2010

Wind Powering America: FY09 Activities Summary

National Renewable Energy Laboratory

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

WIND AND HYDROPOWER TECHNOLOGIES PROGRAM

Wind Powering America FY09 Activities Summary

WIND POWERING AMERICA

Dear Wind Powering America Colleague,

We are pleased to present the Wind Powering America (WPA) FY09 Activities Summary, which reflects the accomplishments of our state Wind Working Groups, our projects at the U.S. Department of Energy's National Renewable Energy Laboratory, and our partner organizations. The national WPA team remains a leading force for moving wind energy forward by addressing public perception and acceptance in the United States.

Collectively, we have achieved much success since this initiative was launched in 2000. The United States was home to only 2,500 MW of installed wind capacity, and we now have more than 35,000 MW installed. When we started, only four states had more than 100 MW of installed wind capacity. Now, 26 states have more than 100 MW installed, and we anticipate that four additional states will join the 100-MW club in 2010. WPA celebrates the 100-MW milestones because the first 100 megawatts are always the most difficult and lead to significant experience, recognition of the wind energy's benefits, and expansion of the vision of a more economically and environmentally secure and sustainable future. Key accomplishments include:

- More than 165 members of national and state public- and private-sector organizations from 35 states attended the 8th Annual WPA All-States Summit in Chicago in May.
- The WPA State and U.S. Wind Resource Maps pages on the WPA Web site ranked second only to the DOE/EERE home page in number of visits (270,095); it receives 50,000-70,000 visitors each month.
- There are 33 state Wind Working Groups, which continue to form the necessary strategic alliances to communicate the opportunities and benefits of wind energy to a diverse set of stakeholders.

Although the United States has experienced increasing deployed capacity, our work in market acceptance activities is nowhere near complete, especially given our current economic situation. Stakeholders and sectors such as the rural agricultural and Native American communities stand to reap the significant economic development benefits of wind. Many of our state partners are active in attracting the wind manufacturing supply chain and developing the workforce needed for a rapidly growing industry through our Wind for Schools project. Finally, our three Regional Wind Energy Institutes have been active in training state outreach teams in wind energy basics. Through these joint efforts and many others, we continue to expand wind energy as a viable option for power generation.

We invite you to read each state and project summary to learn about the accomplishments of the past year. We appreciate the commitment of our partners to continue to work together for a cleaner, more prosperous America with increased energy security, and we look forward to working with you in FY10.

Regards,

Larry Flowers and Michele DesAutels

Contents

Cover Photos:

An anemometer loan from the Wind Powering America program led to Arizona's first utility-scale wind energy project, the 63-MW Dry Lake Wind Power Project. Photo credit: Iberdrola Renewables/PIX16702.

Key development partners joining WPA's Marguerite Kelly at the Dry Lake Wind Power Project's dedication ceremony include representatives from Iberdrola Renewables, Salt River Project, Bureau of Land Management, Arizona State Land Department, Rocking Chair Ranch, Navajo County, and Suzlon Wind Energy Corporation. Photo credit: Amanda Ormond/ PIX16846.

Students at Pocatello Community Charter School participated in WPA's Wind for Schools project. The public attended a dedication and ribbon-cutting ceremony on September 23, 2009 that celebrated "Pocatello's First Wind Turbine." Photo credit: Billie Johnson/PIX16749.

WPA State Activities

The Wind Powering America (WPA) program educates, equips, and supports state Wind Working Groups by providing group members with timely information on the current state of wind technology, economics, wind resources, economic development impacts, and policy options and issues. Group members include landowners and agricultural sector representatives, utilities and regulators, colleges and universities, advocacy groups, and state and local officials. WPA concentrates efforts in "stuck" markets and avoids investing resources in markets that are fully commercial and active. The following FY09 activity summaries were provided by the Wind Working Groups.

Awards from Alaska's Renewable Energy Fund partially funded three GE 1.5-MW wind turbines at Kodiak Electric. Photo credit: Kodiak Electric Association/PIX16795.

Alaska

The Alaska Energy Authority (AEA) focused on two large tasks over the past year: administering the State Renewable Energy Fund and developing a State Energy Plan. AEA's Wind Program plays a major role in the selection and completion of the Renewable Energy Fund projects. The Wind Program manager evaluates all applications for wind-related projects and develops a list of projects recommended for funding by the state legislature. Once the legislature selects the final projects, Wind Program staff members work with the grant recipients to set up grant budgets, milestones, and scopes of work for the projects. They also administer the grants as the projects move toward completion.

- In the past year, Alaska's Renewable Energy Fund awarded the first two rounds of funding, which totaled $125 million. Of the total funding awarded, $66 million was awarded to 30 wind-related projects. Of the 30 projects funded, 20 projects are construction projects and 10 are characterized as pre-construction (reconnaissance, feasibility, or final design).
- In July, the Kodiak Electric Association installed three GE 1.5-MW SLE turbines on Kodiak Island that, coupled with the utility's existing hydropower facility, allow the association at times to provide 100-percent fossil-fuel-free power to its members. The turbines are the first megawatt-scale machines in the state and are expected to displace 1 million gallons of diesel fuel per year, saving the utility an estimated $2 million per year in today's fuel costs. Six NW100B turbines were installed in Unalakleet, and one EWT 900 turbine was installed in Delta Junction.

Awards from Alaska's Renewable Energy Fund partially funded six NW100B wind turbines in Unalakleet. Photo credit: STG Inc./PIX16797.

- AEA's Wind Program staff systematically evaluated the wind resource in each Alaska community for the State Energy Plan. Based on these wind resource data and other basic data, AEA staff sized a hypothetical wind project and determined a capital cost estimate. This information was used to demonstrate the potential impact of wind projects in communities with wind development potential. In addition to the modeling effort, AEA produced a wind power report that discusses general wind power basics, wind-diesel applications, project development, case studies, and Wind Working Group recommendations. The report is available at www.akenergyauthority.org/PDF%20files/AK%20Energy%20Final.pdf. The energy planning effort is ongoing.

In addition to dedicating time to the Renewable Energy Fund and the State Energy Plan, AEA's Wind Program staff members also:

- Drafted a Regional Integrated Resource Plan for the state's main electrical grid ("the Rail Belt"). Learn more about this report at www.akenergyauthority.org/regionalintegratedresourceplan.html.
- Worked with the Alaska Center for Energy and Power and the National Renewable Energy Laboratory to develop the Wind-Diesel Applications Center (WiDAC). WiDAC is a university-based center that addresses issues related to wind-diesel, ranging from system performance and design to workforce needs and workforce development.
- Helped organize or participated in wind-related workshops and conferences such as the WiDAC Summit, 2009 Wind-Diesel Workshop, Renewable Energy Fair, and the Renewable Energy Alaska Project's (REAP's) Bi-Monthly Forums.
- Funded and participated in producing Alaska Wind Energy Development Best Practices Guide to Environmental Permitting and Consultations. The guide is available at www.akenergyauthority.org/Reports%20and%20Presentations/2009WindBestPracticesGuide.pdf.
- Continued to administer the state's anemometer loan program.

The Alaska Wind Working Group (AWWG) helped organize several events this year, including:

- The Anchorage Wind-Diesel Summit, aimed at developing a mission and vision for the newly formed Wind Diesel Application Center (June 2009).
- The first Business of Clean Energy in Alaska Conference in Anchorage. More than 240 participants attended the sold-out event to hear energy efficiency and renewable energy experts from around the country, including Dan Arvizu, director of the National Renewable Energy Laboratory (May 2009).
- The 5th Annual Alaska Renewable Energy Fair. More than 2,000 people attended. Iowa Gov. Chet Culver shared Iowa's success story in becoming a nationwide wind leader (August 2009).

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Arizona

In FY09, the Arizona Wind Working Group:

- Published the first annual Arizona Wind Development Status Report, which was widely distributed and presented to three of the five elected Arizona Corporation Commissioners. The report summarizes development activities by county and company, and it lists the status of wind projects in the state (September 2009).
- Hosted two annual Arizona Wind Working Group meetings. The fall meeting was held in conjunction with Northern Arizona University's (NAU's) Southwest Renewable Energy Conference, which is the leading policy and technical conference on renewable energy in the West.
- Continued wind anemometer monitoring and data collection. The team collects wind data from multiple sites in Arizona and uploads the information to www.wind.nau.edu. Data are currently collected from viable project sites such as Gray Mountain on the Navajo Reservation and Foresight's Grapevine and Aubrey Cliffs projects. This work is especially important considering that data from the anemometer loan program led to the development of the Dry Lake Wind Farm.
- Provided technical expertise to landowners, citizens, elected county and city officials, economic development organizations, legislators, tribes, and companies working to develop wind projects in Arizona. The group facilitated collaboration and provided public presentations, one-on-one meetings, wind data for specific locations, and strategic advice.
- Provided training and education to local and NAU staff by participating in WPA-sponsored events, Webinars, and the annual WINDPOWER conference. Team members are now equipped to discuss the myths of wind energy, proper siting for large and small turbines, Arizona's wind potential, economic development benefits of wind in Arizona, current state of development, and policies to support wind.
- Founded an Arizona chapter of the Women of Wind Energy to help mentor and train women and men to work in the wind energy field and hosted chapter meetings in Phoenix and Flagstaff.

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Arizona Welcomes the Dry Lake Wind Power Project

Wind Powering America has been active in Arizona for a number of years. The team developed the Arizona wind resource map, funded the Arizona Wind Working Group, funded outreach activities through Northern Arizona University (NAU), and participated in the annual Southwest Renewable Energy Conference in Flagstaff. In September 2009, efforts paid off when Arizona's first utility-scale wind project, the 63-MW Dry Lake Wind Power Project near Holbrook, came online. The project contributed approximately $110,000,000 to Arizona's economy and will result in annual tax payments of $440,000.

WPA's Marguerite Kelly presented the Carpe Ventem (Seize the Wind) award to development partners Iberdrola Renewables, Salt River Project, Bureau of Land Management, Arizona State Land Department, Rocking Chair Ranch, Navajo County, and Suzlon Wind Energy Corporation. Secretary of the Interior Ken Salazar, Congresswoman Ann Kirkpatrick, and the Director of the Bureau of Land Management attended the event. The Carpe Ventem award honors the first utility-scale project in a state.

Secretary of the Interior Ken Salazar attended the dedication ceremony. Photo credit: Amanda Ormond/PIX16844.

The 63-MW Dry Lake Wind Power Project in Arizona is the state's first utility-scale power project. Photo credit: Iberdrola Renewables/PIX16705.

Arizona Congresswoman Ann Kirkpatrick spoke at the dedication ceremony. Photo credit: Amanda Ormond/PIX16843.

Arkansas

- The Arkansas Energy Office (AEO, a division of the Arkansas Economic Development Commission) and John Brown University (JBU) began administering an anemometer loan program. The team purchased four 34-meter meteorological towers in June 2009 and accepted applications during the summer. Twenty-three individuals from around the state applied to participate in the program (see map). The team conducted site visits to application locations in September 2009.
- With funding provided by the American Recovery and Reinvestment Act of 2009, the AEO will complete a tall-tower wind measurement study. The AEO received preliminary assistance from DOE's National Renewable Energy Laboratory (NREL) via the Technical Assistance Project (TAP). Under this TAP, NREL identified Arkansas areas that should be priorities for collecting wind data at commercial-scale heights. Further design details for this study are underway.
- With funding provided by the American Recovery and Reinvestment Act of 2009, the AEO is designing a Renewable Technology Rebate Fund. This program will provide nearly $2 million in rebates to individuals who install small renewable electric-generating systems that participate in the Arkansas Net Metering Program. These rebates should be available in early 2010.

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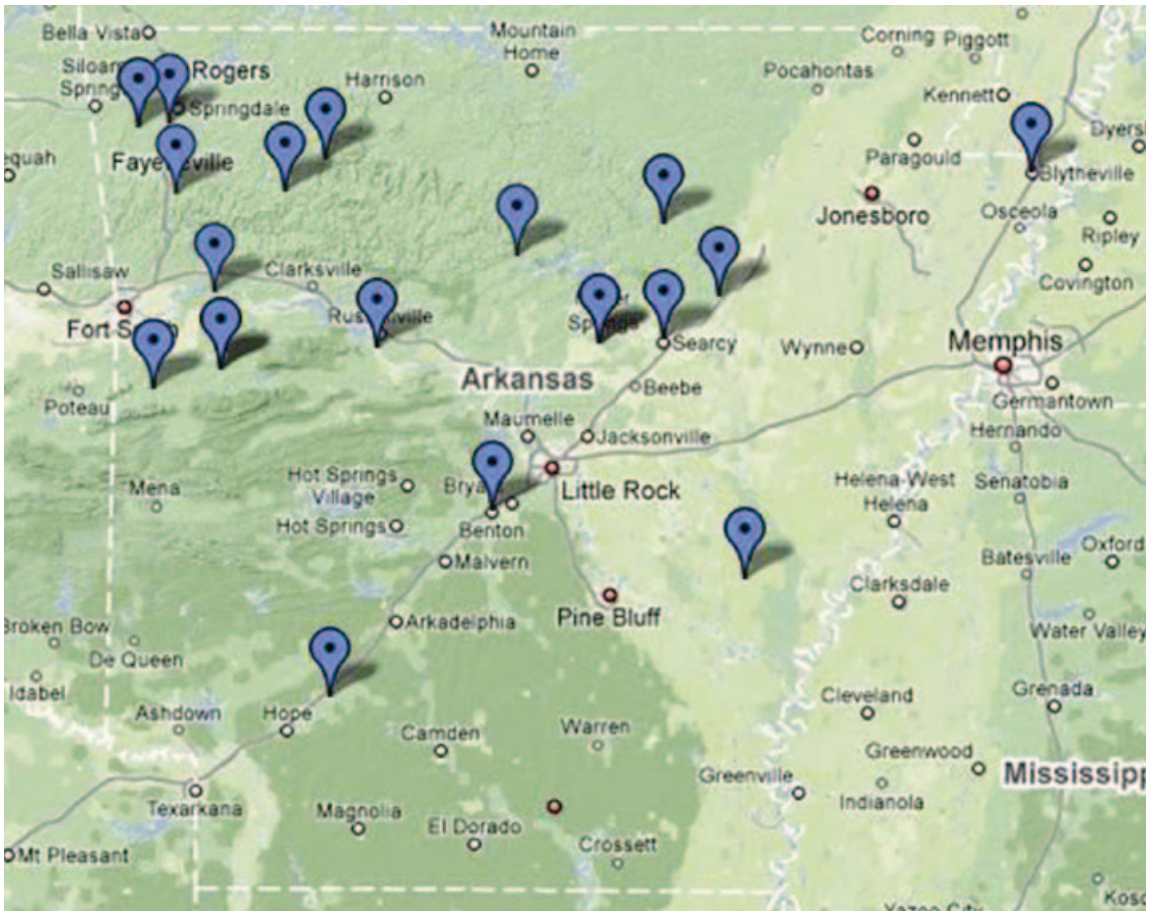
In preparation for installations at chosen sites, John Brown University staff temporarily installed a meteorological tower on the campus to check and calibrate the equipment. Photo credit: Jenny Ahlen.



Locations of 2009 applications for the Arkansas Anemometer Loan Program.

Colorado

- The Colorado Wind Working Group was established in March 2009 to overcome barriers to community wind development. Over the past several years, landowner groups have attempted to develop community wind projects without success. However, local interest remains strong, and three national community wind developers are now active within Colorado. During its initial meeting, the group requested research on local siting regulations and development of a workable definition for "local ownership." Locally owned projects receive a 1.5 Renewable Energy Credits multiplier, making them more valuable. A proposed interpretation to define "local ownership" was filed with the Colorado Public Utilities Commission, but the issue remains unresolved. The group is examining possible modifications to the existing statutory definition.
- The group conducted a survey of Colorado county siting regulations and issued a report on recommended practices.
- A discussion paper was prepared and circulated describing three policy options that would promote local ownership of renewable technologies. One option would allow local investors to establish an equity interest in large utility-scale projects. The second option would authorize formation of a feed-in tariff for innovative technologies. The third option would establish a set-aside for distributed generation within the Colorado renewable energy standard.
- The Wind Working Group published a revised community wind handbook, *Ownership Matters*. The handbook, which helps landowners understand options for developing their wind resource, is available at www.harvestenergy.org/colorado/final_website/WindHandbook.pdf.
- Colorado Governor Bill Ritter joined state and federal administrators, scientists, and engineers from three Colorado universities and three federal laboratories at the University of Colorado at Boulder for the inaugural symposium of the Colorado Renewable Energy Collaboratory's Center for Research and Education in Wind (CREW). The Collaboratory is a consortium charged with developing new, cutting-edge energy technologies in Colorado that can be rapidly transferred to the marketplace. The Collaboratory includes the University of Colorado at Boulder, Colorado State University, the Colorado School of Mines, and the National Renewable Energy Laboratory. CREW's founding members include leading national and international wind power manufacturers, developers, operators, and consultants.
- The Governor's Energy Office (GEO) partnered with five rural electric utilities to offer incentives to install small wind turbines. The GEO offered $25,000 to each utility partner (Highline Electric Association, Southeast Electric Association, Sangre de Cristo Rural Electric Association, Mountain View Electric Association, and Town of Estes Park), and each utility matched the amount. More than $300,000 in incentives was offered to residential and commercial customers. The rebate offer was $2/watt with a maximum rebate amount of $6,000. By December 21, 2009, more than 40 turbines were installed in the utilities' service regions.

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Burlington High School science teacher Jim Jones digs the foundation for the Wind for Schools project turbine. Photo credit: Michael Kostrzewa/PIX16847.

Colorado Wind for Schools Program

Wind Applications Center (WAC): Colorado State University (CSU)

State Facilitator: Tom Potter, All American Energy

- The Colorado WAC and the Colorado Governor's Energy Office (GEO) selected six rural schools for the 2009 Wind for Schools program: Arriba-Flagler Consolidated School District High School, Burlington High School, Kit Carson High School, Stratton High School, Walsh High School, and Wellington Middle School. Each school received a $5,000 grant from the GEO to help purchase and install a Skystream 3.7 turbine. Students and staff from the Colorado WAC helped to design the installations during the summer, and the turbines should be installed during 2010. The WAC and the GEO will select an additional five schools for the Wind for Schools program in 2010 (the GEO budgeted $100,000 for the Wind for Schools program in 2010). NREL's Ian Baring-Gould and Larry Flowers participated in the GEO's proposal review, and NREL has agreed to purchase the green tags from the first projects.
- The Colorado WAC also installed one of four 34-m Earth Turbine anemometer towers in Idalia in July. This site is about one hour north of the Wind for Schools host schools in Flagler, Stratton, and Burlington. The WAC plans to install three more 34-m towers in 2010 to support the Wind for Schools program.
- The Colorado Anemometer Loan Program continued a successful 2009 by moving 20-m and 30-m anemometer towers from six sites and re-installing these and other towers at nine sites across Colorado. Student teams (17 undergraduates and one graduate student) were employed for the installation. Among the 18 students were two minorities: two female mechanical engineering undergraduates and two Native American undergraduates (one in mechanical engineering and one in electrical engineering). Many of these same students also contributed to the Colorado WAC during the past year, either as part of a preliminary student design team or assisting with various installation phases during the year. During the past year, six mechanical engineering undergraduate students conducted wind resource analyses at 25 sites.

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Connecticut

A 60-m met tower at Bishop's Orchards in Guilford, Connecticut. Photo credit: Glenn Weston-Murphy.

- The Connecticut Wind Working Group (WWG) facilitated the passage of zoning enabling local wind projects in the Town of Guilford.
- The WWG inspired Yale University's first wind energy course (G&G/ ENAS485b), taught by Professor Ronald Smith in the spring 2009 semester.
- At least six wind studies are underway in Connecticut for utility-scale turbines (individual and small groupings), and there are numerous inquiries for residential and small business turbine applications.
- The WWG expects the official announcement of Connecticut's first utility-scale projects in 2010. In addition, the group expects that the state's first medium-scale turbines will also be installed in 2010.
- The Clean Energy Fund's small wind turbine demonstration project will be operational in the first quarter of 2010.
- The group is currently seeking funding for a used SecondWind Sodar to be used in place of an anemometer loan program to evaluate Connecticut's wind resources and facilitate wind energy development in the state.

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Georgia

Georgia WWG members toured the future site of a Towns County wind turbine to be installed for use at a school. Photo credit: Rita Kilpatrick.

- Over the past year, the Georgia Wind Working Group expanded its base to advance wind energy in Georgia. The group met quarterly and convened routine committee meetings for the Georgia Mountain Wind Committee and the Coastal-Offshore Wind Committee.
- The Georgia Mountain Wind Committee collaborated with Gainesville State College on a wind mapping project and technical support to Georgia Wind Working Group members, including Georgia utilities and land-use planners to install wind projects at appropriate school sites in Georgia.
- The Coastal-Offshore Wind Committee attended two public forums in Savannah sponsored by the U.S. Minerals Management Service on offshore renewable energy rulemaking, in recognition of the interest by Southern Company and various other utilities in the region to begin feasibility testing for offshore wind development. An offshore wind fact sheet and FAQs were drafted for use by the public.
- A model wind ordinance was finalized that reflected input from the full Wind Working Group and legal specialists from the University of Georgia.
- A wind intern from Agnes Scott College assisted with Web site redesign and updates.
- The group received information and updates about federal recovery stimulus grant opportunities for wind projects and provided suggested criteria for grant guidelines for wind energy projects.
- Six members of the Georgia Wind Working Group participated in WPA's All-States Summit in Chicago.

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Hawaii

- The State of Hawaii and the Hawaiian Electric Company (HECO) signed an energy agreement to accelerate Hawaii's energy objectives in the regulated electric utility sector (October 2008). The agreement includes renewable energy commitments, measures to increase energy efficiency, and improvements to grid operation and infrastructure.
- Major wind projects are on the horizon for Hawaii. HECO is negotiating for another 30-MW wind farm in the Kahuku area of Oahu, and two wind farms on Maui (about 22 MW each) may receive power purchase contracts (although it's possible that only one will be built). These are an expansion of the Kaheawa wind farm and a new development at Auwahi that is expected to include battery storage.
- The biggest wind news relates to the proposed 200-MW wind development on Lanai and possibly another 200 MW on Molokai, which would be connected

to the Oahu grid via an undersea cable. The Department of Business, Economic Development, and Tourism (DBEDT) expects to award a contract for an EIS on the cable system in the coming months; the RFP was issued in 2009.

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Idaho

The Idaho Wind Working Group (WWG) supported wind industry expansion in the state, beginning with less than 50 kW of installed capacity in 2000 to almost 150 MW of installed capacity today. The group's activities have now concluded. The Idaho Wind Task Force, which is part of the Idaho Strategic Energy Alliance, will conduct many of the original WWG's tasks. The Alliance will make recommendations to Governor Butch Otter to help Idaho develop all forms of energy (as well as energy conservation and transmission).

