide: April 2007 ([PDF 1.58 MB](#))

Small Wind Electric Systems: An Illinois Consumer's Guide: April 2007 ([PDF 1.3 MB](#))

Small Wind Electric Systems: A North Dakota Consumer's Guide: April 2007 ([PDF 1.24 MB](#))

Small Wind Electric Systems: A South Dakota Consumer's Guide: April 2007 ([PDF 1.35 MB](#))

Small Wind Electric Systems: A Vermont Consumer's Guide: April 2007 ([PDF 1.28 MB](#))

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New report high on renewable energy

Renewable energy could provide the U.S. with up to 635 gigawatts (GW) of new electricity generating capacity by 2025 according to a new report by the American Council On Renewable Energy (ACORE).

[ACORE's report](#) states, "Renewable fuels can serve a large portion of U.S. oil consumption needs. Recent studies suggest that biofuels could supply 30 to 40 percent of U.S. petroleum products by 2030. Ethanol alone could reach 11.5 billion gallons per year by the end of the first quarter of 2009, a significant contribution to the approximately 135 billion gallons of gasoline we consume annually."

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Features



Commercial-scale wind power applications are proving practical and competitive from Hawaii to Vermont, leading to increasing optimism about the role of renewable energy in meeting the nation's need for power.

Wind Powering America partners with states

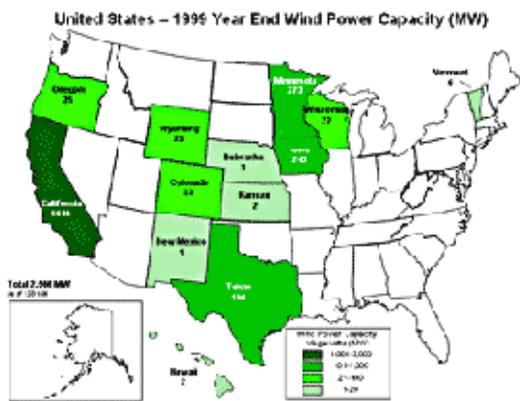
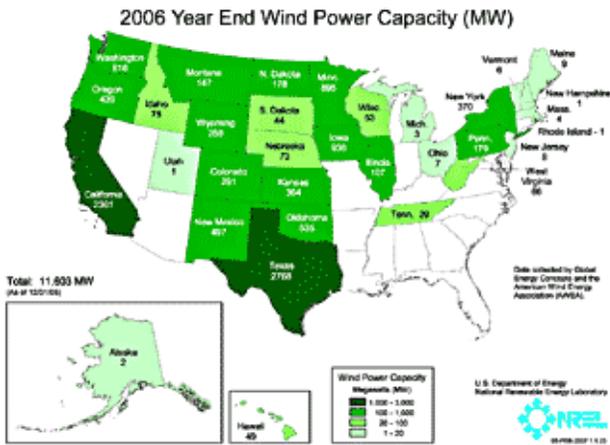
U.S. wind energy is, in the minds of many, a “good news, bad news” story. The good news is that we now have wind installations in more than 30 states capable of generating 11,700 megawatts (MW) of electric power. The bad news is that wind generates less than one percent of our nation's electricity.

Challenges to increasing wind usage include:

- Increasing the understanding of wind power within the financial community, regulators and utilities;
- Gaining more consistency in government policies at all levels;
- Integrating wind onto the grid at a large scale, and;
- Improving performance and reliability of wind turbines.

EERE's [Wind Powering America Program](#) (WPA) has taken a leadership role in meeting these challenges, primarily by working through partnerships with states.

When the WPA partnerships started in 2000, there were only 2,500 MW of installed wind capacity in the U.S. Only four states had more than 100 MW of installed wind capacity. Currently, 16 states have more than 100 MW of installed capacity. Five to six more states will join the 100 MW club this year, and by the end of the decade more than 30 states will have passed the 100 MW milestone.