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IDAHO STATE JOURNAL

Charter school harnesses wind

School's wind turbine is first in city limits

Idaho Wind for Schools Program

Wind Applications Center (WAC): Boise State University (BSU)

State Facilitator: Renaissance Engineering and Design

Pocatello Community Charter School (PCCS): PCCS received $12,500 in funding from the Lowe's Toolbox for Educators program, more than double the amount requested. In April 2009, the Pocatello Planning & Zoning Committee approved the permits to erect a Skystream on a 45-foot monopole tower. Many community members testified in support of the turbine project; nobody testified in opposition. The committee unanimously approved the permits.

The team erected the turbine on August 12, 2009. Many parents and local businesses contributed to the effort. Program partner H & H Utility Contractors, Inc. provided a crane and bucket truck to erect the tower at no cost. On September 23, 2009, the public attended a dedication and ribbon-cutting ceremony that celebrated "Pocatello's First Wind Turbine." The mayor was the event's keynote speaker.

Shelley High School: Shelley received $4,000 in funding from the Lowe's Toolbox for Educators, which covered the costs of the turbine and foundation bolt kit. Local donations paid for conduit and wiring, a backhoe contractor, concrete for

the foundation, and the electric meter. The BSU WAC provided technical specs for the disconnect switch.

Contractors poured the foundation for a 45-foot monopole tower in June 2009, and on July 28, 2009, Shelley-based LC Insulation (a Skystream dealer) erected the turbine. Several Shelley High School students watched the installation along with BSU WAC student-employee Ken Fukumoto.

Richard McKenna Charter High School: School officials applied for $5,000 from Lowe's Home Improvement's Outdoor Classroom Grant. (Lowe's grants provided funding to the Shelley High and Pocatello projects.) The BSU WAC pledged to contribute the remainder of the Tidwell Idaho Foundation's donation to purchase a 45-foot monopole tower. Additionally, the school's governing board has approved up to $5,000 to fund the project. H & H Utility Contractors, Inc. has also pledged its bucket truck and crane for this project.

Boise State University maintains a comprehensive Web site documenting the Idaho Wind for Schools program. Visit the site (http://coen.boisestate.edu/WindEnergy/WfS/index.asp) and watch a YouTube video of the Pocatello Community Charter School turbine installation.

Workforce Development Updates:

- Both of the first-year BSU WAC student employees graduated and are now working in the wind industry. Gamesa Energy USA hired Zach Parker, and RE Power Systems hired Stephanie Lively. Gamesa selected Parker in large part because of his understanding of the wind industry and the permitting and interconnection experience he gained working at the WAC. Other BSU alumni in the wind industry are listed on the alumni roster: http://coen.boisestate.edu/WindEnergy/AlumRoster.asp
- The BSU WAC hired Ken Fukumoto, a mechanical engineering junior at BSU, to replace Parker as a WAC student employee. This year Fukumoto accompanied the state facilitator on site visits to nine Idaho schools interested in applying for a Blue Sky Grant from Rocky Mountain Power.
- Researchers at the BSU WAC presented three conference posters at WINDPOWER 2009 in Chicago. Dustin Shively, a mechanical engineering master's student, presented *Carbon-Free, Site-Independent Energy Storage for Grid Integration*. Master's students Alan Russel (mechanical engineering) and Kevin Nuss (computer science) conducted the bulk of the work on a research project titled *Forecasting for Wind Energy Grid Integration* (partially funded by the Bonneville Power Administration). Two posters detailing aspects of this project were on display at WINDPOWER.

- Industry partner PowerWorks sponsored a wind energy senior design project at BSU. The project entailed designing replacement blades for PowerWorks' 100-kW turbine based on existing airfoils but using newer materials.
- The BSU WAC is collaborating with partners at the Idaho National Laboratory to collect, analyze, and post meteorological data from more than 60 potential wind sites around the state. Anemometer towers provided by WPA's Anemometer Loan Program are collecting most of the data. Data are available on the BSU WAC Web site at http://coen.boisestate.edu/WindEnergy/WindData/index.asp
- The BSU WAC is also collaborating with two Idaho colleges to develop wind energy technician training programs: the College of Southern Idaho and Idaho State University Energy Systems Technology and Education Center (ISU ESTEC). Todd Haynes serves on the advisory committees for both programs. Both programs have verbally committed to their tech students performing maintenance on the Wind for Schools Skystream turbines as necessary. The BSU WAC would coordinate the maintenance (order parts, schedule bucket trucks, and make arrangement with K-12 schools), but wind tech students from one (or both) of the colleges would perform the maintenance. Both programs plan to begin offering wind energy technician courses during the 2009-10 academic year.

Funding Updates:

According to the Idaho Wind for Schools team, funding is the biggest obstacle for interested schools in Idaho. The Tidwell Idaho Foundation awarded a grant of $15,000 to the Boise State Foundation in support of the Wind for Schools program. BSU used $4,600 of that contribution to purchase equipment at Jerome Middle School (installed at the end of FY08). Approximately $3,800 was used to purchase a 45-foot tower for Shelley High School, and funds were also used to purchase a weather station at Riverstone International School. The remainder was earmarked as a match to purchase a 45-foot monopole tower and foundation bolt kit at Richard McKenna School.

On behalf of five schools in Rocky Mountain Power's (RMP's) eastern Idaho service territory, the BSU WAC applied for $56,000 in funding through RMP's Blue Sky Grant. RMP awarded the WAC $32,000 (www.rockymountainpower.net/Article/Article72035.html), which will assist three of the original five schools (Clark County Junior/Senior High, Midway Middle School, and Rigby High School) in purchasing wind turbines, towers, foundation kits, and balance-of-plant equipment to participate in the Wind for Schools program.

Now that a major portion of funding has been secured and the permit and interconnection processes have begun, the goal is to install three turbines in late spring 2010. H & H Utility Contractors, Inc. will provide a bucket truck and crane for these installations. This donation was one of several matches provided in the Blue Sky Grant application.

Additional Updates:

- In collaboration with the Idaho National Laboratory (INL) and Skyline High, the BSU WAC participated in a teacher-training event in Idaho Falls in October 2008. The two-day event, held in conjunction with the Idaho Science Teacher Summit, focused on energy and was open to all Idaho science teachers. The BSU WAC participated in a similar teacher-training event in August 2009 in Idaho Falls sponsored by INL. The 2009 workshop was larger than the prior year's, with more than 100 teachers from around Idaho in attendance. Haynes was part of a panel discussion to the general assembly focused on energy-related careers in Idaho and hosted a break-out session

focused on Wind for Schools participation. The National Energy Education Development (NEED) Project was a co-sponsor/participant at both events.

- AWEA provided scholarships for several K-12 teachers throughout the nation to attend WINDPOWER 2009 in Chicago. Haynes assisted Katie Cutler, Jerome Middle School's teacher/project champion, to prepare an application that highlighted participation in the Wind for Schools program. AWEA selected Cutler to attend the conference.
- INL created a database that will allow turbine data sharing for all Wind for Schools projects nationwide (http://wind-for-schools.caesenergy.org/wind-for-schools/Wind_For_Schools.html). INL and the Center for Advanced Energy Studies (CAES) are hosts.

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Illinois

- The Center for Renewable Energy at Illinois State University hosted the Illinois Wind Working Group's (IWWG's) Third Annual Wind Energy Conference in Bloomington (Illinois). More than 420 people attended the two-day event that featured four concurrent sessions with topics such as siting and zoning, economic development, wind for schools, environmental impacts, and aerial application. Twenty-four exhibitors provided information for attendees (July 2009).
- As a pre-conference event, the Center for Renewable Energy hosted a wind turbine supply chain workshop for 200 manufacturers. The event featured speakers from the Great Lakes Wind Network, Acciona, and suppliers that are already in the wind turbine supply chain (July 2009).
- The second Siting, Zoning, and Taxing Wind Farms in Illinois Conference was held in Peoria for 300 county board and zoning board members from across the state (February 2009).
- The IWWG held seven Wind Energy 101: From a Landowner's Perspective forums at different locations in the state.
- The Illinois Institute for Rural Affairs (IIRA) at Western Illinois University continues to operate and maintain the state's wind monitoring program. The program now has information on 27 sites throughout Illinois and has utilized the data to create wind maps at various heights (simulating hub heights for small to large wind turbines). The data and maps are available at www.illinoiswind.org, along with more online resources for individuals interested in wind energy in Illinois.

- American Recovery and Reinvestment Act funding allowed the state government to roll out major new grant programs for wind turbine projects, and IIRA served as the primary technical assistance provider to applicants. IIRA staff conducted a comprehensive survey of county-level wind energy zoning ordinances in Illinois and gave presentations around the state on wind turbine zoning and related issues.
- The Center for Renewable Energy at Illinois State University prepared and presented *Economic Impact: Wind Energy Development in Illinois*, June 2009 (http://renewableenergy.illinoisstate.edu/wind/downloads/072409%20IWWG%20Economic%20Impact%20Report.pdf). The analysis showed that the 1,119 MW of wind energy will generate $1.9 billion in economic activity over the life of the projects, including 6,019 full-time jobs during construction periods and almost 292 permanent long-term jobs. The report noted that a number of factors contributed to the rapid growth of wind power capacity in Illinois from 50 MW in 2003 to 1,119 MW in 2009, including federal and state policies, energy security, energy costs, environmental benefits, and economic development opportunities. One key policy driver in Illinois was the passage of the Illinois Power Agency Act in 2007, which included a Renewable Portfolio Standard of 25% by 2025 (of which 75% of the renewable energy resources must come from wind).

Wind Energy School Programs

Illinois State University has 70 students in the Renewable Energy undergraduate major, along with a waiting list. The curriculum includes courses in the departments of technology, economics, and agriculture. Students in the program choose between a technology track or an economics/public policy track. Renewable energy experts and potential employers comprise the program advisory committee and review the curriculum to ensure that it will result in graduates who are highly trained and knowledgeable. Graduates are expected to be conversant in diverse disciplines, including technical, managerial, political, and economic issues important to renewable energy.

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Indiana

- Indiana has experienced tremendous growth in wind development during the past year. According to the Midwest Independent System Operator (MISO) queue, approximately 2,600 MW are under development in the state, making Indiana one of the fastest-growing states for wind development. A large portion of this growth is attributed to ease of access to transmission capacity, which has opened up more expensive electricity markets in other parts of the country.
- Fueled by the growth of the wind industry and interest from the manufacturing sector, the Indiana Wind Working Group (IWWG) grew from approximately 200 members at the end of September 2008 to approximately 340 members to date. The group held five meetings during the past year.
- The Indiana Office of Energy Development (OED) and a variety of partners within the IWWG produced two large events. In April, a supply chain workshop in Fort Wayne helped to educate existing manufacturers about the wind industry. The event attracted more than 270 people representing approximately 120 manufacturing firms. OED also organized Windiana, its annual wind conference. The event doubled in size from the previous year (approximately 650 attendees). OED handled event logistics with assistance from Purdue University while the IWWG helped define the content.
- OED continued its public outreach program to thousands of Indiana constituents at regional workshops; county-level informational meetings; speaking engagements before local, regional, and state organizations; and the Indiana State Fair.

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Jon Bell, marketing manager for Arrowhead Plastic Products of Eaton, Indiana, took this photo of the Fowler Ridge Wind Farm while attending the Windiana Conference in July 2009. Photo credit: Jon Bell, Arrowhead Plastic Products/ PIX16445.

Kansas

In its first year, the Kansas Wind Working Group (WWG) focused on the critical issue of transmission, both in Kansas and within the Southwest Power Pool (SPP). At its spring meeting, keynote speaker Michael Moffet, commissioner with the Kansas Corporation Commission and president of the Regional State Committee of the SPP, provided an overview of the planning process for transmission within the SPP. At its fall meeting, the WWG heard from the state's largest investor-owned utilities, Westar and Kansas City Power and Light, regarding their plans for transmission expansion in Kansas.

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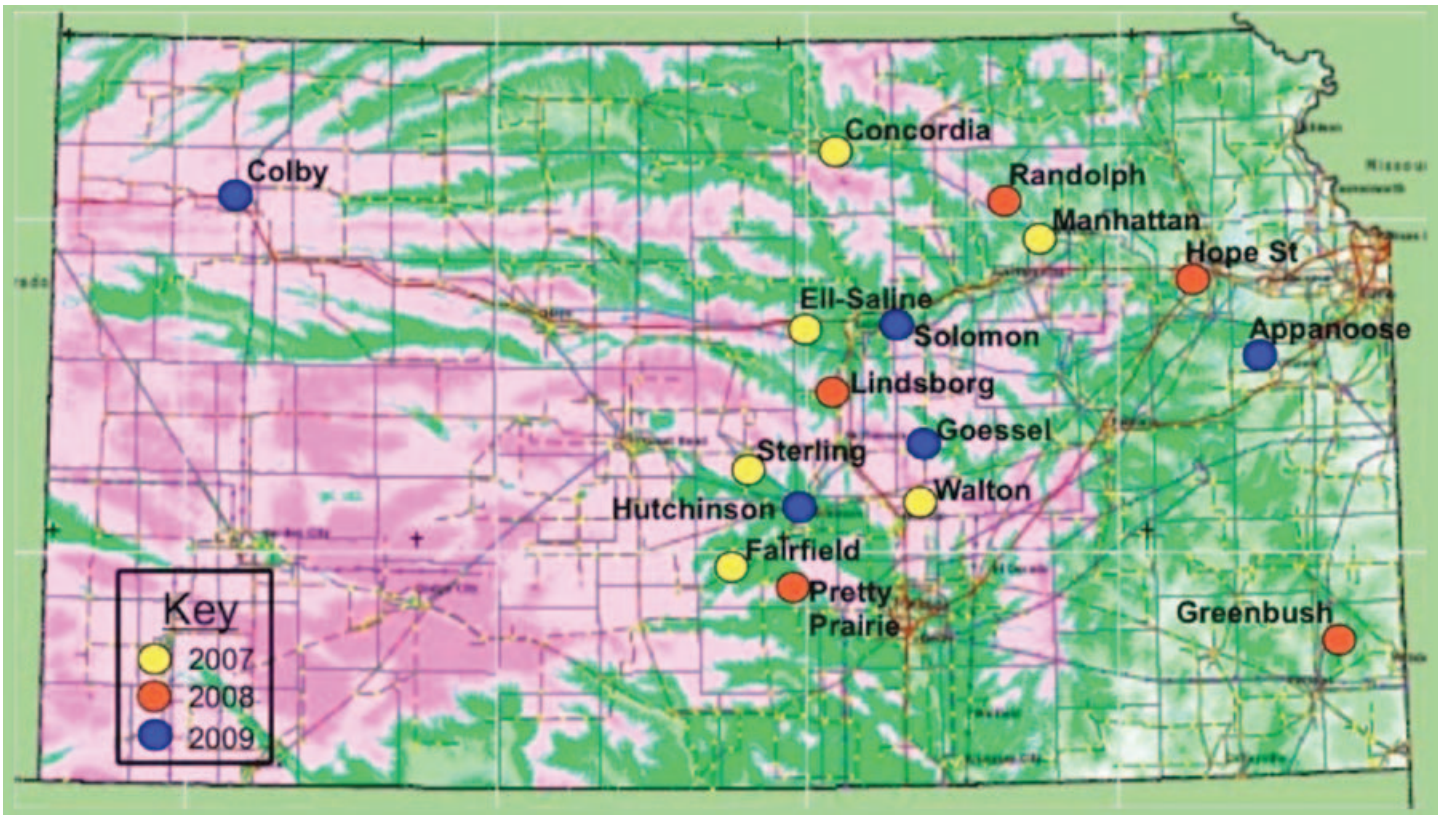
The ninth turbine in the Kansas Wind for Schools program was installed on September 15, 2009 in Pretty Prairie. The entire school watched the installation (90 grade school students and 60 middle school students). Photo credit: Ruth Douglas Miller.

Kansas Wind for Schools Program

Wind Applications Center (WAC): Kansas State University (KSU)

State Facilitator: Dan Nagengast, Kansas Rural Center

The Kansas Wind for Schools program installed its first turbine in 2008. The table provides a status update for the 21 Kansas schools visited or contacted by the Kansas WAC team since the program's inception.



Status of 21 Kansas Schools Visited and/or Contacted by Kansas WAC Team		
School Name and Location	**Date First Contacted**	**Status**
First Round		
Fairfield USD 310 Langdon	September 2007	Installed May 2008 Operating; no online data
Sterling HS Sterling	September 2007	Installed May 2008 Operating; online data in progress
Walton Elementary Walton	September 2007	Installed July 2008 Operating; no online data
Concordia Jr/Sr HS Concordia	September 2007	Installed fall 2008 Operating; no online data
Ell-Saline Jr/Sr HS Brookville	September 2007	Installed November 2008 Operating; online data through INL
Second Round		
Greenbush Education Center Greenbush	September 2007; delayed acceptance to second year	Installed September 2008 Operating; online data through Fat Spaniel and INL
Blue Valley Jr/Sr HS Randolph	April 2008	Installed April 2009 Operating; online data local and INL
USD 217 Rolla	September 2007; reapplied in April 2008	Site visit spring 2008 Declined; want to install larger turbine
USD 225 S. Barber Co	September 2007; reapplied in April 2008	Site visit spring 2008 Declined; want to install larger turbine
USD 216 Deerfield	April 2008	Site visit spring 2008 Declined due to tight budget
Pretty Prairie Jr HS Pretty Prairie	April 2008, originally on hold to 2009; replaces Rolla	Site visit spring 2008 Installed September 2009 Operating; no online data
Smoky Valley School District Lindsborg	April 2008 originally on hold to 2009; replaces S. Barber	Siting visit and report completed fall 2009 Determining desired turbine and budget
USD 380 Centralia	April 2008	Denied application due to insufficient detail
USD 329 Alma	April 2008	Denied application; insufficient detail and poor wind resource
Hope Street Academy Topeka	April 2009 To replace Deerfield	Siting visit completed summer 2009 Permitting complete Awaiting good weather for install
Third Round		
Appanoose Elementary Pomona	April 2009	Siting visit and report completed fall 2009 Permitting complete Awaiting good weather to install
Solomon School District Solomon	September 2007 (incomplete application denied) Reapplied April 2009	Siting complete Permitting complete Awaiting good weather to install
Colby Community College Colby	April 2009	Siting visit and report completed fall 2009 Permitting in process Awaiting good weather to install
Hutchinson School District Hutchinson	April 2009	Siting visit and report completed fall 2009 Awaiting good weather to install
Goessel School District Goessel	April 2009 Originally delayed; to replace Hope Street	Siting visit and report completed fall 2009 Turbine and tower selection Awaiting final decision by board
Seaman HS Topeka	April 2009	Denied due to proximity to Hope Street, which had the stronger application

Blue Valley School District, Randolph: Blue Valley School District is located near KSU. The district's information technologies staff person, who is also a KSU employee, played a major role in installing the communications software. Blue Valley was the first Kansas turbine with live streaming data from INL. Students assembled the turbine foundation cage, and Westar Energy's Green Team and Smalley Energy completed the installation. This site appears to have the best wind resource of all Kansas Wind for Schools project locations so far.

Pretty Prairie School District, near Fairfield: During the WAC's initial visit in 2008, the team selected a site near the elementary school at the southern edge of town. Smalley Energy and Westar, however, later selected a site near the middle school due to concern about the proximity to the playground. The final site is between two rows of hackberry trees, presently about 45 feet tall. This site will likely degrade turbine production quite a bit. Kansas Public Television station KTWU filmed the installation, and the program aired in December 2009.

Brookville, near Salina: Tradewinds Energy provided financial support for this project. Graduate student Mark Hopkins assisted with the installation and programming of the turbine.

Anemometer installations: As part of the Kansas Wind for Schools Program, one anemometer tower was installed (at Colby Community College) in 2009. The WAC team identified sites for two more installations in 2010 (at Kansas State University and Hutchinson School District).

Workforce Development Updates:

The following table describes the students who participated in wind-related academic activities as part of the Wind Application Center.

- Students in ECE 681 in Fall 2009 completed 10 projects: six Wind for Schools project site assessments, two met tower or community wind site assessments, and two turbine design projects.

Students in Wind Energy Courses	Caucasian	African-American	Hispanic	Native American	Asian-American	Foreign	Total
Class number Class name Semester							
ECE 582 Wind Research Spring 2009 (So, Jr, Sr UG)	4 M	1 M	1 F				6
DEN 499 Honors Research Spring 2009 (Sr UG)	1 M 1 F						**2**
IMSE 591/592 Senior Design Project Spring-Fall 2009 (Sr UG)	3 M						**3**
ECE 681 Wind and Solar Energy Systems Design Fall 2009 (Jr, Sr, G)	23 M 4 F	1 M	1 M 1 F			2 M	**32**

M= male, F= female, UG = undergraduate, G = graduate

- The WAC also engaged students outside of class activities. During 2009, three Master of Science (MS) candidates and eight undergraduate students participated in WAC activities outside of enrolled classes. One MS student receives direct funding from the WAC; one MS and two undergraduate students are funded by the Power Affiliates Program, supported by a consortium of local electric utilities; and three undergraduate students and one MS student are supported by a National Science Foundation grant to incorporate sustainability principles into the undergraduate curriculum.

KSU mechanical engineering senior Andy Fry (in the white shirt) presents his team's Wind for Schools report to the Goessel school board and employees of Endurance Wind. Andy is now employed at the Kansas Corporation Commission and will likely be tasked with helping to evaluate proposals for projects funded by the American Recovery and Reinvestment Act.

Student Projects:

- Constructing a vertical-axis wind turbine (without generator) from various scavenged materials for a demonstration at the University Open House
- Providing wind site assessment and turbine production estimates for a Kansas Department of Transportation rest area on Interstate 70 near Goodland
- Working with all the Wind for Schools host schools to post data online through INL, creating a Kansas Wind for Schools turbine production database at KSU, and installing a complete network/data acquisition system for KSU's WAC turbine
- Developing a model of low-altitude turbulence around trees and buildings (to be verified with anemometer and turbine data)
- Installing an Air Breeze wind turbine at the engineering building on campus, along with a small solar array, associated data logging equipment and software, and a Web camera to display the generators in real time.

In addition, WAC students submitted three posters for presentation at WINDPOWER 2010.

Additional Updates:

- Approximately 20 teachers attended a National Energy Education Development (NEED) Project teacher-training workshop in Newton. All but two were from schools that had applied for a Wind for Schools turbine, and only one teacher had no previous knowledge of the Wind for Schools project (August 2009).
- WAC director Ruth Douglas Miller attended the WINDPOWER conference in Chicago and presented a poster: *Wind for Schools in Kansas: A Second-Year Progress Report*.
- At the annual WPA All-States Summit, Douglas Miller and Kansas facilitator Dan Nagengast received an award for "Outstanding Leadership in the Application of Wind for Schools."
- Douglas Miller gave four wind energy presentations in Kansas during summer 2009.
- The WAC Web site was revised during fall 2009 and now includes a map and links to all the Kansas Wind for Schools host schools and INL data displays.
- The public television station KTWU aired a profile of local Skystream dealer-installer Bill Smalley in December 2009, including footage of the Pretty Prairie Wind for Schools installation and information on the Wind for Schools project.

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Maine

Maine currently has the most operating wind power projects in New England: 95% of New England's installed wind power base is in Maine.

- In November 2008, Governor Baldacci created an Ocean Energy Task Force to investigate how to take advantage of the strong offshore wind resources off the coast of Maine. In April 2009, it finished its preliminary report to the Governor. In June 2009, the Legislature passed into law its proposed Test Site Permit requirements. During June 16–18, 2009, it hosted *OceanEnergy 2009*, a national, scientific conference on harnessing ocean energy (wind, tidal, wave, etc.) with more than 800 participants. The state, along with private companies, is working with the University of Maine, Orono to secure funding for an offshore wind resource center where offshore wind technologies could be tested for commercial operation. To date, more than $25 million in federal dollars have been secured for this proposed project.
- In addition, Governor Baldacci, through his leadership with the New England Governors' Conference, is leading an effort to develop a "Regional Energy Blueprint" that will help guide renewable energy development, including wind power, in the region as well as the transmission necessary to make it a reality.
- Led by the Governor's Senior Policy Advisor, the Commission to Study Energy Infrastructure was developed to: 1) review the state entering into agreements for the use of state-owned assets (highways, submerged lands, rail corridors, etc.); 2) develop a plan to govern agreements, including how to value, price, and allocate them to maximize public value; 3) ensure that any agreements enhance state energy goals regarding renewable energy, energy rates, natural resources, etc.; 4) examine policy issues relating to energy corridors in general and within the context of regional and federal energy transmission planning. The commission is composed of three state Senate members, five state House members, and five members selected by the Governor. During the first few meetings, the commission made the following findings: 1) Maine has an ideal location, as it is at the center of 75+ million North American energy consumers, many of whom are located in major metropolitan areas; 2) Maine and eastern Canada have large sources of identified renewable energy; 3) Energy transmission developers have a strong interest in using some state

assets as locations for transmission of energy, including state highways and rail corridors, submerged lands, and public lands.

- The Maine Composites Alliance, in collaboration with the University of Maine, First Wind (wind developer), Cianbro (major construction company), and the Maine Port Authority, launched the Maine Wind Industry Initiative (MWII) in FY09 to develop the competitiveness of Maine industry and to grow opportunities in the wind industry in the Northeast United States. MWII will lead the Maine wind industry and drive collaborative efforts involving the following organized industry clusters: Maine Composites Industry (MCA); Heavy Constructors (AGC); Precision Manufacturing and Machining (MAMe); Research and Development (AEWC); Government (Maine Port Authority/Governors Office); major wind site developers, including First Wind and TransCanada; and engineering and environment consulting firms operating in this market. The purpose of the initiative is to organize the interests currently involved in the wind energy industry to identify common needs, pursue market opportunities on behalf of Maine industry, document the industry's needs, and assist the state in leveraging its considerable natural resources to the benefit of the state. In late FY09, MWII released two essential wind industry and job information reports that focused on employment opportunities and requirements and wind development training in Maine.

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Maryland

In FY09, the Maryland Energy Administration (MEA) team:

- Met with the three main utility-scale wind developers in Maryland — Criterion Power, Synergics LLC, and U.S. Windforce — to examine challenges and opportunities for utility-scale development in the western part of the state. MEA invited consultants Natalie McIntire of AWEA and Kevin Porter of Exeter Associates to the meeting to speak about PJM interconnection issues.

In 2009, MEA conducted a series of small/residential wind power stakeholder outreach meetings to discuss issues of concern for Maryland residents. The most commonly encountered barrier to deployment of wind energy systems is lack of local ordinances.

So far, nine Maryland counties passed ordinances creating siting guidelines for small- and community-scale wind (eight passed in 2009). Many of these were based on the Model Small Wind Ordinance developed by MEA in collaboration with small wind energy stakeholders.

Photo and map courtesy of Andrew Gohn, Maryland Energy Administration.

- Utilized ARRA funding to increase the Windswept grant program funding levels. Grant amounts are no longer proportional to a manufacturer's rated capacity; now grant amounts are indexed to a manufacturer's projected power output at 11 m/s wind speed. The grant cap was raised from $10,000 to $20,000. Also, grant rates increased from $2,500/kW to $2,800/kW for the first 5 kilowatts and $2,100/kW for each additional kilowatt.
- Worked with local officials from Somerset County and the Town of Crisfield to plan a community-scale wind energy project.
- Testified in support of deployment of utility-scale wind power at an administrative hearing before the Maryland Public Service Commission.
- Met with a local wind energy group interested in developing wind energy on U.S. Navy properties.
- Drafted a new policy for the anemometer loan program that directs more anemometers toward mid-scale community wind projects to maximize cost efficiency and support state community wind policy.
- Worked with state university personnel to improve methodologies for analyzing meteorological and climatological patterns that bear on wind energy development in Maryland.
- Coordinated with the Appalachian Regional Commission to develop a regional community outreach effort.
- Worked with the Maryland Department of Natural Resources and the Maryland Critical Area Commission to develop interim guidelines regarding the installation of small and residential wind energy turbines within the Chesapeake Bay Tributary Critical Area. This coordination is necessary to balance the protection of critical wetlands with the need for streamlined permitting for installation of small wind turbines.
- Hosted three small and residential wind energy outreach forums in the eastern, central, and western areas of the state to reach out to stakeholders who would be unlikely to travel for a central meeting. These meetings yielded the following points of consensus:
  - Outreach and education are needed for the general public and stakeholders like county and town elected officials and planners, students and schools (elementary, secondary, and higher education), utilities, and others. It is important for the public to understand the difference between utility and small-scale wind.
  - Although localities are unique and must lead their own zoning/planning decision-making, coordinating and sharing information on "best practices" for small wind ordinances across towns and counties might be valuable.
  - Those who are interested in installing a turbine at their residence or business could benefit from easily accessible information on financing and incentives, technical information on turbines and wind resources, and local permitting processes.
  - Regional meetings are useful to promote information exchange, identify resources, ask questions, and consider activities.
- Participated in national press coverage of a Maryland small wind installation that highlighted the benefits of renewable energy in contrast with a local coal-fired power plant.
- Developed a plan to partner with the Maryland Association of Counties to provide a forum for county planning and zoning officials to improve the consistency of small wind ordinances among Maryland counties.

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Massachusetts

- The final version of the Massachusetts strategic plan was issued in November 2008 to a wide variety of stakeholders. Plan implementation is underway.
- The Wind Energy Center (WEC, formerly RERL) continues to lend technical support to a variety of wind projects in the state, participating in weekly conference calls with the state's new Director of Wind Energy Development, Steven Clarke. Efforts are focused on mapping state wind potential, development work at state-owned sites, and technical advice concerning setback, sound and visual impacts, and icing.
- The WEC also provided technical assistance to the State Siting Subcommittee of the Energy Facilities Siting Commission, convened by the Massachusetts Executive Office of Energy and Environmental Affairs. This subcommittee was charged with developing draft legislation to make the current permitting process for wind energy facilities in the state more coherent and predictable. The WEC also participated in Massachusetts Department of Public Utilities proceedings on net metering, net billing, and neighborhood net metering and helped to develop recommendations for the Massachusetts Renewable Portfolio Standard.
- The Massachusetts Wind Working Group continues to meet regularly. Highlights of the past year's meetings include a tour of the new 600-kW turbine at Holy Name Central Catholic Junior/Senior High School in Worcester.
- The WEC participated in a Department of Public Utilities Technical Conference in October 2008 to discuss key provisions of the new Green Communities Act.
- The state-based anemometer loan program continues to support anemometry projects.

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Massachusetts Wind Working Group meeting. Photo provided by Mary Knipe.

Michigan

- The Michigan State Wind Outreach Team conducted 151 presentations that reached more than 11,000 people. The diverse groups interested in learning about wind energy included township and county officials, local planners, crop dusters, students and teachers, farmers, and the Corvette Club of Michigan.
- The Michigan Wind Working Group held three meetings in FY09, and staff sent regular e-mail updates to share information among the more than 400 group members.
- Governor Granholm's Executive Order 2009-1 created the Great Lakes Wind Council to identify promising Great Lakes sites for wind energy systems. In addition to examining how best to engage citizens in a public dialogue about offshore wind, the council identified criteria for reviewing applications for offshore wind development and criteria for mapping areas that should be excluded or are more favorable for such development. The Governor received a full report by September 2009, and she has extended the work of the council for one more year. The council has asked the State Wind Outreach Team to develop an outreach and education plan related to offshore wind energy.
- The Great Lakes Renewable Energy Association sponsored the third Michigan Wind Energy Conference in Detroit in March, attracting approximately 900 attendees the first day and 600 attendees the second day. Manufacturers involved or seeking involvement in the wind industry comprised approximately half the attendees on the first day. First-day workshop tracks were manufacturing, training, finance and legal issues, and commercial wind. Second-day workshop tracks were small wind, community wind, and offshore wind.
- Michigan State University Extension (MSUE) continued its extensive outreach efforts to farmers, landowners, and other interested parties. MSUE is now in the third round of its anemometer loan program. In addition to the regular operation of the loan program and collection and analysis of data, MSUE has expanded the service by offering 60-meter anemometer towers that are needed for community wind projects. The State of Michigan and MSUE received "tall towers" funding support from a U.S. Department of Energy special project grant to Wisconsin. A state police communications tower in southwest Michigan has been instrumented at three levels, including 100 meters, and data collection began in April 2009. Most recently, the State of Michigan awarded MSUE an $83,820 grant to instrument five additional tall towers in Michigan.
- Michigan has continued to be an active participant in the Great Lakes Wind Collaborative (GLWC) and the Great Lakes Regional Wind Energy Institute activities. John Sarver serves as the co-chair for the GLWC Advisory Committee and participates in the offshore wind and best practices work groups. Michigan was well represented at the February meeting of the Great Lakes Regional Wind Energy Institute in Columbus and the June meeting of the GLWC in Milwaukee.

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Montana

- In 2009, Montana experienced a large increase in installed wind generating capacity. The Glacier II wind farm near Shelby came online in September 2009, generating 103.5 MW. Combined with a 106.5-MW Phase I project that came online in 2008, Glacier I and II now constitute Montana's largest wind energy project. Project developer NaturEner USA plans to construct an additional 900 MW in Montana, part of more than 5,000 MW currently under development at more than 50 sites across the state.
- Transmission remains the single greatest barrier to expanded wind energy development in Montana, and the state is working hard to overcome it. Five major transmission projects are currently planned that will export significant quantities of wind energy from Montana: the Chinook Transmission Project, the Mountain States Transmission Intertie, the Montana Alberta Tie Line, the Colstrip Upgrade, and the Wind Spirit Project being developed by Grasslands Energy. The Montana Alberta Tie Line is permitted and will be financed by a $161 million loan from the Western Area Power Administration (WAPA). This facility is the first project financed by WAPA using the $3.25 billion American Recovery & Reinvestment Act transmission appropriation budget to finance qualified projects. The project in-service date is scheduled for 2011. NaturEner USA plans to construct the 309-MW Rim Wind Farm to connect to the Montana Alberta Tie Line. Collector transmission lines are also being developed in the state that will deliver power to export lines.
- Other important wind development activities in 2009 include the creation of a transmission working group that meets regularly and is being facilitated by the state's Energy Promotion and Development Office. A subset of the transmission working group created a Montana transmission scenario brochure. A wind integration study was disseminated widely in 2009 and formed the basis for the development of a wind integration working group that meets regularly to develop a fair and reasonable wind integration rate. The Energy Promotion and Development Office also contracted to have a Montana Wind Study prepared by Energy Strategies Inc. of Salt Lake City. The report was released in January 2010.
- NorthWestern Energy, the state's largest investor-owned utility, broke ground in August 2009 on a 200-MW natural-gas-fired firming power plant that should be operational in 2010. NorthWestern plans to market this as firming power for future Montana wind farms. The Energy Promotion and Development Office met regularly with local officials to help them understand the impacts and the opportunities of such a project to the community.

The Montana Department of Environmental Quality administers the state energy office's activities. The agency received WPA funding in FY09 to coordinate wind energy resource information to Montana developers and to provide technical assistance to small-scale projects. The Montana Department of Environmental Quality:

- Organized wind energy panels at renewable energy meetings, USDA finance workshops, and the Harvesting Clean Energy Conference.
- Coordinated resources for producing, analyzing, and distributing anemometer data for measuring local wind resources.
- Attracted more than 1,000 hits per month on the Energize Montana Web site (www.energizemontana.com).
- Provided assistance to small-scale developers in their applications to the Alternative Energy Loan Program.

- Provided information to wind developers on Montana resources, incentives, permitting, economic development activities, and stakeholders' issues.
- Provided renewable energy workshops in Miles City, Missoula, Helena, and Plentywood, reaching more than 100 attendees.

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Montana Wind for Schools Program

Wind Applications Center (WAC): Montana State University (MSU), Bozeman

State Facilitator: Sean Micken, REsolve Energy

- The National Energy Education Development (NEED) Project hosted a wind energy curriculum workshop in Livingston. Twenty-five teachers from more than a dozen schools across the state, including all four 2008 host schools, attended the workshop. Classroom teachers interested in the Wind for Schools program learned about wind energy, wind-generated electricity, and using data produced from wind installations in their classrooms. The Montana Office of Public Instruction approved the workshop for professional development and continuing education credits. Early reports indicate that the NEED curriculum is well-received by teachers and students alike (October 2008).
- Governor Schweitzer's office presented a Governor's Clean Energy Award to Western Community Energy for the Wind for Schools Program in Montana (January 2009).
- Montana Wind for Schools Facilitator Sean Micken attended the School Administrators of Montana (SAM) conference and presented two workshops on wind energy education and the Wind for Schools program to approximately 60 teachers, administrators, and facilities managers (January 2009).
- Micken also attended the legislative session in Helena to lobby state policymakers to provide funding for the Wind for Schools program. His efforts to introduce a bill proved unsuccessful (January 2009).
- Because of funding challenges, the Montana Wind for Schools program was unable to install turbines in 2009.

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Nebraska

Nebraska now has 153 MW of installed capacity, and efforts continue to reach the 20% Wind Energy by 2030 future scenario of 5 to 10 GW.

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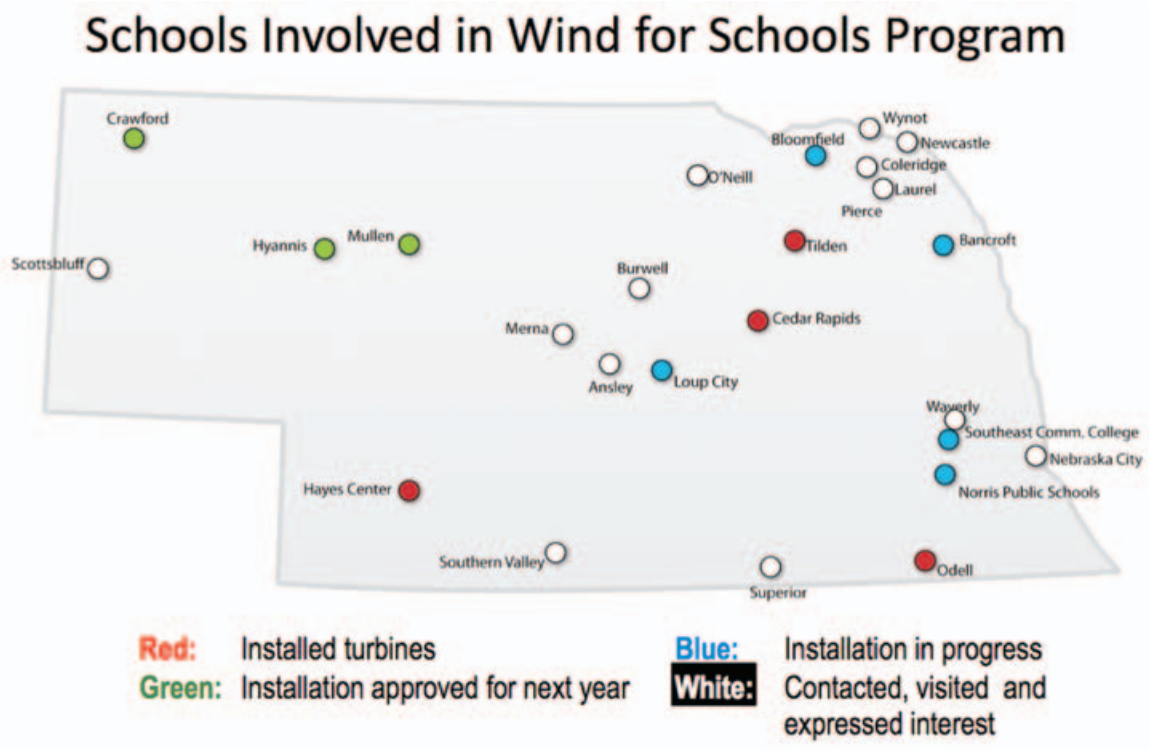
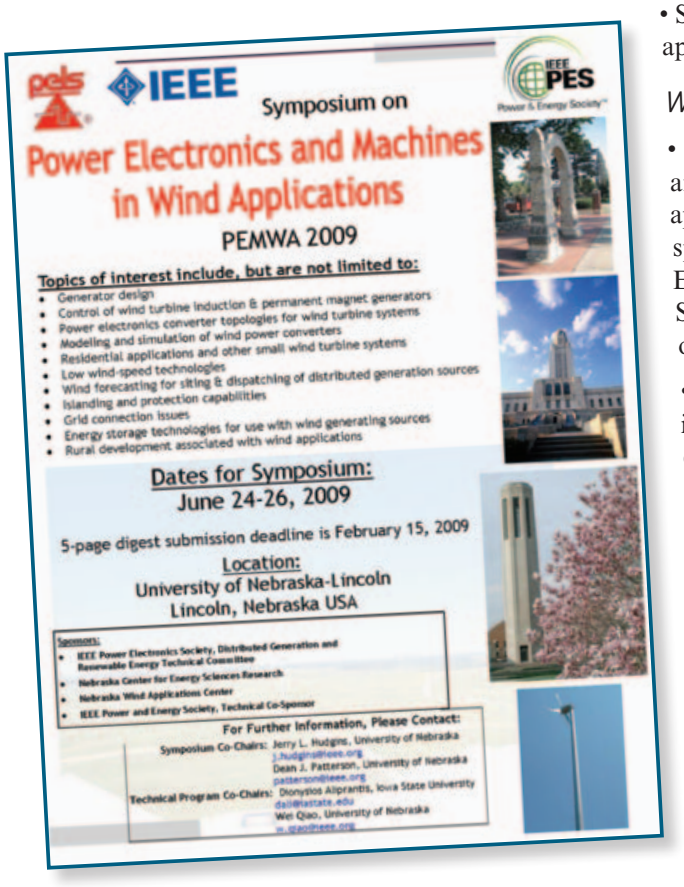
Wind for Schools Program

Wind Applications Center (WAC): University of Nebraska - Lincoln (UNL)

State Facilitator: Dan McGuire

- The U.S. Department of Agriculture awarded Nebraska $147,800 to start or expand rural businesses and to fund employment-related education programs as part of the American Recovery and Reinvestment Act, and as part of that funding, Loup City Public Schools received an $8,800 grant to install a Wind for Schools turbine (July 2009).
- First-round schools all have operational turbines: Elkhorn Valley District School in Tilden, Hayes Center Public Schools in Hayes Center, Cedar Rapids School District in Cedar Rapids, and Diller-Odell School District.
- Foundations have been installed and poured for second-round schools: Bloomington Community Schools, Loup City, Bancroft, and Norris Public Schools. Towers have been ordered from Valmont Industries in Valley, Nebraska, and should be delivered in early 2010. Purchase orders for turbines are in place.





• School boards at Mullen, Hyannis, Creighton, and Crawford have approved their projects, and site selection is almost complete.

Workforce Development Updates

• The Nebraska WAC at the University of Nebraska - Lincoln co-hosted an international symposium on power electronics and machines in wind applications. Approximately 88 attendees from eight countries heard speakers from GE, Vestas/Aalborg University, North Wind, NREL, Electric Power Research Institute (EPRI), Convention of National Societies of Electrical Engineers of Europe (EUREL), the University of Wisconsin, and Oregon State University (June 2009).

• Nebraska facilitator Dan McGuire also assisted with planning and installation of a Skystream at Southeast Community College. Nebraska community colleges and UNL have a "STEP" program that allows credits for electrical and engineering courses at the community college level to transfer to UNL. In addition, Northeast Community College in Norfolk added a wind technician course to its curriculum in the fall 2009 semester. McGuire serves on Norfolk's Wind Technician Advisory Committee.

• Senior design teams and individual projects included:
  – Integration of PV array and small wind turbine on a DC bus
  – Data logging and telemetry for wind and solar
  – Anemometer tower data logging and wireless transfer
  – Power converters for solar array and wind turbine systems
  – Wind resource assessment and siting
  – Small wind turbine installations and grid connection
  – Permanent magnet machine design, fabrication, and testing (linear, axial flux).

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Joe Pizur installed a Bergey XL-1 turbine on a 60-foot tower at his residence in the Virginia City Highlands, Nevada. Mark Harris/PIX16742.

Nevada

Nevada made great strides toward developing a utility-scale wind project. NV Energy, the state's largest utility, is now developing five wind energy projects comprised of 685 MW. The first project is expected online in late 2010 or early 2011.

The Nevada Wind Working Group's FY09 accomplishments include the following:

• Worked with Phase II of Governor Jim Gibbons' Renewable Energy Transmission Access Advisory Committee to develop a final report. Jeneane Harter, Nevada's Wind Powering America representative, authored the committee's report, which makes six recommendations for improving transmission in Nevada

• Provided legislators with information to craft renewable energy legislation. See Nevada's extensive update in the FY09 Renewable Energy Legislation Update at the end of this publication.

• Continued to develop www.windpowernevada.com to ensure that it is the state's premiere resource for wind energy information

- Helped develop codes and ordinances and created wind workshops for county planners and county commissioners. Washoe County and Carson City now have new wind codes and ordinances
- Worked with the military, Nevada's Congressional Delegation, Nevada's utility executives, and Nevada's Consumer Advocate to address issues regarding wind and the military.