WPA now has 29 state wind working groups that form strategic alliances to communicate wind's benefits to state stakeholders. The program's emphasis remains on the rural agricultural sector, which stands to reap significant economic benefits from wind energy development. WPA also continues outreach, education and technical assistance to Native American communities, public power organizations and regulatory and legislative bodies.

Steve Palomo, WPA project manager said, "One of our continuing successes is the Anemometer Loan Program. This is a program that helps states and local entities put up the necessary equipment to monitor and record local wind power potential.

"WPA started the program to help states purchase the anemometers and successfully install and operate them. The program proved so popular that NREL started a similar Anemometer Loan Program for Native Americans. And the Western Area Power Administration (WAPA) now has a similar program for its utility customers. Today, states have about 100 towers out in use, the NREL program has another 100, and WAPA has about a dozen in use."

States, working with WPA, have taken diverse approaches to support wind power. This past year's efforts are impressive:

- **Arizona:** Using a geographic information system to determine the amount of wind in each county, scientists have determined that Coconino County alone holds 7,500 MW of wind energy potential, with Navajo County having a 5,000 MW potential.
- **Hawaii:** Two new wind projects came online in '06: the 10.5 MW Hawi Renewable Project at Upolu Point on the Big Island, and the 30 MW Kama'oa Wind Farm at South Point, still under construction.
- **Illinois:** Horizon Wind Energy has begun phase one (198 MW) of the Twin Groves project in McLean County. An estimated 100 MW will be installed this year, and phase two is expected to double that capacity. Additionally, the Illinois Commerce Commission has started work on a Renewable Energy Standard.
- **Indiana:** The Randolph Eastern School Corporation (RESC) is building a wind/solar hybrid energy system at its K-12 campus, a rural school in Union City. The one kW wind/920-watt solar system will be incorporated into the school's science curriculum. Randolph County may have one of the best wind resources in the state and this project will help increase public awareness.
- **Kansas:** The Kansas Energy Office and Kansas Department of Commerce have developed a Community

Wind Tool Kit that enables local leaders to assess their area's potential for community wind projects (usually 20 MW or less). The tool kit provides detailed transmission and wind resource information, ecological and topical information and a financial calculator.

- **Montana:** The first two utility-scale wind farm projects in Montana have been commissioned and dedicated: the 135 MW Judith Gap Wind Farm and the 9 MW Horseshoe Bend Wind Farm near Great Falls International Airport. The state's local governments have applied for \$37 million in Clean Renewable Energy Bonds. Additionally, the Montana Public Service Commission adopted rules to implement the Renewable Energy Portfolio Standard passed in '05.
- **New Jersey:** The state dedicated its first wind power generation facility, the Jersey-Atlantic Wind Farm in Atlantic City. Five 1.5 MW wind turbines power the Atlantic County Utilities Authority Wastewater Treatment Facility, with excess energy being fed into the power grid.
- **Ohio:** The Ohio Wind Working Group (OWWG) initiated its Anemometer Loan Program last year with three 50-meter tower kits available. The OWWG also assisted in getting an educational utility-scale wind turbine installed in downtown Cleveland on the lake shore. It is located next to the Cleveland Browns Stadium and the Rock & Roll Hall of Fame, attracting thousands of visitors each year.
- **Washington:** The Washington Energy Program, in cooperation with the State Department of Revenue held three public and stakeholder meetings on implementation of a 12 cents per kWh production incentive for wind energy systems installed on non-utility property. The program is intended to encourage community wind and wind projects on school grounds, with the production credits being available for nine years.

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Wind energy may lead to future hydrogen production



The NWTC-Xcel Energy Wind2H2 project captures the energy from two small wind turbines that produce alternating current (AC) that varies in magnitude and frequency (known as wild AC) as the wind speed changes.

Harnessing and storing wind power with minimum efficiency loss has long been the dream of many researchers. Now, thanks to two innovative research projects supported by DOE, the dream may become reality. Wind power may be the answer to finding an inexpensive, emission-free, renewable power source for hydrogen production.

Two wind-to-hydrogen projects are now in progress, [one at NREL](#) and another in North Dakota.