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New Jersey

- The New Jersey Small Wind Working Group's (NJSWWG's) goal is to address barriers to the deployment of terrestrial-sited wind generation in New Jersey. The NJSWWG advises the Office of Clean Energy and the Renewable Energy Committee of the Clean Energy Council on legislative language to advance the development of New Jersey's small wind market. Municipalities use the New Jersey Wind Model Ordinance (developed by the NJSWWG) to advance wind energy systems. To date, nine municipalities have adopted a wind model ordinance/resolution.
- On October 20, 2009, the municipality of Ocean Gate (also the first town to adopt the New Jersey Wind Model Ordinance) became the first New Jersey municipality to install wind turbines. Ocean Gate will use the wind power generated from its two 50-kW turbines as the primary energy source for its municipal office building and water treatment plant. The NJ Clean Energy Program provided funding for the two systems. The wind turbines are expected to generate 224,000 kWh per year, providing about 80% of the electricity needs for the municipal office building and water treatment plant while reducing annual carbon emissions by 162 tons.
- The New Jersey Clean Energy Program administers an anemometer loan program through a partnership with five state colleges and universities. These institutions of higher education currently assist the state by providing wind resource assessment services to municipalities, businesses, and residential customers. The participating colleges are Rutgers University, Richard Stockton University, Rowan University, College of New Jersey, and Ocean County College.
- The NJSWWG enlisted the state's anemometer loan program partners to conduct wind energy symposiums targeting municipal officials and zoning officers. The events are designed to answer questions from municipal and zoning officials regarding wind energy systems and provide municipal officials with information regarding available financial incentives. The following colleges held a Wind Energy Symposium: Ocean County College (April 2009), College of New Jersey (July 2009), and Rutgers University (September 2009).
- The Renewable Energy Incentive Program (REIP), sponsored by the NJ Board of Public Utilities, Office of Clean Energy, provides rebates that reduce the upfront cost of installing renewable energy systems, including wind. In 2009, the program adopted an Expected Performance Based Buydown (EPBB) methodology to determine the funding level for wind projects. The incentive is based on the estimated annual energy production in kilowatt-hours for the

This 50-kW wind turbine is a primary energy source for a municipal office building and water treatment plant in Ocean Gate, New Jersey. Photo credit: Alma Rivera/PIX16904.

proposed wind turbine at the specific site and hub height. Incentive levels for small systems are capped for residential systems at 16,000 kWh or at $51,200. For larger systems, the incentive level is capped at 750,000 kWh or at $418,200.

Annual Estimated Production	Incentive Level
1-16,000 kWh	$3.20/annual kWh
16,000-750,000 kWh	$0.50/annual kWh

In 2010, the annual estimated production for small systems will remain the same. For large systems, the maximum annual estimated production level will increase to 1,000,000 kWh.

- Approximately 30 people attended and completed the New Jersey Wind Site Assessor Training program (part 1 in December 2008 and part 2 in March 2009). This certification training meets the Midwest Renewable Energy Association's certification requirements for wind site assessors.
- The Energy Master Plan contains a goal of installing at least 1,000 MW of offshore wind energy by 2012 and at least 3,000 MW by 2020. The New Jersey Board of Public Utilities authorized an application process for an Offshore Wind Rebate Program to construct meteorological towers to support the development of at least 1,000 MW of offshore wind by 2012. The Board approved $12 million in funding for the proposed program (December 2008).
- The Board approved the rebate applications from Fishermen's Energy of New Jersey, LLC; Bluewater Wind of New Jersey, LLC; and Garden State Offshore Energy, LLC. Construction of the meteorological towers should be completed by the end of 2010 (December 2008).

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New Mexico

- The New Mexico Wind Energy Working Group convened three times in 2009. The first meeting in January attracted more than 30 people with affiliations including landowner associations; concerned citizens; wind turbine installers; developers; lawyers; and local, state, and federal governments. They engaged in a roundtable discussion of current issues with opportunities for all who were present to speak. The group discussed wind farm site issues and identified a potential need for siting guidelines that would aid New Mexico counties as some are moving to adopt wind ordinances. The transmission grid was discussed at length. Presentations, participant lists, and other working group information are available for download from a new Web site (www.emnrd.state.nm.us/ecmd/RenewableEnergy/WWG.htm).
- Jeremy Lewis of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) provided an overview of wind and other renewable energy resources in New Mexico to a group of 25 young business leaders from around the state. The presentation was part of a 3-day Leadership New Mexico program designed to cultivate the next generation of leadership by encouraging participants to foster new ideas while exploring critical issues facing the state (January 2009).

- Michael McDiarmid of the EMNRD participated in a tour of the Caprock Wind Ranch, organized by the NM State Land Office and attended primarily by local residents. McDiarmid also presented a lecture on wind power to an engineering class at the University of New Mexico and participated in a televised panel discussion on wind energy in New Mexico filmed and broadcast by public television station KNME (March 2009).
- More than 30 people attended the NM Wind Energy Working Group's meeting in April in Santa Fe. Attendees received an overview of Recovery Act funding opportunities from the NM State Energy Office. The group split into break-out groups to discuss and prioritize issues for residential wind and wind farm siting.
- As a result of a technical workshop organized by EMNRD and presented by the National Renewable Energy Laboratory, the Regulation and Licensing Division of NM Construction Industries Division revised their guidelines for small wind turbines and will no longer require that the turbines be "listed" by a testing laboratory. This now makes installation permitting feasible in New Mexico (May 2009).
- Lewis presented and staffed an information table at the RENEW 09 Empowering the Land conference in Tucumcari. This conference, designed for landowners to engage the emerging renewable energy economy, was attended primarily by the eastern New Mexico agriculture and ranching community. Lewis presented to a coalition of landowner associations on anemometer tower locations, wind speed and wind power datasets, and how to obtain the information. The information booth distributed wind speed maps, small wind resource guides, and maps of wind farm locations in New Mexico. Additionally, Lewis promoted the NM Wind Energy Working Group and signed up 20 people for the group e-mail list (June 2009).
- Lewis and Wes Perrin organized and facilitated a meeting of the NM Wind Energy Working Group in Roswell. The public event, attended by 31 participants, featured presentations from Sandia National Labs, U.S. Department of Agriculture, and an environmental consultant firm (July 2009).

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North Carolina

The North Carolina Solar Center (coastal initiatives), Appalachian State University (work in western North Carolina), and the State Energy Office in the Department of Commerce participate in WPA-funded activities.

- The Solar Center has performed more than 100 small wind consultations over the past year for homeowners, farmers, and business owners in coastal and central North Carolina. These consultations involve phone conversations, e-mails, and the creation of custom GIS-based wind resource maps. Such consultations typically require 30 to 90 minutes to complete over one to two days. As a result of small wind consultations, potential wind consumers are

advised whether wind energy is an appropriate technology to meet their environmental and economic goals given their geographic context.

- The Solar Center has collected wind-speed data from 10 sites in eastern North Carolina (see http://maps.google.com/maps/ms?ie=UTF8&hl=en&msa=0&msid=105284248313864691746.00045af50302950134881&z=8). These data, collected at heights from 30 meters to 120 meters, have provided valuable real-world wind resource data for farmers, landowners, municipalities, and businesses and have also been useful to researchers in the state. The Center currently has two 30-meter towers installed on farms in eastern North Carolina (Moyock and Wenona).
- The North Carolina Wind Working Group (WWG) holds quarterly plenary meetings. Additionally, the State Wind Outreach Team (SWOT) holds teleconferences to address issues as they unfold (e.g., progress toward state wind permitting regulations). These WWG management activities are important to maintaining an active group of wind energy stakeholders in North Carolina from the general public, state and federal agencies, university researchers, environmental groups, the business community, and wind developers. Four WWG quarterly meetings were held in FY09, two in Boone and two in Raleigh.
- Two SWOT/education committee conference calls were held to plan education and outreach activities throughout the year.
- The NC Wind Technical Advisory Group met three times. This group was instrumental in shaping the wind permitting legislation currently under consideration in the NC General Assembly (S1068 and H809, see http://www.ncga.state.nc.us/gascripts/BillLookUp/BillLookUp.pl?Session=2009&BillID=S1068).
- The Solar Center Coastal Wind Initiative hosted or presented at 16 workshops and Webinars. Information was presented on topics such as wind energy introduction for primary school students, information on lease agreements for

Appalachian State University is now home to a 100-kW wind turbine, the largest wind energy project in North Carolina. In 2004, the student body voted for a $10 annual fee per student to fund renewable energy projects on campus (a referendum on the fee passed with a 93% majority). The fees were used to partially fund the turbine. Photo credit: Dennis Scanlin/PIX16801.

farmers and landowners, pending state wind permitting legislation, turbines surviving hurricanes, and general wind energy technology.

- Brian Miles, wind energy extension specialist at the Solar Center and State Energy Office, and renewables program manager Bob Leker approached the Minerals Management Service (MMS) to charter and launch an offshore wind taskforce, which will help MMS lay the ground rules for offshore renewable leases off the North Carolina coast. The North Carolina taskforce will also help streamline the leasing process with the state's Coastal Area Management Act implementation of the federal Coastal Zone Management Act. The state has an estimated 10,000 MW of offshore wind potential.
- The wind program at the Solar Center now provides technical assistance to communities to leverage ARRA and other funds to support community wind development.
- Three wind turbines were installed at schools in Madison County, and five teacher-training workshops were conducted.

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Ohio

- The State of Ohio is working directly with the Great Lakes Wind Network (www.glwn.org) to grow the wind supply chain in Ohio. More than 100 Ohio companies are now active in the wind supply chain, and more than 500 Ohio companies are actively pursuing entry into the wind supply chain.
- In conjunction with the Great Lakes Energy Development Task Force, the Ohio Department of Natural Resources, and the Great Lakes Energy Institute at Case Western Reserve University, RESOLVE planned the Offshore Wind Conference and Quarterly Meeting at Case Western Reserve in Cleveland. More than 200 people attended, including wind and renewable energy manufacturers, developers, academia, state agencies, and township and county officials (December 2008).
- RESOLVE also facilitated a quarterly meeting of the Ohio Wind Working Group, which took place at Case Western Reserve University in Cleveland following the offshore wind conference. Approximately 75 attendees had an opportunity to provide updates, learn about Cuyahoga Community College's windsmith program, suggest 2009 activities, receive updates on work group activities and potential new projects, and hold work group meetings to coordinate next steps (December 2008). A quarterly meeting was also held in June 2009.

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Oklahoma

- FY09 efforts included a focus on fulfilling the needs and interests of various Oklahoma educational institutions. In February 2009, Oklahoma Wind Power Initiative (OWPI) hosted a day-long KidWind workshop, using the national program to bring wind-focused curriculum and information to Oklahoma's primary and secondary school teachers. OWPI also continued its tradition of exhibiting at the annual ScienceFest event at the Oklahoma City Zoo, giving it access to about 5,000 4th- and 5th-grade students and teachers. ScienceFest provides 4th- and 5th-grade Oklahoma students an opportunity to enjoy a full day of interactive science and environmental activities focused on the conservation of natural resources and the use of alternative energies.
- Wind turbine technician programs at CareerTech technology centers, community colleges, and universities across the state graduated or certified their first students in FY09, and additional programs began securing equipment for instruction and developing their curriculum. OWPI continues to play a vital role in ensuring these programs are top tier in the education they provide. OWPI also continued its work on the educational front with multiple opportunities to lecture and present at various schools across the state.

- With continued and enthusiastic interest across the state about the U.S. Farm Bill and its applications, OWPI led the effort to provide information and assistance to Oklahoma farmers and ranchers on how the Farm Bill can facilitate renewable energy development on their lands.
- OWPI renewed its efforts in FY09 to collaborate with numerous wind energy industry partners in Oklahoma. One area of focus is developing and expanding the wind industry supply chain across the state. OWPI worked closely with the Oklahoma Department of Commerce, the Oklahoma State Energy Office, the Oklahoma Renewable Energy Council, and others to plan and sponsor Wind Commerce 2009 in Oklahoma City, a conference designed to help Oklahoma companies, small businesses, entrepreneurs, and communities explore the many business and economic development opportunities involved with Oklahoma's emerging wind industry (June 2009).
- Anemometers were installed in Reydon and Fredrick, and the instrumentation was updated in Langston. Data from the new installations, combined with the existing towers, continue to add to the information database cataloging Oklahoma's wind resource.

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Pennsylvania

The Renewable Energy Center at St. Francis University engaged in the following activities in FY09:

- Managed an anemometer loan program and facilitated community meetings to answer questions about wind power
- Measured wind resource at nine sites, which is leading to two community wind project developments in Patton/Ebensburg and in Blue Mountain
- Made presentations to school children, township supervisors, community meetings, and wind power conferences (reached more than 2,000 people)
- Mark Bollinger and Matthew Karcher developed an investment analysis tool specifically for community wind in Pennsylvania
- Performed an analysis to assist Pennsylvania community wind investors in determining the best investment scheme for their needs and the impact of varying assumptions
- Assisted three townships to develop commercial and residential wind ordinances
- Installed a sample residential wind turbine on campus.

The Community Wind Project at Saint Francis University manages an anemometer loan program. Measurement of wind resource at nine sites is leading to two community wind project developments in Patton/Ebensburg and Blue Mountain. Photo courtesy of Gwen Anderson.

Wind Energy School Programs

Saint Francis University offers a Renewable Energy Certificate as part of the MBA program and a renewable energy concentration as part of the environmental engineering program.

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South Dakota

- The South Dakota Wind Energy Association launched in January 2009 with 25 members, which increased to more than 150 members by October. The Association conducted more than 20 wind workshops with landowners, county and city government, industry groups, and citizens. Wind meetings were held in Madison, Freeman, Clear Lake, Bison, White River, Murdo, Sioux Falls, Spearfish, Hot Springs, Chamberlain, Tyndall, Mission, Pierre, Rapid City, Huron, Brookings, and Martin.
- In conjunction, the South Dakota Public Utilities sponsored numerous wind workshops for South Dakota utilities and has proposed a small wind and renewable initiative to be presented to the 2010 legislature (see http://puc.sd.gov/SmallWind/default.aspx).
- The South Dakota Public Utilities Commission (SDPUC) sponsored a statewide conference on energy issues in May 2009 (see http://puc.sd.gov/energyconf/default.aspx).
- The SDPUC also presented a cap and trade forum for South Dakotans in March 2009 (http://puc.sd.gov/pucevents/carbonforum/default.aspx).
- The anemometer program has loaned out three anemometers for sites in Parkston, Fall River County, and Smith. In addition, the Wind Resource Assessment program received a $50,000 grant to collect and update the data on the existing tower sites.

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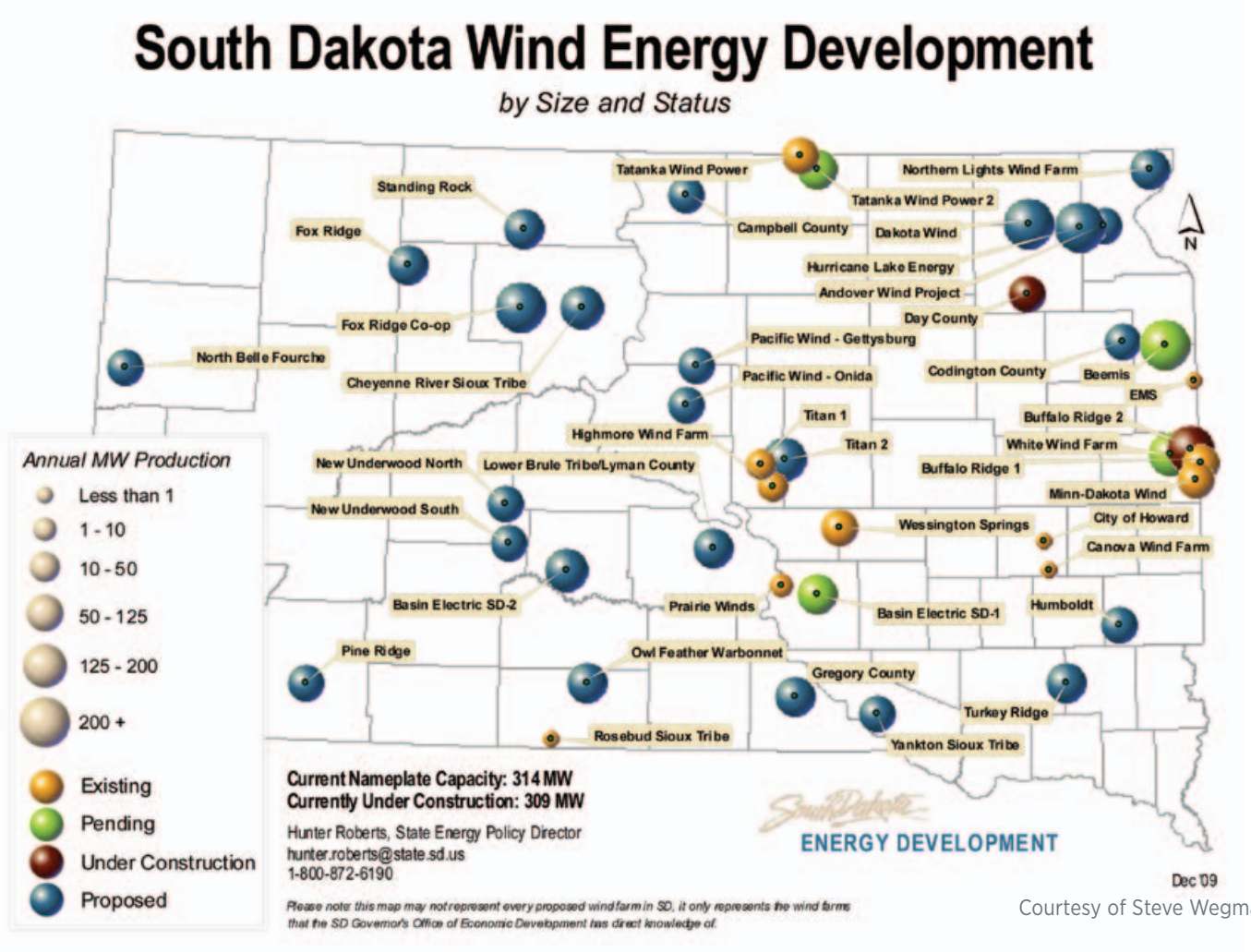

Courtesy of Steve Wegman.

Wind for Schools Program

Wind Applications Center (WAC): South Dakota State University

State Facilitator: Matt Hein

- Nine South Dakota schools districts have wind turbines, and more than 20 school district use the WAC Web site at wac.sdwind.org.
- Three new schools in South Dakota offer advanced training in wind energy: South Dakota State University (wac.sdwind.org), Mitchell Technical Institute (www.mitchelltech.edu/ViewProgram.aspx?id=24&ContentID=9), and Lake Area Technical Institute (www.lakeareatech.edu/programs/energytech/index.html).
- The South Dakota Wind for Schools team held the first Wind for Schools K-12 teacher-training workshop in South Dakota at the Mitchell Technical Institute in Mitchell. Approximately 40 teachers from 30 school districts attended the one-day event, which was taught by NEED Project staff under contract to the WPA Wind for Schools program. The participating school district paid for the teachers to come to the workshop. NEED curricula teaching kits were also delivered to the Wind Application Center for loan to interested school districts. More than 100 teachers participated in the wind for schools training in January 2009 at the annual South Dakota Science and Math Conference in Huron.

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Tennessee

- Tennessee now has 29 MW of installed capacity, and the Tennessee Wind Working Group continued its anemometer loan program, workshop outreach, key stakeholder outreach, wind for schools activities, and working with businesses to take advantage of the state and Tennessee Valley Authority's incentives for small wind energy systems. Information can be found on the group's newly launched Web site, www.tennesseewind.org. The site features the U.S. Department of Energy's 20% Wind by 2030 report, information about federal and state financial incentives, anemometer loan program data, and presentations given at wind workshops. Visitors can also sign up for a monthly newsletter distributed via e-mail.
- The Tennessee Wind Working Group workshop series provides outreach to Tennessee communities that demonstrate the potential for commercial-scale wind projects. The workshop series, which traveled through the towns of Johnson City, Jefferson City, and Crossville, included information about wind energy economic impacts, financial incentives, rural wind energy applications, and siting. During the final workshop, more than 90 participants received an overview of a small wind payback calculator, which helped businesses, rural agriculture producers, and landowners determine whether a wind energy system is economically feasible on their property.

Ronnie Trout worked with students to connect a Kestrel 3-kW machine to the 119' guyed tower that was designed and constructed at Morgan County Career and Technology Center. Photo courtesy of Brandon Blevins.

- Morgan County Career and Technology Center received a grant from the Appalachian Regional Commission to continue installing small wind energy systems along the Upper Cumberland Plateau at partner schools. Ronnie Trout, technical director, has worked with more than 250 students to design, install, and raise tall towers that are fitted to small wind turbines at these partner schools. In a partnership with Heraeus Metals, Tennessee Tech University, local engineers, and small wind turbine manufacturers, Morgan County has successfully raised turbines at heights over 100 feet with locally sourced materials. The Tennessee Wind Working Group partnered to chronicle Morgan County's efforts at www.tennesseewind.org/mcctc.html.
- Through the Tennessee Wind Working Group's anemometer loan program, an anemometer tower was installed at Camp Creek Elementary School in Greeneville on its football field during the football off-season of early spring to late summer. A permanent National Weather Service station is located 50 yards from the tower, so the group hopes to correlate the tall tower data with the NWS station to understand the year-round wind regime at Camp Creek.
- Through the Tennessee Wind Working Group's anemometer loan program, a second anemometer tower was raised at Lynda Hughes Lumber Company in Fall Branch in June 2009. The Lynda Hughes Lumber Company hopes to install a medium-size wind turbine to offset some of the energy costs of its sawmill. The group hopes that the anemometer data will help the lumber company's application for USDA-REAP funding, as well as Tennessee's TN-CET program and TVA's Generation Partners program.
- The Tennessee Wind Working Group partnered with Johnson City and Integration Technologies, LLC to place anemometers on a city-owned cell phone tower on Buffalo Mountain in Johnson City in June 2009. The anemometers will record data at the site for 12 to 18 months and allow the city to determine next steps to growing a green energy portfolio. The Tennessee Wind Working Group will also work with East Tennessee State University (ETSU) to help integrate the wind monitoring activities into ETSU's sustainability efforts and into the classroom.
- The Tennessee Wind Working Group will continue to promote the state's Clean Energy Technology Program (which provides financing of up to 40% or $75,000 for businesses to install renewable energy projects) and the Tennessee Valley Authority's Generation Partners Program (which will purchase electricity from wind energy at a rate of $0.03 above the retain rate for all projects less than 1 MW).

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Utah

Utah Clean Energy and the Utah State Energy Program (USEP) participate in WPA activities in Utah. The Utah Clean Energy team concentrates on outreach and education, and the USEP focuses on the technical side of wind energy issues.

Developer and owner First Wind is constructing a multi-megawatt wind farm in Milford, Utah. Phase I is 145 MW (Clipper turbines) and Phase II is 58.5 MW (GE turbines). Photo credit: First Wind/PIX16738.

- In 2009, Utah welcomed its second commercial-scale wind project (the Milford Wind Corridor Project in Millard and Beaver Counties). More communities, local governments, and utilities are exploring wind energy development (both commercial-scale and residential-scale), including Summit County, Iron County, the Utah Association of Municipal Power Systems, and Logan Municipal Power.
- During the last legislative session, the USEP worked with Senator Patricia Jones to draft language that was introduced in the Senate as Senate Joint Resolution 1 (SJR1). When SJR1 passed both houses, it directed the USEP to develop a model wind ordinance through a consensus-building stakeholder process. To meet this task, the USEP first held a Wind Working Group meeting to introduce the topic.The group released a draft for comment to all Wind Working Group members, city and county planners in Utah, wildlife stakeholders, renewable energy companies, utilities, and the Utah League of Cities and Towns. Comments were gathered and incorporated as appropriate. The USEP then reported the findings to the Utah State Legislature's Natural Resources, Agriculture, and Environment Interim Committee. The Governor's Office of Planning and Budget has posted the completed ordinance (http://planning.utah.gov/library/Index_files/Energy/RenewableEnergy.htm).
- The USEP also advised the Iron County Planning Commission on wind ordinance amendments. These amendments were quite strict in the beginning, and while they are still more restrictive than the USEP ordinance recommends, the regulations are now more reasonable.
- The USEP is the Utah lead on identifying its wind resources. Since 2000, USEP has operated the Anemometer Loan Program, which has collected wind data for 100 Utah sites. By identifying the wind resource in a given area, USEP can inform leaders and decision-makers in those areas about the development potential for small- and large-scale wind. This data can also be integrated into the educational process.
- In 2009, the USEP installed 13 anemometer towers and decommissioned 12. USEP provides all collected data to the public via the USEP Web site. Raw data can be obtained by special request. USEP advertised the Anemometer Loan Program through targeted public speaking to increase participation from rural landowners. The application pool usually includes about 20 applicants during every round.
- USEP presented to various groups, including the Public Utilities and Technology Legislative Committee; the Natural Resources, Agriculture, and Environment Committee; legislative representatives; county, city, and planning commissioners; school district board members and superintendents; the Public Service Commission and staff; and the Governor's Renewable Energy Initiative Task Force and participants.

- In coordination with the Utah State Wind Outreach Team (SWOT), Utah Clean Energy developed, organized, and promoted an innovative Utah Wind Outreach Training course. The goal of the training is to recruit and train new wind energy advocates to initiate and conduct outreach and education across the state. As a result of media coverage, more than 54 people applied for the first two trainings on June 6 (Spanish Fork) and September 19 (Tremonton). However, class size was limited to 12 to 15 participants to make the training most effective. The state now boasts 26 trained Utah Wind Pioneers. Participants ranged from graduate students and stay-at-home moms to electrical contractors, wildlife biologists, and local government representatives. The diversity of the group presents a significant opportunity for greatly expanding wind outreach across the state and across numerous sectors. To date, the Utah Wind Pioneers hosted a wind information table at the Spanish Fork Wind Festival, assisted with model wind ordinance efforts, and presented information on the 20% Wind Vision to the Logan Renewable Energy and Conservation Advisory Board. Utah Clean Energy continues to keep the newly trained Utah Wind Pioneers engaged through monthly conference calls, informing them of community wind outreach opportunities and upcoming wind-related events.
- Utah Clean Energy coordinated with the USEP, Western Resource Advocates (WRA), and the National Renewable Energy Laboratory to organize a presentation for the Utah Wind Working Group featuring info on a WRA Water & Wind Study and an economic development study of the Spanish Fork Wind Farm (February 2009).
- Utah Clean Energy worked with the USEP to coordinate a Wind Working Group meeting with diverse stakeholders (including the Utah Association of Municipal Power Systems, League of Cities & Towns, planning and zoning officials, etc.) to discuss developing a model wind ordinance for Utah in accordance with newly passed Senate Joint Resolution 1- Renewable Energy Systems (June 2009).
- Utah Clean Energy participated in the Spanish Fork Wind Farm ribbon-cutting event, which was attended by several legislators, local dignitaries, and media (October 2009).
- Utah Clean Energy coordinated with the State Energy Program and the Governor's Energy Advisor's Office to organize a tour of Utah's renewable energy projects for legislators, members of the Utah Renewable Energy Zone Task Force, utility regulators, and industry professionals. Tour sites included the Spanish Fork Wind Farm, First Wind Milford Wind Site, and the Milford High School Renewable Energy Fair. Governor Huntsman joined the tour in Milford, where he participated in a presentation at Milford High School on Utah Renewable Energy policies and initiatives. Utah Clean Energy members participated in a panel discussion on economic development and presented findings from their study, *Building the Clean Energy Economy: A Study on Jobs and Economic Development from Clean Energy in Utah* (April 2009).
- Utah Clean Energy worked with Edison Mission and the City of Spanish Fork to develop an educational wind kiosk located on a major highway beside the Spanish Fork Wind Power Project.
- Utah Clean Energy hosted community tables with wind information at more than 15 events, reaching 12,000 people. The team also provided wind presentations for multiple organizations, including the Utah Water Users Association (December 2008) and Utah Valley University Environmental Symposium (April 2009). More than 350 individuals attended these events. The group also promoted a Webinar on landowner wind associations and participated in meetings with representatives of the USDA Rural

Utah Wind Pioneers tour Utah's first commercial-scale wind project in Spanish Fork. Wind Powering America presented a Carpe Ventem (Seize the Wind) award to developers Wasatch Wind and Edison Mission Group in October 2008. Photo credit: Utah Clean Energy.

Utah Wind Pioneers participate in a mock panel discussion on wind energy during the Wind Outreach Training Course. Photo credit: Utah Clean Energy.

Development, Utah State University Extension Service, the RC&D Council, and Utah ag representatives to increase the number of successful Renewable Energy for America Program (REAP) grants for wind and energy efficiency in Utah.

- Utah Clean Energy collaborated with the Uinta Headwaters RC&D and USDA Rural Development to assist with the Uinta Headwater's Rural Renewable Energy Conference. The final agenda included wind-related presentations on *The Power of Wind – Wind Basics & Applications for Home, Farm, and Community* (Sara Baldwin, Utah Clean Energy); *Small Wind – Experiences Placing a Small Wind Turbine at Three Peaks Elementary* (Stewart Somerville, Alternative Power Systems); and a workshop, Funding for Renewable Energy Projects. Approximately 150 representatives of Utah's rural and agricultural community attended (November 2008).

Wind Energy School Programs and Workforce Development

- Utah Clean Energy and the USEP coordinated with the Three Peaks Elementary School, Iron County School District, and Rocky Mountain Power to organize and host a ribbon-cutting event for the Three Peaks wind project (a 1.8-kW wind turbine with interactive monitoring system). Approximately 200 people attended the event, including numerous local dignitaries, state legislators, mayors, the district school board, media, school faculty, staff, and students. The event received coverage from local and state media outlets (March 2009).
- Teachers at Three Peaks Elementary received training from the National Energy Foundation on curriculum integration, and most teachers are incorporating renewable energy and wind energy into their classes. The Iron County School District and the Utah State Office of Education are exploring creative ways to integrate wind and renewable energy curriculum into the core curriculum and through the Applied Technology Center.
- Utah Clean Energy collaborated with the USEP, the Utah State Office of Education, Granite School District, Cyprus High School, and Rocky Mountain Power to install a wind energy system at Cyprus High School in

Magna. Utah Clean Energy participated in the National Energy Foundation training for teachers in Granite School District.

- Utah Clean Energy supported the Southwest Applied Technology College's proposal to the U.S. DOE for wind energy workforce development. Southwest's proposal to create a wind and renewable energy training center in central/southwest Utah was funded at the $50,000 level.
- Utah Clean Energy worked with the USEP and the Governor's Energy Advisor's Office to develop a draft model wind ordinance for Utah, with input from the Utah Wind Working Group and numerous stakeholders.
- Utah Clean Energy provides ongoing assistance, presentations, and recommendations for best practices for wind zoning (small and commercial) and wind-related net metering to counties and cities across the state.
- Utah Clean Energy collaborated with the Governor's Energy Advisor's Office, Senator Stowell, First Wind, and other clean energy industry representatives to host a Clean Energy Legislative Breakfast highlighting new and upcoming wind, geothermal, and energy efficiency projects across the state and their associated economic benefits to Utah. The group also hosted an information booth in the lobby of the Capitol Building, providing information on wind energy and projects in Utah (February 2009).
- Utah Clean Energy coordinated with the Office of the Governor's Energy Advisor to host a Utah Energy Forum on Clean Energy Jobs and Economic Development, featuring information on wind and renewable energy potential, jobs, and training. Approximately 100 people attended, including legislators, regulatory commissioners, and utility representatives (October 2008).
- Utah Clean Energy and the USEP presented to the Utah League of Cities and Towns Annual Conference on *Wind Energy in Utah: The Important Role of Local Governments*, highlighting the importance of strong wind ordinances and best practices for local governments. Approximately 30 local Utah government representatives attended (September 2009).

Utah Wind Working Group Contacts

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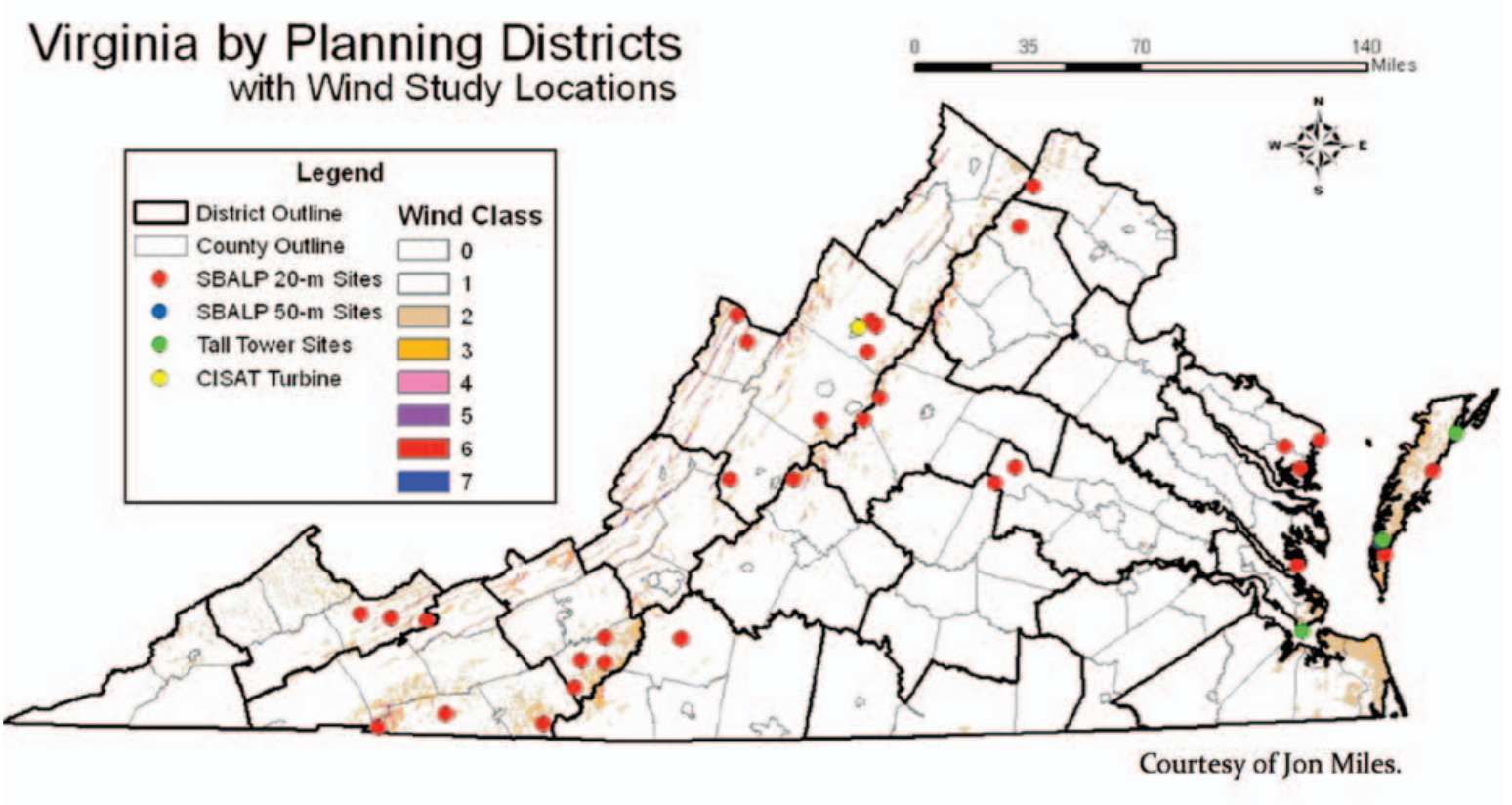
Virginia

The Wind Power Applications and Technologies Team (WPATT), launched at James Madison University in 2007, serves as a central body to support the efforts of the Virginia Wind Energy Collaborative and the Virginia Coastal Energy Research Consortium. The group engages faculty, staff, students, and other stakeholders and promotes research, development, and outreach efforts to advance wind power deployment throughout the Commonwealth. The WPATT also administers the state-based anemometer loan program. Activities in FY09 include:

- Installed anemometers as part of the state-based anemometer loan program at Quinby (January 2009), Dam Neck/Oceana in Virginia Beach (July 2009), and Port Isobel (Tangier Island; September 2009). Data from these installations will be used in student projects to assess the feasibility of a wind installation as well as for a comparative study with the NREL wind map
- Developed an online economic calculator called NextStep as a response to the multiple calls received each week by the WPATT members from residents and businesses across Virginia inquiring about their wind resources and whether a wind turbine is economically feasible. NextStep allows a user to log in and register, enter a street address, and access the AWS Truewind map for Virginia to provide a basis for performance and economic calculations. NextStep estimates installed costs, payback times, and energy generation and is supported by wind resource and economic models as well as a turbine optimization algorithm
- Continued outreach and assistance to key stakeholders at community events (more than 600 attendees), teacher workshops (more than 2,800 attendees), and classroom visits (more than 800 students).



Courtesy of Jon Miles.

Virginia Wind Working Group Contacts

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West Virginia

- The West Virginia Wind Working Group (WVWWG) conducted an annual symposium and other public activities to educate the public and state policymakers on the importance of wind as an important component in West Virginia's energy portfolio and assisted wind developers.
- At the end of 2009, West Virginia had a total of 330 MW in commercial wind generation, including the largest single wind operation in the eastern United States (the 264-MW Ned-Power Mount Storm LLC project in Grant County).
- Five projects totaling 627 MW are under construction or have received siting approval from the West Virginia Public Service Commission. One additional 55-MW project received local approval and is waiting for state approval.

West Virginia Wind Working Group Contact

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Wisconsin

- The Wisconsin Wind Working Group met twice in FY09, in Madison (November 2008) and Appleton (March 2009). About 30 people attended each meeting. The November 2008 meeting featured a presentation by Deborah Erwin on the Public Service Commission's Wind on the Water investigation of offshore wind development on the Great Lakes bordering Wisconsin. Discussion at the March 2009 meeting centered on an upcoming legislative campaign to establish uniform permitting standards for wind energy systems. The March meeting featured a reception and dinner at the Paper Valley Hotel in Appleton, taking place the night before a one-day AWEA supply chain seminar.
- The group took part in planning, publicizing, and organizing the AWEA supply chain seminar. The conference attracted more than 600 people, and Governor Jim Doyle was the keynote speaker. Michael Vickerman, executive director of RENEW Wisconsin, presented on upcoming state policy initiatives affecting the wind industry. He also moderated a panel featuring two wind farm builders (We Energies, Michels Wind) and two equipment suppliers (Wausaukee Composites, Strowig Industries).
- As facilitator of the Wisconsin Wind Working Group, RENEW Wisconsin provided regular updates and circulated notices and articles to the list-service and friends. More than 120 people now receive e-mail updates.
- The Wind Working Group participated in and provided an overview of Advanced Renewable Tariffs at the Midwest Ag Energy Network (MAEN) meeting in Chicago (December 2008).
- The team issued a press release urging Manitowoc County to approve Emerging Energy's application to construct a seven-turbine project called the Mishicot Wind Project (November 2008). They later issued a press release critical of Manitowoc County's rejection of the Mishicot Wind Project (January 2009).
- The group participated in a conference on Renewable Energy Buyback Rates organized by the Institute for Local Self-Reliance in Northfield, Minnesota (January 2009).
- Wind Working Group members wrote feature articles on Wisconsin wind topics; gave presentations and Webcasts; exhibited at renewable energy events (Renewable Energy Summit in Milwaukee, Open House at Blue Sky Green Field project in Johnsburg, The Energy Fair in Custer); participated in the Small Wind Conference at Stevens Point; led a caravan tour of Forward, Cedar Ridge, and Blue Sky Green Field projects; issued a critique of a CWESt report contending that wind turbines depress residential property values; and attended the Great Lakes Wind Institute in Columbus, Ohio and the Wind Powering America State Summit in Chicago.

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Wyoming

- Wyoming approached 1,000 installed megawatts in FY09, and several hundred megawatts were constructed in both Converse and Carbon Counties. State leadership noticed the activity, and the Wyoming Wind Working Group worked with the Wyoming County Commissioners Association and state legislature task forces formed to consider regulations and possible tax structure changes for the wind industry.
- Renewable energy conferences in Wyoming this year addressed many issues, from regulations to wildlife. These forums educated elected officials and citizens on many topical issues affecting the wind industry in Wyoming. The main discussion topics this year were wildlife impacts, including upland sage grouse; state versus county oversight and regulation of wind farms; property rights, especially as they apply to view sheds; and taxation. Of greatest concern for the wind industry is the potential listing of sage grouse as an endangered species and the state legislature's desires to add new taxes to wind generation while allowing other tax breaks to expire.

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WPA Activities at NREL

State and Agricultural Community Outreach

WPA team members at NREL attended multiple regional, national, and state events in FY09, often presenting or staffing exhibits. The team continues to develop and strengthen alliances with the agricultural sector and organizational alliances, including 25x'25, the American Corn Growers Foundation, and the National Association of Counties.

October 2008

- West Virginia Wind Working Group Meeting (Canaan Valley, West Virginia)
- Colorado New Energy Economy (Denver, Colorado)
- Alaska Federation of Natives (Anchorage, Alaska)
- Canadian Wind Energy Association Annual Conference (Vancouver, British Columbia)
- National Renewable Energy Marketing Conference (Denver, Colorado)

November 2008

- Nebraska Wind Conference (Kearney, Nebraska)
- Acquisition and Integration of Wind Power for Northwest Public Power Utilities (Portland, Oregon)
- Oklahoma Wind Energy Conference (Oklahoma City, Oklahoma)
- National Association of Farm Broadcasters Trade Talk (Kansas City, Missouri)
- Cooperative Extension Agent Workshop (National Wind Technology Center, Boulder, Colorado)

December 2008

- Midwest Ag Energy Network Summit (Chicago, Illinois)

January 2009

- 2009 International Economic Development Council Leadership Summit (Tempe, Arizona)
- Harvesting Clean Energy (Billings, Montana)
- American Corn Growers Association Annual Convention (Coralville, Iowa)

February 2009

- Wyoming Wind Working Group Meeting (Cheyenne, Wyoming)
- Governor's Forum on Colorado Agriculture (Denver, Colorado)
- Farm Foundation Forum (Washington, DC)
- Commodity Classic (Grapevine, Texas)

March 2009

- Iowa Wind Energy Association Annual Meeting (Estherville, Iowa)
- 25 x '25 Annual Meeting (Washington, DC)

April 2009

- New Mexico Center for Energy Policy Renewable Energy Conference (Hobbs, New Mexico)
- Wind Economics Road Trip (Limon, Flagler, Burlington, and Stratton, Colorado)

May 2009

- Business of Clean Energy in Alaska Conference (Anchorage, Alaska)

June 2009

- PennFuture's Annual Renewable Energy Conference (Harrisburg, Pennsylvania)
- Women Involved in Farm Economics Annual Meeting (Denver, Colorado)
- Oklahoma Wind Commerce 2009 (Norman, Oklahoma)
- Transition to a Bioeconomy: The Role of Extension in Energy (Little Rock, Arkansas)
- 2009 International Wind Diesel Workshop (Ottawa, Canada)
- Great Lakes Wind Energy Collaborative Annual Meeting (Milwaukee, Wisconsin)
- Western Governors' Association Annual Meeting (Park City, Utah)
- Pew Climate Trust's Clean Energy Economy Meeting (Santa Fe, New Mexico)
- Utah Wind Working Group Meeting (Salt Lake City, Utah)
- National Conference of State Legislators Meeting (Golden, Colorado)
- University of Alaska Wind-Diesel Application Center Meeting (Anchorage, Alaska)
- Midwest Renewable Energy Fair (Custer, Wisconsin)
- American Public Power Association's Annual Meeting (Salt Lake City, Utah)

July 2009

- National Association of Counties Annual Conference (Nashville, Tennessee)
- Windiana 2009 (Indianapolis, Indiana)
- Cooperative Extension High Plains Energy Work Group (National Wind Technology Center, Boulder, Colorado)
- Illinois Wind Working Group Annual Conference (Bloomington, Illinois)

August 2009

- American Council of Engineering Companies' Environment and Energy Committee Summer Meeting (Golden, Colorado)

September 2009

- Farm Progress Show (Decatur, Illinois)
- Dakotafest (Mitchell, South Dakota)
- Southwest Renewable Energy Conference (Flagstaff, Arizona)
- Kansas Wind Working Group Meeting (Topeka, Kansas)
- Rocky Mountain Farmers Union Annual Renewables Conference (Denver, Colorado)
- Colorado River Project Symposium (Santa Fe, New Mexico)
- Arkansas Basin Roundtable Meeting (Pueblo, Colorado)

NREL lead: Larry Flowers

NREL contractors: Alaska Energy Authority; Robert L. Anderson; Community Energy Partners; Global Energy Concepts LLC; Great Lakes Commission; HiTech Communications; Indiana Office of Energy; Ronald Lehr; Maine Public Utilities Commission; Maryland Energy Administration; Massachusetts Division of Energy Resources; Michigan Department of Labor, Energy, & Economic Growth; Nebraska Farmers Union; Nebraska State Energy Office; North Carolina Department of Administration; Northern Arizona University; Ohio Department of Development; James "Wes" Perrin; Thomas Potter; POWAIR; Renewable Energy Alaska Project (REAP); RENEW Wisconsin; State of Utah; Dale Strickland (WEST); Utah Clean Energy; Virginia Department of Mines, Minerals, and Energy; Western Community Energy; Western Ecosystems; Western Resource Advocates; and Wind Utility Consulting

FY09 publications:

National Association of Farm Broadcasters Interviews
WPA continued contracting with the National Association of Farm Broadcasters (NAFB) to provide monthly wind energy interviews for use on rural radio stations. NAFB broadcast the following segments in FY09, and Webmaster Julie Jones also posted the segments on the WPA Web site:

States Striving to Do Their Part for 20% Wind Goal, but Challenges to Overcome
featuring John Hansen, Nebraska Farmers Union President
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2042)

Legislation Helps State Address Unique Barrier to Wind Development
featuring John Hansen, Nebraska Farmers Union President
(www.windpoweringamerica.gov/media/2008/nafb_hansen2.mp3)

Why Does Ag Equipment Company Get Involved in Wind Industry? Benefits
featuring Dave Drescher, John Deere Wind Energy Vice President
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2079)

Despite Challenges, Wind Energy Development Worth the Effort
featuring Dave Drescher, John Deere Wind Energy Vice President
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2083)

One County, 646 Wind Turbines: Electricity an Exported Commodity
featuring Jimmy Bricker, Purdue Extension Director in Benton County, Indiana
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2120)

Growing Wind Industry Great, But Have to Grow a Workforce
featuring Jimmy Bricker, Purdue Extension Director in Benton County, Indiana
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2123)

Minwind: a Farmer-Owned Concept Others Can Put to Work
featuring Mark Willers, CEO of MinWind Energy
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2151)

Overcoming Challenges to Community Wind Will Result in Big Benefits
featuring Mark Willers, CEO of MinWind Energy
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2175)

Changes, Better Understanding Bring Utilities on Board with Wind Energy
featuring Mark Parkinson, Kansas Lieutenant Governor
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2199)

Wind Energy Powering Economic Development in Rural Communities
featuring Mark Parkinson, Kansas Lieutenant Governor
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2209)

Working to Overcome Barriers to Meeting 20% U.S. Wind Vision
featuring Mark Parkinson, Kansas Governor
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2219)

For States to Reach Full Wind Potential, National Effort Needed
featuring Steve Wegman, South Dakota Wind Energy Association Executive Director
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2338)

Wind Energy Brings Jobs to Rural America
featuring Steve Wegman, South Dakota Wind Energy Association Executive Director
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2358)

Wind Brings Great Deal of Economic Development Potential to the Table
featuring Jay Haley, Partner with EAPC Architects Engineers
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2386)

Regional Wind Energy Institutes

Many of the most challenging wind energy issues are regional in nature. The Wind Powering America team formed the Regional Wind Energy Institutes (RWEIs) so that professionals in each state can learn from the experiences and best practices of others in their regions. The three RWEIs — Southwest, Mid-Atlantic/Southeast, and Great Lakes — utilize a train-the-trainer approach that provides regional training to a small group of outreach professionals in priority states to enable these individuals to reach key audiences in their areas.