Last December, Xcel Energy and NREL dedicated a new system to convert wind power into hydrogen for use in fuel cells. The system, located at the National Wind Technology Center (NWTC), takes power from two turbines (a 10-kilowatt and a 100 kilowatt) and sends it to devices called electrolyzers, which pass the electricity through water to split the liquid into hydrogen and oxygen.

NREL researcher Benjamin Kroposki said, "'The Wind2H2 Project is designed to achieve efficiency gains through integrated AC-to-DC and DC-to-DC power electronics-based connections between the wind turbines and the electrolyzers.

"The project will also compare multiple electrolyzer technologies, including alkaline and proton exchange membrane electrolyzers, to gauge their efficiencies and abilities to be brought on- and off-line quickly."

Similarly, Basin Electric Power Cooperative, University of North Dakota researchers and other state organizations are experimenting with a wind energy transmission project to help fuel three converted 4x4 pickups and a tractor.

Energy is captured from two wind turbines in Minot, N.D. to make electricity, and then transmitted to a prototype filling station where it goes through the electrolysis stage to make hydrogen.



A pickup truck converted to run on hydrogen is used in a North Dakota research project using wind to make hydrogen fuel.

The hydrogen is then compressed and stored and used to fuel the vehicles. The study will analyze development of integrating production and delivery systems needed to produce hydrogen, which can be blended with diesel fuel, regular gas and E85 ethanol fuel.

An underlying ambition of the converted wind study is to aid U.S. farmers in increasing their energy efficiency by using vehicles and equipment that can be powered with hydrogen-blended fuel sources.

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Large-scale turbine facilities needed to carry the load

The rapid growth in wind power has spurred the development of new facilities to manufacture and test large-scale wind turbine blades.

For the past decade, researchers at NREL's NWTTC have conducted static and fatigue tests on blades up to 35 meters in length.



NWTTC's wind blade testing facility can conduct static and fatigue testing on blades measuring near 35 meters. The door to the facility can be opened to allow for testing blades around 50 meters, yet industry standards, especially for larger-scale turbines, have pushed testing blades closer to 70 meters in length.

However, the market has reached a point where turbine size has recently outstripped the capacity of the blade testing facility. In fact, some large-scale turbines, mounted atop 100-foot towers, generate 3.5 MW of power and require blades up to 70 meters (230 ft.) in length.

Under a [Cooperative Research and Development Agreement \(CRADA\) with NREL](#), last year DOE sought to establish new facilities that could test blades on a larger-scale. Blade testing is required to meet design standards and to reduce machine costs as well as technical and financial risks associated with mass-producing turbines.

Finalists for the new facility have been narrowed down to Texas and Massachusetts.

DOE/NREL will provide \$2 million in capital equipment to the blade testing facility in addition to technical assistance. The estimated capital cost to build it is \$9-12 million.

The partners in Massachusetts include the Massachusetts Technology Collaborative, the University of Massachusetts and the Massachusetts Executive Office of Economic Development.

In Texas, the Lone Star Wind Alliance, led by the University of Houston and the Texas General Land Office, is partnering with Texas A&M University, Texas Tech University, University of Texas-Austin, West Texas A&M University, Montana State University, Stanford University, New Mexico State University, Old Dominion University

and the Houston Advance Research Center.

While a decision on the CRADA is expected soon, other new blade factories opened last month.

[Knight & Carver](#), previously known for building yachts in California, opened a testing and repair facility in Howard, S.D. that will specialize in blade testing, model and fixture fabrication and data collection. The facility is 26,000 square feet and the company expects to employ as many as 25 full-time employees this year and double that within two years.

[Vestas](#) announced plans to open a factory in Windsor, Colo., located near Fort Collins. The new \$60 million facility will house more than 1,200 blades per year and employ about 400 people.

To date, the Danish company has installed more than 9,300 MW of wind turbines in the U.S. The new blade facility is expected to be open next year.