WPA provides accurate and current information to members of State Wind Outreach Teams who further wind power development by educating key constituents in their respective states. RWEI members host an annual 1- to 2-day training session in their regions that includes updates on the wind industry, state progress, and challenges. National experts provide updates on issues of regional importance. RWEI members also host three to four Webcasts per year on current topics. Members also have an opportunity to meet in regional groups at the Wind Powering America Summit following the annual WINDPOWER conference.

The Fourth Mid-Atlantic/Southeast Regional Wind Energy Institute meeting. Photo credit: Rita Kilpatrick, Southern Alliance for Clean Energy.

Bill Spratley, executive director of Green Energy Ohio, attends the Great Lakes Regional Wind Energy Institute annual meeting in Columbus, Ohio in February 2009. The Great Plains Windustry Project coordinates the Great Lakes RWEI, which focuses on Indiana, Michigan, and Ohio. Photo credit: Melissa Peterson/PIX16947.

Southwest RWEI

- The Core Foundation coordinates the Southwest RWEI, which focuses on Arizona, Nevada, and Utah. Approximately 20 representatives attended the RWEI's fall meeting in Palm Desert, California. Meeting topics included the 20% Wind Energy by 2030 scenario, transmission, comparative economics of various power generation technologies, refuting misinformation about wind, comparative water consumption of various power generation technologies, wind forecasting, radar, and individual state reports (November 2008).

Southwest RWEI Webcast topic: Experts discussed workforce training issues and key green job provisions in the federal economic stimulus package during a Webcast titled *Workforce Training for Wind Energy Careers: How the West is Preparing Workers for the Green-Collar Economy* (February 2009).

Mid-Atlantic/Southeast RWEI

- The Southern Alliance for Clean Energy coordinates the Mid-Atlantic/Southeast RWEI, which focuses on Maryland, North Carolina, and Virginia. Approximately 50 representatives from Maryland, North Carolina, Virginia, West Virginia, Georgia, Tennessee, and Pennsylvania attended the fall meeting in Alexandria, Virginia. Topics included state reports, how to create an effective Wind Working Group, siting issues, the manufacturing supply chain, offshore wind, and a developers' panel. Lisa Barnett, Megan McCluer, Dwight Bailey, Jim Ahlgrimm, and Brian Connor represented the DOE Wind Program (November 2008).
- The group also organized a meeting to discuss activities in Maryland, Virginia, and North Carolina. Ordinances, community wind, offshore wind, and proposed legislation were hot topics (July 2009).

Mid-Atlantic/Southeast RWEI Webcast topics: NREL's Maureen Hand discussed the assumptions used in the 20% Wind Energy by 2030 analysis and answered questions on the scenario's implications (February 2009). Michael Milligan of NREL presented on integrating wind energy into the utility grid (April 2009).

Marguerite Kelly presents *Outreach in Priority States* at the 2009 WINDPOWER conference in Chicago with (left to right) Tom Potter, Colorado Wind for Schools facilitator; Larry Flowers, Wind Powering America Technical Lead; and Dan McGuire, Nebraska Wind for Schools facilitator.

Great Lakes RWEI

- The Great Plains Windustry Project coordinates the Great Lakes RWEI, which focuses on Indiana, Michigan, and Ohio. Marguerite Kelly, Lisa Barnett, and Lisa Daniels kicked off the annual session at the Ohio State Energy Office, which focused on state activity reports, the supply chain and workforce development, economic policy, the Great Lakes Wind Collaborative, how to make a Wind Working Group successful after a state RPS is in place, integrating wind into the grid, mid-size turbines and distributed generation, permitting and legal issues for offshore wind, leases, and easements. AWEA's Jeff Anthony also provided a policy update (February 2009).
- More information on the Great Lakes RWEI is available at www.windustry.com/GLRWEI.

Great Lakes RWEI Webcast topics: The group produced a Webcast on offshore wind in the Great Lakes featuring Jason Jonkman of NREL, Dan Sage and Deb Erwin of

Wisconsin Public Service Commission, and Mike Klepinger of Mikinetics Consulting (January 2009). Laurie Jodziewicz of AWEA and Michael Vickerman of RENEW Wisconsin presented on wind project siting in the Great Lakes Region (August 2009).

NREL lead: Marguerite Kelly

NREL contractors: CORE Foundation (Craig Cox); Great Plains Windustry Project (Lisa Daniels, Melissa Peterson); Southern Alliance for Clean Energy (Gil Melear-Hough, Brandon Blevins, and Mary Carr)

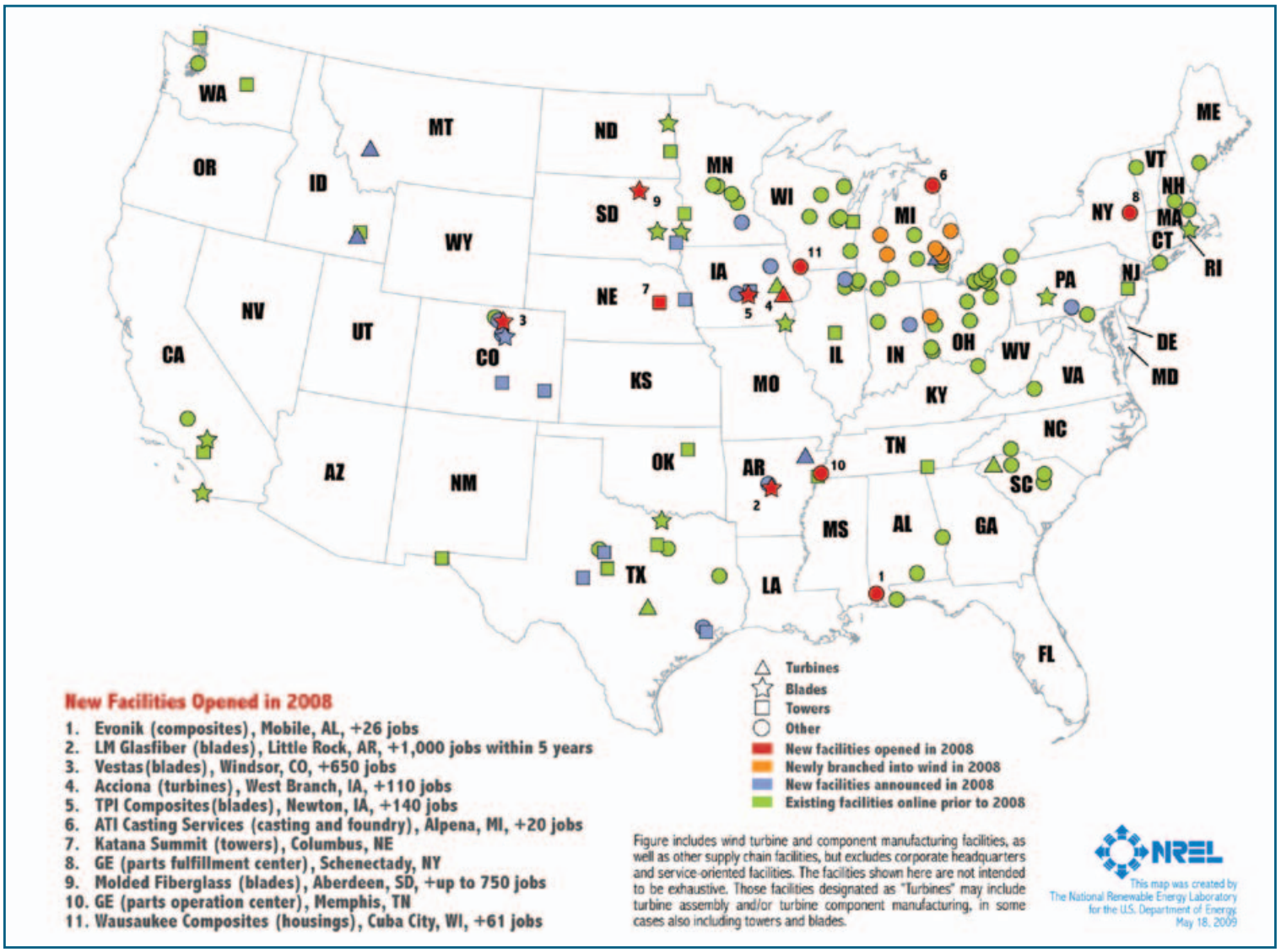
FY09 publication:

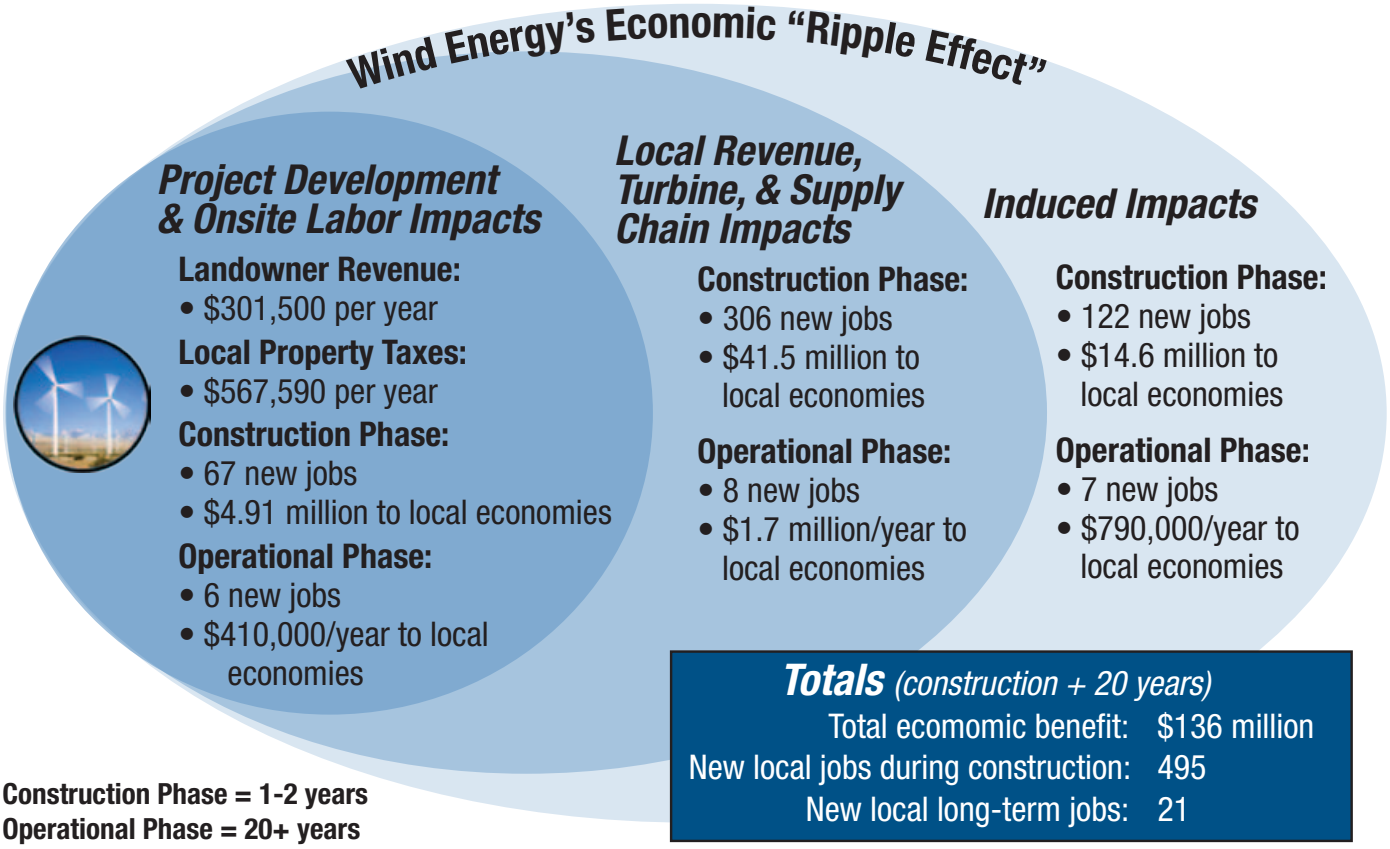
Wind Powering America — Outreach in Priority States, a poster presentation at the 2009 WINDPOWER conference in Chicago (www.nrel.gov/docs/fy09osti/45342.pdf)

Economic Development Analysis

NREL researchers specializing in economic development performed analyses and provided support to states weighing the impacts of wind energy versus coal. The team's FY09 accomplishments include:

- Based on an extensive survey of reported impacts, Sandra Reategui, Eric Lantz, and Suzanne Tegen completed a new release of the JEDI Wind





Model (Version W1.09.03e). The team revised overall project costs and the distribution of project costs, reflecting recent changes in capital costs, productivity improvements, and changing industry practices. The model now contains updated construction and O&M labor ratios (number of workers) based on current industry averages. The multiplier data are 2006 data from the Minnesota IMPLAN Group, reflecting the most recent data available from the Bureau of Economic Analysis. State-specific tax estimates, based on surveys of existing wind farms and state tax policy, are included. Default construction- and operations-period labor costs and payroll parameters (including average wage per hour) now automatically adjust in accordance with state industry job and earnings ratios. Default project construction and O&M cost factors now reflect economies of scale, accounting for increased construction and operating efficiencies observed as individual projects increase in size.

- The team completed the economic development impacts analyses of the first 1,000 MW of wind deployment in Colorado and Iowa, as well as the comparative impacts of community-owned versus conventional third-party-owned projects. Reategui represented WPA at the Governor's Forum on Colorado Agriculture in Denver, where she provided the newly published Colorado analysis and related fact sheet to agricultural decision-makers. She also presented the impacts (including land lease payments to farmers and ranchers, tax revenue, economic activities, and employment) of 1,000 MW of commercial wind energy development in Iowa at a seminar presented by NREL's Strategic Energy Analysis Center and DOE/EERE's Office of Planning, Budget, and Analysis. Reategui also presented to the Utah Wind Working Group and at the Great Plains and Southwest Summit in Texas (February 2009).

- Lantz completed a study of the economic development impacts of wind energy in Nebraska. The results included scenarios of 1,000 MW and 7,800 MW (the additional capacity needed in Nebraska to reach its allocation under the 20% Wind Energy by 2030 scenario). Lantz presented the research at the Nebraska Wind Energy Conference (November 2008).
- Lantz and co-author Tegen reviewed previous economic development analyses of community wind projects and compared these projected results with empirical impacts from four projects currently in operation. Lantz presented the results and analysis at WINDPOWER 2009, as well as to the Colorado Wind Working Group, the Rocky Mountain Farmers Union, and at a Southwest Minnesota Initiative Foundation community meeting.
- Tegen, Lantz, and Reategui attended a very informative training provided by the Minnesota IMPLAN Group. They learned inner workings and details about direct, indirect, and induced impacts in standard input-output models as well as in IMPLAN, which is vital to the team's current understanding and future direction of the JEDI models.
- Tegen worked with Stephen Hendrickson and WPA's Frank Oteri to complete the wind power manufacturing map for the 2008 DOE Annual Report.
- Tegen presented sample JEDI results and provided JEDI model tutorials by Webinar for the National Conference of State Legislators and for the Great Lakes Wind Collaborative (June 2009).
- The JEDI informational page on the WPA Web site (www.windpoweringamerica.gov/economics_jedi.asp) received 1,440 visits during the fiscal year, and during that same period, 1,114 economic development publications were downloaded.

NREL team members: Suzanne Tegen, Eric Lantz, Sandra Reategui

NREL contractors: MRG & Associates, Frank Oteri

NREL intern: Stephen Hendrickson

FY09 publications:

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Arizona (www.nrel.gov/docs/fy09osti/44144.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Idaho (www.nrel.gov/docs/fy09osti/44145.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Maine (www.nrel.gov/docs/fy09osti/44146.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Massachusetts (www.nrel.gov/docs/fy09osti/44914.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Montana (www.nrel.gov/docs/fy09osti/44147.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Nevada (www.nrel.gov/docs/fy09osti/44271.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in New Mexico (www.nrel.gov/docs/fy09osti/44273.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in North Carolina
(www.nrel.gov/docs/fy09osti/44916.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Pennsylvania
(www.nrel.gov/docs/fy09osti/44274.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in South Dakota
(www.nrel.gov/docs/fy09osti/44275.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Tennessee
(www.nrel.gov/docs/fy09osti/44915.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Utah
(www.nrel.gov/docs/fy09osti/44268.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in West Virginia
(www.nrel.gov/docs/fy09osti/44276.pdf)

Economic Benefits, Carbon Dioxide (CO_2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Wisconsin
(www.nrel.gov/docs/fy09osti/44277.pdf)

Economic Development Benefits from Wind Power in Nebraska: A Report for the Nebraska Energy Office
(www.nrel.gov/docs/fy09osti/44344.pdf)

Economic Development Benefits of the Mars Hill Wind Farm
(www.nrel.gov/docs/fy09osti/44824.pdf)

Economic Development Impacts in Colorado from Four Vestas Manufacturing Facilities
(www.nrel.gov/docs/fy09osti/44620.pdf)

Economic Development Impacts of Colorado's First 1,000 Megawatts of Wind Energy
(www.nrel.gov/docs/fy09osti/44317.pdf)

Economic Development Impacts of Community Wind Projects: A Review and Empirical Evaluation
(www.nrel.gov/docs/fy09osti/45555.pdf)

Generating Economic Development from a Wind Power Project in Spanish Fork Canyon, Utah: A Case Study and Analysis of State-Level Economic Impacts
(www.windpoweringamerica.gov/pdfs/economic_development/2009/ut_spanish_fork.pdf)

Social Acceptance of Wind Power in the United States: Evaluating Stakeholder Perspectives, a poster presentation at the 2009 WINDPOWER Conference in Chicago
(www.nrel.gov/docs/fy09osti/45554.pdf)

Wind Energy and Economic Development in Nebraska
(www.nrel.gov/docs/fy09osti/45340.pdf)

Wind for Schools

Now in its second year, WPA's Wind for Schools project continues to attract interest and press coverage. More than 20 small wind turbines were installed at host K-12 schools with assistance from six Wind Applications Centers (WACs). K-12 teacher training workshops on wind curricula were conducted in four states, and more than 150 engineering students are now involved in wind energy curricula through the university-based WACs. More than 75 representatives from educational institutions, industry, and government joined a roundtable discussion to initiate a wind energy workforce development roadmap.

Wind for Schools program team members also launched an auxiliary program that allows host schools and state programs to participate in the DOE's project by using locally available, non-DOE funds. Any material developed can be applied not only to partner states, but also to other organizations from individual schools, school districts, or state energy offices that may not be formally aligned with the Wind for Schools activity.

For FY09 state updates on Wind for Schools projects, see the state summaries for Colorado (page 7), Idaho (page 10), Kansas (page 16), Montana (page 26), Nebraska (page 27), and South Dakota (page 37). FY09 Wind for Schools project activities at NREL (including workforce development) include the following:

- Marguerite Kelly and Ian Baring-Gould met with representatives of the University of Colorado's MESA (Mathematics, Engineering, Science Achievement), a national organization of universities and K-12 schools in nine states that promotes increased focus on math, engineering, and science education in schools with a focus on women and disadvantaged students. One of MESA's activities is a development project in which university students work with middle and high school student teams to develop a specific device, which will then be competed against other MESA teams. The planned project for the 2009/2010 school year includes constructing a small wind turbine. The Wind for Schools program will likely support MESA program activities with a wind focus and provide support using the curricula developed through the program while taking advantage of MESA's network of universities and schools.
- In an effort to understand workforce development needs in the wind industry, NREL convened a roundtable of Colorado and Wyoming educators and industry representatives to discuss wind energy workforce development and to solicit guidance on structuring a program to support wind energy workforce development. Participants included representatives of all educational levels, including community and vocational programs and several industry sectors.
- Trudy Forsyth met with Linda Lung, NREL's education group; Larry Snyder, Red Rocks Community College; Michael Schmidt, Laramie County Community College (LCCC); and Barry Kaz and Paula Davis, Colby

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- Wind Powering America Home
- **About Wind Powering America**
- **Program Areas**
  - States
  - Regions
  - Agricultural Community
  - Native Americans
  - Public Lands
  - Public Power
  - Schools
    - Wind for Schools
    - Project Locations
    - Educational Programs
    - Teaching Materials
    - Resources & Tools
  - Small Wind
  - Economic Development
  - Policy
  - Siting
- **Awards**
- **Perspectives**
- **Resources & Tools**
  - Anemometer Loans
  - Wind Working Groups
  - Wind Maps
  - Videos
  - Audio
  - Publications
  - News
  - Events
  - Past Events

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Wind Energy Educational Programs

SHARE

The U.S. map below shows which states have higher education or continuing education programs for wind energy. Click on the map to activate it and then click on a state to read more about offered programs.

California

- **Airstreams Renewables, Inc.**
  Tehachapi , California
  Contact: Mike Messler or Lisa Gilbert, Airstreams Renewables Technical Institute
  Phone: (661) 822-3963
  Airstreams Renewables, Inc. offers vocational career focused training programs for individuals and companies seeking certificates in all industry recognized safety related aspects of wind and renewable energy.

- **California Wind Energy Collaborative**
  Davis , California
  Offers a wind energy technology and industry primer course for technicians but is appropriate for business office personnel, decision makers, or anyone seeking a better understanding of the technology and science driving the wind industry.

- **California Wind Tech**
  Rancho Cucamonga , California
  Phone: (909) 215-0860
  California Wind Tech offers an accelerated and comprehensive monthly course that provides technical training for an entry-level career as a wind technician. The class is broken into six distinct units that are engineered to educate and the build skills that are needed to enter the wind industry. The units include: Wind Power Systems, Wind Turbine Schematic Reading, Wind Turbine Circuit Troubleshooting, Hydraulic Power Systems, Basic Electrical Systems, and Safety Certifications.

- **Cerro Coso Community College**
  Ridgecrest , California
  Contact: Valerie Karnes, Dean Career Technical Education, Cerro Coso Community College

NEWS

Video Documenting Installation Process of the Pocatello Community Charter School, Idaho, Wind Turbine
December 11, 2009

Careers in Wind Energy
December 11, 2009

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EVENTS

Indiana Energy Workshop for Educators
January 13, 2010

Rhode Island Energy Workshop for Educators: Middle School
January 27, 2010

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PUBLICATIONS

Wind for Schools Affiliate Programs Fact Sheet (PDF 759 KB)
Download Adobe Reader
December 10, 2009

More Publications

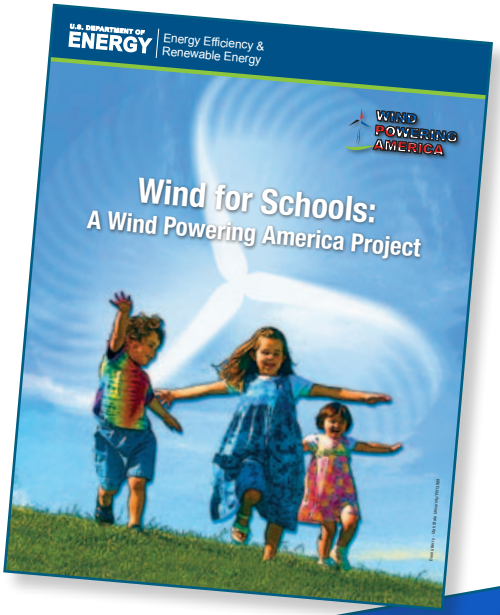
Community College (CCC) to discuss implementing a wind technician training program at CCC in Kansas. Schmidt, who originally worked with Iowa Lakes Community College and recently joined the LCCC staff to launch a 2-year wind technician program, offered advice to the CCC staff (November 2008).

- Baring-Gould attended the 2009 European Wind Energy Conference in Marseille, France and presented a paper and poster on the DOE's Wind for Schools and workforce development activities. The European Wind Energy Association (EWEA) and the European wind industry have identified workforce development as a critical issue, especially with the recent European Union mandate to supply 20% of the total energy in European Union member countries from renewable sources by 2020. Baring-Gould participated in discussions with staff from Denmark's Riso National Laboratories and EWEA on workforce development opportunities in Europe and potential U.S. collaboration (March 2009).
- Baring-Gould provided a lunch address at the Iowa Wind Energy Association's annual meeting and met with staff of the Iowa Lakes Community College wind technician training program. This 2-year program is arguably the best-recognized program in the United States. Discussions focused on the program's design and needs, including expanding training opportunities for certificate and non-certificate programs. The facility is currently expanding to allow training for approximately 100 students per year. Baring-Gould also met with staff from DOE and the American Wind Energy Association (AWEA) to discuss wind workforce development and educational programs (March 2009).
- Baring-Gould participated in the AWEA/DOE/NREL Workforce Action Plan Development Meeting at the WINDPOWER 2009 conference in Chicago. The meeting attracted members of industry, government, and education to address the wind industry's workforce needs (May 2009).
- Baring-Gould was an invited panelist at the closing session of the 2009 Workforce Innovation in Regional Economic Development (WIRED) Policy Academy, discussing the national impact of wind energy education and jobs and using the Colorado experience as a case study. The U.S. Department of Labor sponsors the WIRED initiative to develop expanded workforce and regional development through a collaboration of organizations involved in workforce development, economic development, education, business, government, and other key market sectors. This year's session addressed green jobs, especially in the renewable energy industry (June 2009).
- Baring-Gould and staff from the National Energy Education Development (NEED) Project supported a K-12 teacher-training program in Boulder, Colorado. The Colorado MESA chapter sponsors the program, which focused on educational curricula associated with wind technologies (September 2009).

NREL lead: Ian Baring-Gould

NREL team member: Rebecca Meadows

NREL contractors: The six Wind Applications Centers are located at Boise State University, Colorado State University - Fort Collins, Kansas State University, Montana State University, South Dakota State University, and University of Nebraska at Lincoln. The state facilitators are Dan McGuire of the American Corn Growers Foundation (Nebraska), Dan Nagengast of the Kansas Rural Center (Kansas), Brian Jackson of Renaissance Engineering and Design (Idaho), Michael Costanti of Western Community Energy (Montana), Tom Potter of All-American Energy (Colorado), and Steve Wegman of the South Dakota Wind Energy Association (South Dakota). Other Wind for Schools contractors are American Spirit Productions, Earth Turbines, and The NEED Project



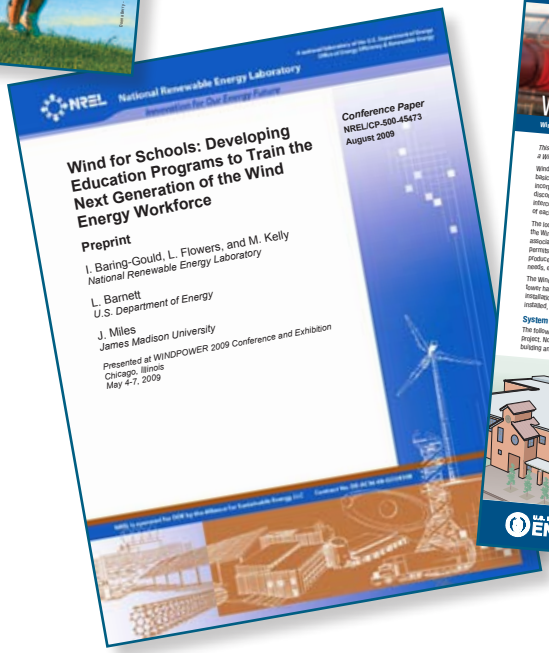
FY09 publications:

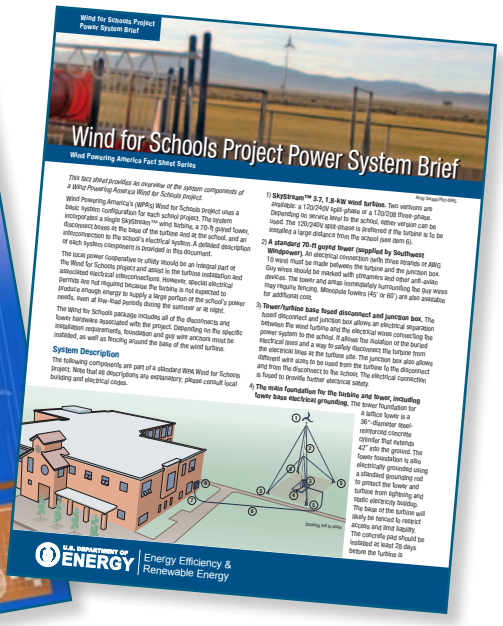
Wind for Schools: A Wind Powering America Project (revision)
(www.nrel.gov/docs/fy09osti/45684.pdf)

Wind for Schools: Developing Educational Programs to Train the Next Generation of Wind Energy Experts, a poster presentation at the 2009 WINDPOWER conference in Chicago
(www.nrel.gov/docs/fy09osti/45472.pdf)

Wind for Schools: Developing Education Programs to Train the Next Generation of the Wind Energy Workforce, a conference paper presented at the 2009 WINDPOWER conference in Chicago
(www.nrel.gov/docs/fy09osti/45473.pdf)

Wind for Schools Project Power System Brief (revision)
(www.nrel.gov/docs/fy09osti/45685.pdf)





"Tell me and I forget. Teach me and I remember. Involve me and I learn."

—Ben Franklin

"It's a great fit for our area in that wind is something we deal with all of our lives around here. It's great to see it finally put to some productive use."

Kyle Hebberd, superintendent of the Walsh School District, Colorado

"What this program is addressing is the bottleneck in brainpower. That's why wind power in the schools is all about education."

Todd Haynes, Boise State's Wind for Schools coordinator, Idaho

Photo credit: Sean Micken.

Photo credit: Stephanie Lively/PIX16753.

"These wind turbine projects represent another important way all regions of Colorado are participating in our New Energy Economy. Educating today's young people about the benefits and mechanics of renewable energy systems prepares them for a wealth of future opportunities and demonstrates the crucial role our rural communities can play in mapping out a new energy future for Colorado and the country."

Colorado Gov. Bill Ritter

"When we were working on the Wind for Schools project, which is an awesome program, we kind of saw this as the tip of the iceberg."

Bill Peisner, school counselor at Wellington Middle School in Colorado (referring to plans to expand on Wind for Schools with a two-classroom, net-zero science lab that will use renewable energy)

"Being able to participate in this project is a once in a lifetime opportunity. Hopefully today's students will remember this as an important change in technology and that they were part of it."

Vincent Wray, science teacher at Shelley High School, Idaho

"It helps our earth and our environment so it's not polluted."

Stefani Miller, student at Pocatello Community Charter School, Idaho

"I believe that Wind for Schools Montana will be a valuable asset for our state for years to come...It is a new and unique program that reaches the heart of Montana."

Jon Tester, Montana Senator

Photo credit: Todd Haynes.

Photo credit: Todd Haynes.

"I stopped by Greenbush today on my way back from talking to a bunch of school facilities people on energy efficiency and renewables. Josh Cochran, a Greenbush teacher, says they have people stopping by almost daily to ask about the turbine, and they have had some 16,000 to 17,000 students working with it, one way or another, in the last year. And that's just one installation (albeit, a somewhat special one—Greenbush is not a single school but a service provider for many schools). This program works, and it's a tremendous draw."

Ruth Douglas-Miller, Associate Professor, Department of Electrical and Computer Engineering, Kansas State University

"This broad-based collaborative project stands to enhance Montana State University's energy research efforts, support engineering education, and help to demonstrate a commitment to sustainable and renewable energy on the Bozeman campus."

Tom McCoy, V.P. for Research, Creativity

"I would just like to expose my kids to all the possible alternative energies that are out there, and what better way than this? It's just too good of a project to turn down."

Cedar Rapids Superintendent
Amy Malander, Nebraska

Photo credit: Billie Johnson/PIX16750.

Photo credit: Billie Johnson/PIX16751.

"Montana's on the move. This important program will not only provide a small amount of wind energy for rural Montana schools but will also educate tomorrow's leaders on the value and importance of this renewable energy source."

Brian Schweitzer, Governor of Montana

"These projects will get people back on the job now and will set the stage for growth by educating future generations."

Nebraska Senator Ben Nelson (announcing American Recovery and Reinvestment Act funding that included three Wind for Schools projects)

"It's a new job market opportunity for some of our vocational kids."

Dave Owen, Burwell Schools principal, Nebraska

"I believe the Wind for Schools Project provides an excellent opportunity for our students and staff to study renewable energy. Having a wind turbine on our campus provides our staff and students an opportunity to study firsthand what renewable energy can do for this country."

Dr. Loren Scheer, Superintendent for the Douglas School District, South Dakota

Photo credit: Billie Johnson/PIX16752.

"This Wind for Schools Project is such a great opportunity for students at Douglas. As the wind industry expands, particularly in South Dakota, we realize how important it is to equip students with an understanding of wind energy. In a few years these students will be the ones installing and maintaining wind turbines. I hope this project is the beginning of an exciting time for Douglas."

Dusty Johnson, Chairman of the South Dakota Public Utilities Commission

"The Wind for Schools Project will give the students and teachers at Douglas a great hands-on learning experience in the growing field of wind energy. They will play a vital role in bringing renewable energy to a grassroots level in Box Elder. This is a project and energy source both the school and community can embrace."

Don Martinez, Energy Services Engineer at Black Hills Power, South Dakota

Photo credit: Sean Micken.

"I strongly support continued local, state, and federal cooperation in putting this nation's wind energy resources to work for all Americans. The Wind for Schools program is an important step in achieving this goal, and I thank you for your continued administration of this program."

South Dakota Senator John Thune

"We in the Renewable Energy class at Milford High School have benefited greatly from our association with each one of you. I never dreamed that I would feel as successful as I do in educating young people. I never dreamed young people would show such fascination and interest in the subject matter. I think we owe all of you who have allowed us to be a part of the renewable energy happenings of our valley a mountain of thanks."

Andy Swapp, teacher, Milford High School, Utah

Photo credit: Michael Kostrzewa/PIX16848.

Photo credit: Stephanie Lively/PIX16754.

Photo credit: Stephanie Lively/PIX16755.

"The students notice it (the wind turbine) when they come in. They talk specifically about how windy it is, and they've asked to see the output on the windier days."

Tracy Moody, Sanborn Central School District science teacher, South Dakota

"Science is not something that should just be in a textbook or on a test. Students get excited when they get to do something hands-on."

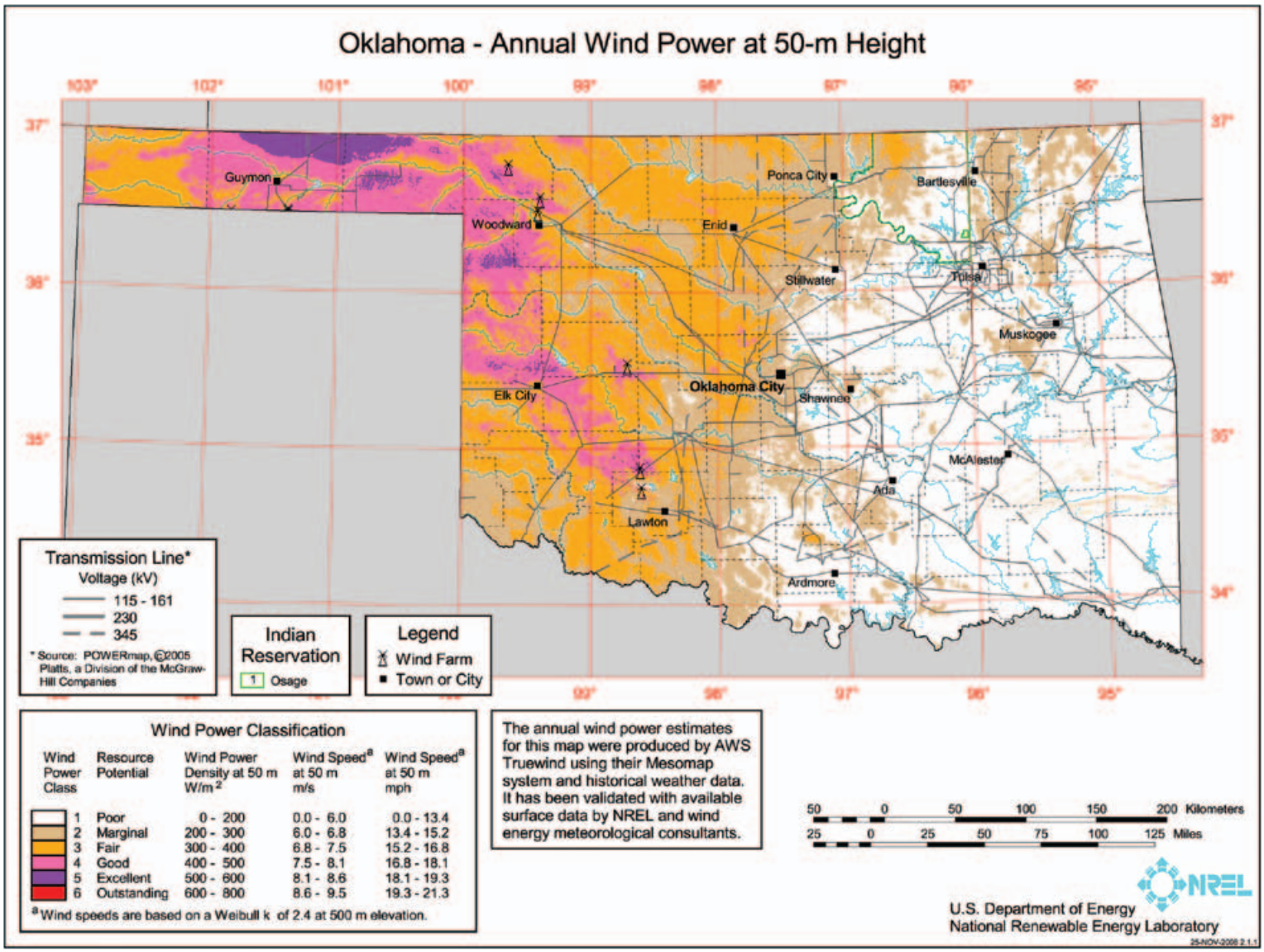
Tim Taylor, principal, Three Peaks Elementary School, Utah

"We are a green school and happy to be sending that message. We really try to walk the talk here."

Martha Martin, Principal of Pocatello Community Charter School, Idaho

Wind Resource Assessment

- The wind resource assessment group completed high-resolution wind resource maps of Oklahoma. Larry Flowers presented them at the Oklahoma Wind Power Conference (November 2008). The wind resource group responded as needed to technical questions and requests from states and other organizations about their wind resources.
- NREL's resource assessment and mapping team won the 2009 NREL Outstanding Team Award at the laboratory's annual awards ceremony. Team members Dennis Elliott, Marc Schwartz, Donna Heimiller, Steve Haymes, George Scott, and Ray George were recognized for their enormous contribution in quantifying and bringing awareness of the substantial wind resources available and their value to energy security, economic development, and climate mitigation (February 2009). The WPA wind maps are the most visited sub-site of the EERE Web site. The wind maps were central to the 20% Wind Energy by 2030 report and are used extensively by states in public outreach and policy analysis.
- The wind resource group analyzed wind data from tall-tower sites in the Great Lakes and Midwest regions to conduct preliminary validations of the wind resource estimates for heights above 50 meters and to gain a better understanding of the wind shear and turbulence profiles at elevated heights.



Elliott presented a poster on the topic, *Wind Shear and Turbulence Profiles at Elevated Heights: Great Lakes and Midwest Sites*, at the WINDPOWER 2009 conference in Chicago (May 2009).

- Four unvalidated state wind maps were converted to the NREL/WPA format and included on the WPA Web site in 2009: Georgia, New York, South Carolina, and Wisconsin. AWS Truewind produced these high-resolution state wind maps, which were publicly funded (in some cases with DOE funds) but not validated by NREL.
- A collaborative project between NREL and AWS Truewind LLC of Albany, New York was initiated in late FY09 to develop new wind energy resource potential estimates and maps at heights of 80 meters and 100 meters above ground for each of the 48 contiguous states. The new products, which will be made available on the Wind Powering America Web site when completed in FY10, are based on a consistent, high-resolution wind resource dataset produced by AWS Truewind. NREL researchers are using this dataset in combination with in-house environmental and land-use exclusion datasets in an advanced methodology to develop the new wind potential estimates. This new information will help set priorities for federal and state policy initiatives to expand wind energy use by providing updated maps and estimates of the potential for wind energy development appropriate to current and future technology and hub heights.

NREL lead: Dennis Elliott

NREL team: Marc Schwartz, Donna Heimiller, Steve Haymes, George Scott, and Ray George

NREL contractors: AWS Truewind, consulting meteorologists

FY09 publication:

Wind Shear and Turbulence Profiles at Elevated Heights: Great Lakes and Midwest Sites, a conference poster presented at the 2009 WINDPOWER conference in Chicago
(www.nrel.gov/docs/fy09osti/45455.pdf)

Federal Energy Management Program (FEMP) and Federal Lands

WPA team members participated in regional, national, and state events related to wind projects on federal lands and provided technical support for federal projects. In FY09, wind assessments at many federal sites were underway.

- Fort Carson, Colorado (U.S. Army; wind resource assessment complete)
- Anzalduas Border Station, Texas (U.S. General Services Administration; data collection ended, final assessment underway)
- Donna Border Station, Texas (U.S. General Services Administration; data collection ended, final assessment underway)
- Cape Lookout at Harker's Island, North Carolina (National Park Service; anemometer tower installed)
- Newport, Rhode Island (U.S. Navy; anemometer tower installed, data analysis in progress)
- Massena Border Station and Alexandria Bay Border Station, New York (U.S. General Services Administration; site visit conducted, anemometer tower installation delayed due to construction and NEPA permitting)
- Eureka, Utah and Anaconda, Montana (Environmental Protection Agency; provided technical assistance, including data analysis)

- Pearl City and Kanehoe, Hawaii (Department of Defense; provided technical assistance, data analysis in progress)
- Guam (U.S. Navy; final report in progress)
- Puerto Rico (U.S. Coast Guard; provided technical assistance, data analysis in progress).

The team provided technical assistance for potential projects at:

- Lompoc Prison in California (Federal Bureau of Prisons)
- Fort Richardson, Alaska (U.S. Army)
- Elmondorf Air Force Base, Alaska
- Schriever Air Force Base, Colorado
- DOE's PANTEX facility in Amarillo, Texas
- DOE's Sandia National Laboratory in Albuquerque, New Mexico
- U.S. Forest Service Madison Ranger District, Ennis, Montana
- Various Naval facilities via Naval Facilities Engineering Command, including Parris Island, South Carolina.

Additional activities:

- Robi Robichaud presented wind technology and development issues to the Colorado Bureau of Land Management (BLM) State Leadership Meeting in Golden, Colorado. The purpose of the talk was to educate BLM state office directors and field office managers on relevant wind turbine technology and wind project development activities to prepare them for evaluating wind development applications and right-of-way issues at BLM properties in the state (December 2008).
- Robichaud participated in the Fourth Annual Military Energy Alternatives Conference in Washington, D.C. The conference provided an opportunity to learn about the energy needs and strategies from high-level undersecretaries and assistant secretaries of the Department of Defense (DOD) branches (Army, Air Force, and Army Corps of Engineers). Robichaud offered DOE/NREL technical assistance to DOD personnel for wind resource assessment and wind project development activities (January 2009).
- Robichaud hosted the Federal Wind Energy Applications Technology Symposium at NREL's National Wind Technology Center (NWTC). The workshop targeted federal energy managers, engineers, planners, and property managers. NWTC scientists and engineers presented a wide range of topics in two days, followed by a third day devoted to connecting representatives from various wind industry sectors to this group of federal agency energy managers. Thirty participants from 11 states and Japan represented the U.S. Marine Corps, General Services Administration, U.S. Navy, Bureau of Land Management, Defense Energy Service Center, U.S. Forest Service, U.S. Department of Agriculture, U.S. Coast Guard, National Oceanographic and Atmospheric Administration, Veterans Affairs, Air National Guard, U.S. Army, Environmental Protection Agency, and the National Nuclear Security Administration (February 2009).
- Tony Jimenez provided a wind energy presentation to 120 attendees at the Net-Zero Installation and Deployed Bases Workshop in Colorado Springs. The U.S. Army Corps of Engineers' Engineer Research and Development Center sponsored the workshop, part of the military's efforts to become more energy efficient and more "green" (February 2009).