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New wind program manager supports U.S. energy goals

***Steve Lindenberg** is the Acting Program Manager for the Department of Energy's Wind and Hydropower Technologies Program (WHTP), one element of the Office of Energy Efficiency and Renewable Energy (EERE). In a recent interview, he discussed goals for increasing the potential of wind power in America.*

"Here in the 'RE' half of EERE, everything we do centers around one overarching goal: to increase the viability and deployment of renewable energy in the U.S. WHTP focuses specifically on the technologies and markets associated with wind-generated electricity (the 'Hydro' label is a bit of a misnomer, as we no longer have Congressional appropriation to work on hydropower).



NWTC researcher Jim Johnson explains the massive equipment used to test reliability and efficiency of wind turbines and gear boxes.

"Our team includes specialists in utility planning, transmission and grid integration, outreach and energy policy, as well as many of the foremost experts on wind turbine technology today. We are spread across DOE Headquarters, the PMC and a number of national labs, with much of our primary research and testing taking place at NREL's National Wind Technology Center (NWTC) in Boulder, Colo.

"WHTP has two complementary charges: to increase the viability of wind energy and to help facilitate the installation of wind systems. The first is accomplished largely through developing new cost-effective technology and increasing the reliability and productivity of all large wind technology. We also devote considerable resources to developing cost-effective distributed, small-scale wind technology and performing research that supports these technology viability activities. The second objective is met through supporting research and outreach in power grid integration, transmission, technology acceptance, policy analysis and analytical support.



Southwest Windpower's Prototype Storm wind turbine produces 1.8-kW for small applications

"Many of our current efforts are oriented toward supporting the President's Advanced Energy Initiative, which lays the foundation of a national strategy to change the way we power our homes, offices and vehicles, and to eliminate our addiction to oil. The document calls for expanding the generation of clean energy from wind. It also emphasizes the potential for wind power to supply up to 20 percent of the electricity consumption of the U.S. within 10 years.

"WHTP has interpreted the Presidential directive to 'change the way we power our homes and businesses' and the implementation focus of EPAct 2005 as a direct call to action on removing barriers to advanced wind technology.

"Future priorities will include:

- Increased efforts to overcome near-term deployment barriers in the areas of grid integration and environmental issues;
- Dedicated effort to enhance the nation's energy infrastructure to allow greater use of wind technologies, and;
- Expanded work in the area of turbine performance and reliability; and broader program activities in the distributed wind technology markets.

"The key to our long-term success in wind power will be found in our ability to properly address these deployment challenges without sacrificing our support of critical technology research and development."

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WPA institutes, schools offer training and education

To support the national 20-percent wind electricity vision, DOE's Wind Powering America (WPA) started Regional Wind Energy Institute (RWEI) training this spring.

RWEIs will provide state wind outreach teams with the tools needed to effectively communicate the larger national vision for wind to regional stakeholders in WPA priority states.

This includes information about the market, wind's attributes, policy developments and strategies for increasing the use of wind and regional energy activities.



The growing popularity of large-scale wind power development leads the need to train new technologists and experts who can install, maintain and repair such equipment.

“We’re looking to train the trainers,” said Marguerite Kelly of WPA, also with NREL. “The training is specific to priority states that have a great wind resource but don’t have much wind deployed.

“While wind has come a long way, there are still a lot of barriers to address, ranging from perception, to site development, to policy, to working with utilities in order to understand how to implement the technology. We want to train the key wind experts, groups in the states that can effectively handle the issues.”

The Southwest region includes Arizona, Nevada and Utah. The Great Lake states include Michigan, Ohio, Illinois and Wisconsin and the Mid-Atlantic states include Maryland, Virginia and North Carolina. WPA also plans to start RWEI training in the Central Plains region next year.

States not mentioned are encouraged to participate in training near them, considering wind use is increasing.

Additionally, [WPA is engaging rural America to study wind energy in the schools](#). The objectives of this program are to: engage rural school teachers and students in wind energy education; equip college students in wind energy applications and education; to introduce wind energy on a small scale in rural communities, starting with a discussion about the benefits and issues in using wind energy.

To accomplish such objectives, WPA and NREL are assisting schools with installing a small turbine in their community.

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