A 60-m anemometer tower on Navy property in Guam. Photo credit: DNV Global Concepts Inc./ PIX16289.

- As part of ongoing BLM support efforts, Robichaud met with BLM officials regarding a large wind farm proposal on BLM land near Rawlins, Wyoming (February 2009).
- Robichaud provided a presentation to Pacific High Command on wind energy activities within the U.S. Navy, including installed met towers, planned met towers, and other wind development activities in Guam, Oahu, and Kauai (March 2009).
- Robichaud served as a chair for the Wind Power Systems Design and Integration session at the American Society of Mechanical Engineers 3rd International Conference on Energy Sustainability in San Francisco, California (July 2009).
- Ian Baring-Gould and Robichaud presented on wind technology at the BLM Renewable Energy Summit in Las Vegas, Nevada. The four-day summit for BLM field office managers focused on wind and solar technologies, transmission, and environmental issues with the goal of increasing approvals for renewable energy projects on BLM lands (August 2009).
- Robichaud served as a project lead on nine projects funded at $510,000 via the American Recovery & Reinvestment Act (ARRA). He conducted kick-off teleconferences for seven projects by the end of the fiscal year (September 2009).
- Baring-Gould presented to a delegation from the Planning & Program Integration Office of the Army Research, Development, and Engineering Command (RDECOM) at the National Wind Technology Center. The delegation is examining the use of small wind to reduce dependence on transported fossil fuels in forward military deployment areas (September 2009).
- Robichaud and a team from NREL met with a contingent from the Environmental Protection Agency to kick off a $650,000 Work for Others renewable projects effort (September 2009).
- Robichaud and Rebecca Meadows conducted a site visit at Altus Air Force Base in Altus, Oklahoma for a 34-m met tower installation and at the McAlester Army Ammunitions Plant in McAlester, Oklahoma for a 50-m met tower installation. Both projects are funded by DOE, FEMP, and ARRA (September 2009).

NREL lead: Robi Robichaud

NREL team members: Rebecca Meadows, Tony Jimenez, Owen Roberts

NREL contractors: Alternative Energy Institute at West Texas A&M, DNV

FY09 publications:

Federal Wind Energy Assistance through NREL (www.nrel.gov/docs/fy09osti/44965.pdf)

Wind Energy Opportunities, Challenges, and Progress Within the Federal Government, a poster presentation at the 2009 WINDPOWER conference in Chicago (www.nrel.gov/docs/fy09osti/45410.pdf)

Native American Program

- WPA, West Texas A&M University, New Mexico State University, and Western Area Power Administration organized three Wind Energy Applications Training Symposium (WEATS) workshops. Attendees learned about wind energy fundamentals, wind plant development, interconnection and transmission, and wind energy policy. The workshops were held in Albuquerque, New Mexico (May 2009); Rapid City, South Dakota (June 2009); and Portland, Oregon (July 2009). Approximately 40 people attended, and overall feedback was positive. Attendees appreciated the chance to have detailed discussions with the presenters.
- Tony Jimenez served on a technical merit review committee that reviewed and ranked grant proposals submitted in response to a Tribal Energy Program Funding Opportunity Announcement (June 2009).
- The team completed final anemometer loan program wind-monitoring reports for Sand Point, Alaska (January 2009) and Keweenaw Bay Indian Community, Michigan (June 2009).
- A 50-m tower was erected on the Yurok Reservation in California as part of the tall-tower anemometer loan program (September 2009).
- Robert Gough worked with tribal entities (National Congress of American Indians, National Tribal Environmental Council, NativeEnergy, Indigenous Environmental Network, Honor the Earth, International Treaty Council, and the Northern Cheyenne) to garner tribal support for Renewable Energy Credits or offsets to support tribal renewable projects in Indian communities.
- Gough reviewed Western Area Power Administration's Wind Hydro Feasibility Study and submitted comments with Patrick Spears, president of Intertribal Council on Utility Policy (February 2009).
- Gough represented tribal interests while working with the Western Governors' Association on Renewable Energy Zones mapping efforts.
- Gough gave a presentation titled *New Opportunities in Project Development: Where Do We Go Now?* at the annual WINDPOWER conference in Chicago (May 2009).
- Gough participated in the Native Tribal Forum Conference on Air Quality (June 2009).

NREL lead: Tony Jimenez

NREL contractors: Robert Gough, New Mexico State University, West Texas A&M University

NREL intern: Josh McDaniel

FY09 publications:

NAWIG News, the Quarterly Newsletter of the Native American Wind Interest Group, Spring 2009
(www.nrel.gov/docs/fy09osti/45413.pdf)

NAWIG News, the Quarterly Newsletter of the Native American Wind Interest Group, Fall 2009
(www.nrel.gov/docs/fy10osti/46407.pdf)

Wind Power Across Native America: Opportunities, Challenges, and Status,
a poster presentation at the 2009 WINDPOWER conference in Chicago
(www.nrel.gov/docs/fy09osti/45411.pdf)

Distributed Wind

Targeted State Outreach

- Trudy Forsyth participated in five meetings in Maine. She provided a small wind session during the Increasing Energy Diversity and Independence: Growing Wind Power Generation in Maine event in Presque Isle. She then provided a summary overview of small wind market and policy as part of a discussion with the Northern Maine Development Commission in Caribou. Forsyth summarized small wind market and policies as part of a briefing discussion with Maine policymakers in Augusta, and while in Augusta she also provided a presentation on small wind technology, market, and policy as part of the Sizing Up Our Wind Opportunity meeting. Maine Rural Partners, a network of renewable energy advocacy groups and economic development interests, and Community Energy Partners organized the last presentations, in which Forsyth also participated (October 2008).
- Forsyth gave a presentation on small wind research and policies as part of a small wind energy seminar held in Cheyenne, Wyoming. The Laramie County Conservation District, Farmers Insurance, and Southeast Wyoming Rural Community and Development sponsored the seminar (October 2008).
- Forsyth met with the Wind Energy Center and a group of stakeholders involved in promoting small wind in Massachusetts to discuss current issues, barriers, and opportunities. Key topics included the status of small turbine certification and issues with performance and initial wind resource assessment (January 2009).
- Forsyth participated in the Maine Governor's press conference, during which he announced the formation of a Small Wind Wind Working Group. Forsyth summarized the results of the Maine Jobs and Economic Development Impacts (JEDI) analysis for the press and governor as part of the 20% Wind Energy by 2030 report (January 2009).
- Forsyth met with the Maine Sustainability in Agriculture leadership, Pennsylvania State Institutes of Energy and the environment director, and University of Maine agricultural extension centers to discuss ways to move wind forward in Maine, as well as a generic university wind course developed by the WPA team (January 2009).
- Forsyth made a small wind presentation at the Maine Agricultural Trades Show. The designated room held 50 people, but a standing-room-only crowd estimated at more than 150 people resulted in the organizers opening an adjoining room as well. During the previous week, Efficiency Maine announced a new small wind incentive (January 2009).
- Forsyth presented a 1-hour keynote speech and moderated a panel at the national Small Wind Conference in Stevens Point, Wisconsin, while Jim Green co-presented a workshop (Small Wind Power for Homes, Farms, Business, and Schools) with R. Preuss of Abundant Renewable Energy at the event. More than 300 people attended the conference, including representatives from more than 16 national and international small wind manufacturers (June 2009).

Zoning Outreach

- Green and Forsyth met with the director, manager, and planners from the Westminster (Colorado) Planning Department. Green gave a presentation on small wind zoning and addressed questions (November 2008).
- Green addressed the Nebraska Planning & Zoning Association Conference in Grand Island, Nebraska about zoning for distributed wind power. This

presentation was a collaboration with a professional planner, E. Garvin of Clarion Associates, Denver, Colorado. Teaming with a zoning/planning professional has been an effective approach to advocate for reasonable and effective solutions to zoning for distributed wind turbine applications (February 2009).

- Green spoke to the Littleton, Colorado city council about zoning for small wind turbines during a council "study session" that was broadcast to the Denver metropolitan area on a local cable channel (February 2009).
- Green made presentations on zoning for small wind to:
  - New York City Economic Development Corporation via Webinar (December 2008)
  - Clear Creek County Planning Commission in Idaho Springs, Colorado (March 2009)
  - Boulder County Commissioners in Boulder, Colorado (May 2009).

Work with Solar Organizations

- Green participated in the SOLAR 2009 Technical Review Committee meeting in Denver, Colorado. The committee reviewed abstracts and created the technical program for the annual American Solar Energy Society (ASES) national conference, which was held in Buffalo, New York in May 2009. Green represented the ASES Small Wind Division on this committee (January 2009).
- Green co-presented a workshop (Small Wind Power for Homes, Farms, Business, and Schools) with Preuss of Abundant Renewable Energy at the SOLAR 2009 Conference in Buffalo. Forsyth and Karin Sinclair (NREL) co-chaired the ASES Small Wind Division meeting, which was also held at this event. Sinclair also moderated a forum panel titled Incentive Policies for Distributed Small Wind (May 2009).

NREL lead: Trudy Forsyth

NREL team members: Karin Sinclair, Tony Jimenez, Jim Green

NREL contractors: Interstate Renewable Energy Council, North American Board of Certified Energy Practitioners

Communications

In addition to producing the publications and assisting with the outreach efforts described in each section in the WPA Activities at NREL chapter of this report, the WPA communications team also produces the annual Wind Powering America Summit.

NREL lead: Marguerite Kelly

NREL contractors: Ruth Baranowski, National Association of Farm Broadcasters, Frank Oteri

Additional FY09 publications not listed in other sections:

2008 Wind Energy Projects
(www.nrel.gov/docs/fy09osti/44823.pdf)

An Overview of Existing Wind Energy Ordinances
(www.nrel.gov/docs/fy09osti/44439.pdf)

Cooperative Extension Service and Wind Powering America Collaborate to Provide Wind Energy Information to Rural Stakeholders, a poster presentation at the 2009 WINDPOWER conference in Chicago
(www.nrel.gov/docs/fy09osti/45412.pdf)

Wind Powering America FY08 Activities Summary (www.windpoweringamerica.gov/filter_detail.asp?itemid=2148)

Water: Maybe the Best Near-Term Benefit and Driver of a Robust Wind Energy Future, a poster presentation at the 2009 WINDPOWER conference in Chicago (www.nrel.gov/docs/fy09osti/45341.pdf)

FY09 Webinars:

WPA and NREL collaborated with the National Rural Electric Cooperative Association, American Public Power Association, Western Area Power Administration, Utility Wind Interest Group, American Wind Energy Association, and the National Wind Coordinating Committee to present a series of Webinars on wind and renewable Energy. NREL's Corrie Christol and Susan Hinnen and Ryan Harry of BCS Incorporated organized the Webinars. Topics included:

- Transmission and Wind Integration into the U.S. Electrical System
- Wind Power Siting and Environmental Issues
- Wind Energy Production Forecasting
- 20% Wind Energy by 2030: Challenges and Opportunities
- Green Jobs and Economic Development from Wind Power
- Small Wind and Distributed Generation
- CREBS and PTC Update
- Wind Turbine Maintenance Programs
- Municipal Utility Wind Project Case Studies
- Electric Cooperative Wind Project Case Studies
- PTC, ITC or Cash Grant: Where Should a Community Wind Developer Begin?
- 2008 Wind Technologies Market Report
- Community Acceptance of Wind.

8th Annual WPA All-States Summit

More than 165 participants from 38 states attended the 8th Annual WPA All-States Summit at the Hotel Allegro in Chicago on May 7, 2009. The attendees represented WPA's network of 35 state Wind Working Groups, state energy officials, DOE and national lab representatives, and professional and institutional partners. The annual Summit provides an opportunity to review successes, opportunities, and challenges.

Following an opening plenary by Denise Bode of the American Wind Energy Association, Larry Flowers led a workforce development panel featuring John Stulp, Colorado Commissioner of Agriculture; Kevin Rackstraw, Clipper Windpower; Al Zeitz, Iowa Community College; Dan Nagengast, Kansas Rural Center; Tom Maves, Ohio Energy Office; Andy Swapp, Milford High School in Utah; and Jonathan Miles, James Madison University. Ryan Wiser from Lawrence Berkeley National Laboratory gave a presentation on the annual wind market report, and Jim Walker of enXco presented on wind energy futures. Amanda Ormond facilitated a transmission panel that included Dave Olsen of California's Renewable Energy Transmission Initiative; Beth Soholt, Wind on the Wires; Ron Lehr, American Wind Energy Association; Mike Sloan; Abby Arnold, National Wind Coordinating Collaborative; and LaVerne Kyriss, Western Area Power Administration.

The Summit also featured regional breakout sessions in the afternoon, facilitated by Gil Melear-Hough of the Southern Alliance for Clean Energy (East), Lisa Daniels of Windustry (Midwest), and Craig Cox of Interwest (West). Table topics included Wind for Schools, community wind, avian/wildlife, small wind, transmission, integration, workforce development, economic development analysis, offshore, working with co-ops, social acceptance/property values, Native Americans, federal loads/lands, climate/Renewable Portfolio Standards, radar, and resource assessment/mapping.

8th Annual WPA All-States Summit Awards

Meghan McCluer (DOE), Dwight Bailey (NETL), Ian Baring-Gould, and Larry Flowers (NREL) presented awards at an industry-sponsored reception on the eve of the Summit.

Outstanding Young Wind Advocate Award: Jennifer Alvarado, Great Lakes Renewable Energy Association

Outstanding Young Wind Advocate Award: Brent Summerville

Midwest Regional Wind Advocacy Award: Dan McGuire, American Corn Growers Foundation

Outstanding State Wind Working Group:
Michigan Wind Working Group

Western Regional Wind Advocacy Award:
Andy Swapp, Milford High School

Small Wind Advocate:
R. Nolan Clark, USDA Bushland

Outstanding Partner Award:
Lawrence Berkeley National Laboratory (Ryan Wiser accepting the award)

Eastern Regional Wind Advocacy Award: Tom Tuffey, PennFuture

Outstanding Leadership Award: Ruth Douglas Miller of Kansas State University and Dan Nagengast of the Kansas Rural Center

WINDPOWER 2009 Conference Papers and Posters

WPA team members presented 12 papers and posters at the WINDPOWER 2009 Conference in Chicago, May 4 – 7.

Conference Papers

Economic Development Impacts of Community Wind Projects: A Review and Empirical Evaluation by Eric Lantz and Suzanne Tegen (www.nrel.gov/docs/fy09osti/45555.pdf)

Technology, Performance, and Market Report of Wind-Diesel Applications for Remote and Island Communities by Ian Baring-Gould and Martina Dabo (www.nrel.gov/docs/fy09osti/45810.pdf)

Wind for Schools: Developing Education Programs to Train the Next Generation of the Wind Energy Workforce by Ian Baring-Gould, Larry Flowers, Marguerite Kelly, Lisa Barnett, and Jonathan Miles (www.nrel.gov/docs/fy09osti/45473.pdf)

Conference Posters

Cooperative Extension Service and Wind Powering America Collaborate to Provide Wind Energy Information to Rural Stakeholders by Antonio Jimenez, Larry Flowers, and Sarah Hamlen (www.nrel.gov/docs/fy09osti/45412.pdf)

National Renewable Energy Laboratory

MONTANA STATE UNIVERSITY EXTENSION

COOPERATIVE EXTENSION SERVICE & WIND POWERING AMERICA COLLABORATE TO PROVIDE WIND ENERGY INFORMATION TO RURAL STAKEHOLDERS

A. Jimenez, NREL L. Flowers, NREL S. Hamlen, MSU Extension

Cooperative Extension & Wind Energy Deployment

Cooperative Extension's presence blankets much of the United States and has been a trusted information source to rural Americans. Wind energy furthers Cooperative Extension goals of promoting community well-being and development. By working together, Cooperative Extension, Wind Powering America, and the wind industry can better educate the public and rural stakeholders about wind energy and maximize the benefits of wind energy to local communities.

What Is Cooperative Extension (CE)?

- Non-formal educational program designed to help people use unbiased, research-based knowledge to improve their lives (Wikipedia)
- Established by the Smith-Lever Act of 1914 to provide the resources of a state's Land Grant Universities to people at a local level
- Typical focus areas: agricultural science, family and consumer science, 4-H and youth development, community and economic development
- Funding comes from a mix of federal, state, and local sources
- CE has a presence in almost every county in the United States
- While work completed in each county is tailored to the needs of that area, collaboration on issues of broader interest are coordinated through state offices and university subject-matter specialists.

Cooperative Extension Activities & Wind Energy

Cooperative Extension has become increasingly involved with wind energy issues in recent years due to greatly increased interest (and inquiries) on this topic.

- Outreach & Education
  - A small wind Webinar on February 13 attracted more than 150 participants.
  - CSU Extension wrote and published "Wind Energy in Colorado."
  - In 2008, MSU Extension provided educational workshops to more than 900 landowners in Montana.
- Analysis Tools
  - Wind-irrigation analysis tool (MSU Extension) http://www.msuextension.org/energy/wind/windhome.asp
- Community & Economic Development
  - Wind monitoring in Northeast Colorado: CSU Extension led an effort to gather wind data in Northeast Colorado.
- Individual Inquiries & Consultation
  - Pre-feasibility analysis of the performance and economics of a proposed medium-size wind turbine project in Indiana
  - Feasibility analysis of municipal wind ownership in Montana.

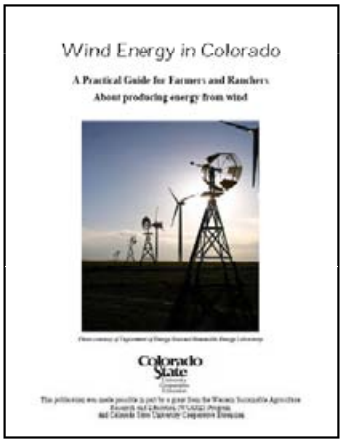
Wind Issues Addressed by Cooperative Extension

- Sizing
- Economics
- Interconnection
- Net Metering
- Commercial Development
  - Leasing, easements, & land issues
- Transmission & Interconnection
  - How it works
  - Queue process
- Qualified Facility Projects
- Grants/Funding Sources
- Home/Farm Applications

Cooperative Extension & Wind Powering America

WPA assists the Cooperative Extension to develop cadres of experts in windy states to provide up-to-date, objective information to rural stakeholders on wind energy applications and issues. Examples of collaborative activities include:

- Cooperative Extension Wind Workshop (November 2008): WPA hosted a wind energy workshop attended by extension representatives from several states. Proposed future work includes:
  - Train CE staff on wind energy and wind energy applications
  - Collaborate on the writing of wind energy outreach publications
  - Assist with the installation of small wind turbines at CE offices
  - Assist 4-H with development of wind energy curriculum
  - Help connect CE and state Wind Application Centers (WACs)
  - Produce topical Webinars
- Small Wind Webinar (February 2009): WPA provided a speaker to a CE-organized Webinar devoted to home/farm wind applications.
- Technical Assistance: WPA assisted the Indiana CE in analyzing the performance and economics of a proposed medium-size wind turbine for a factory.



CSU Extension wrote and published "Wind Energy in Colorado."

- History and value of wind
- Case study: Colorado Green project
- Wind Farm Development Process
- Wind Farm Business Models.

Turbines at Colorado Green project . Photo credit: Craig Cox

WINDPOWER 2009 | Chicago, IL | May 4-7, 2009 | NREL/PO-500-45412

www.windpoweringamerica.gov

Wind Energy Opportunities, Challenges, and Progress Within the Federal Government by Robi Robichaud (www.nrel.gov/docs/fy09osti/45410.pdf)

Wind Energy Opportunities, Challenges, and Progress Within the Federal Government

Robi Robichaud, National Renewable Energy Laboratory, Golden, CO

Wind Powering America (WPA) works with Federal agencies to:

- Increase their understanding of wind resources and assessment;
- Facilitate project development activities through Met tower loans, wind data analysis, and technical assistance; and
- Provide advice on RFP development and financing options.

WPA provides educational opportunities to the Federal sector, as demonstrated by conducting two intensive 3-day workshops **(May 20-22, 2008, MMR, Cape Cod, MA** and **Feb 3-5, 2009, Golden, CO)** targeting federal energy managers, facility managers, and site engineers. These workshops engage participants with detailed wind technology information, project development processes, and industry participants/contacts.

Federal Sector Projects are Challenging

The Federal sector has several unique challenges in completing wind turbine projects, including:

- NEPA requirements typically require more investigation than comparable private sector wind projects.
- Radar and airport issues provide siting challenges, especially at DoD bases with radar, an airport, or both.
- Financing mechanisms such as ESPC, appropriations, ARRA, and ECIP have different award metrics and performance requirements.
- Mission conflicts may exist as wind turbine projects detract from accomplishing existing agency mission goals or interfere with training missions at DoD bases.
- Long-term utility contract terms may be difficult to change.

Federal Policy & Agency Drivers:

EPAct 2005

Federal electricity consumption from RE sources must reach

- 3%: FY 2007- FY 2009
- 5%: FY 2010 - FY 2012
- 7.5%: 2013 and thereafter.

Executive Order 13423

Renewable energy requirements – at least 50% from *new* RE, on-site if possible.

Federal Agency Goal Drivers

- DOE: 185 GWh/year of RE
- DOD: 25% of electricity from RE by 2025
- USCG: 15% energy from RE by 2015.

20% Wind by 2030

Wind industry target for the Federal sector:
~ 4,000 - 5,000 GWh/year of wind generation.

Existing Federal Wind Projects

Federal Wind Sites	# of Turbines	Turbine Size	Manu-facturer	Wind Plant Capacity	Install Year
	[#]	[kW]		[kW]	[Year]
San Clemente Island, CA	3	225	NEG Micon	675	1998
Guantanamo Bay, Cuba	4	950	NEG Micon	3,800	2005
Warren Air Force Base, Cheyenne, WY	1	2,000	Gamesa	3,200	2009
	2	600	Vestas		2005
Air Force Ascension Island, St Helena, UK Territory	4	225	NEG Micon	2,700	1996
	2	900	NEG Micon		2004
Victorville Prison, Victorville, CA	1	750	Vestas	750	2005
Camp Williams, Riverton, UT	1	225	NEG Micon	225	1999
	1	660	Vestas	660	2005
Marine Corps, Barstow, CA	1	1,500	AAER	1,500	2008
Total	**20**			**12,010**	

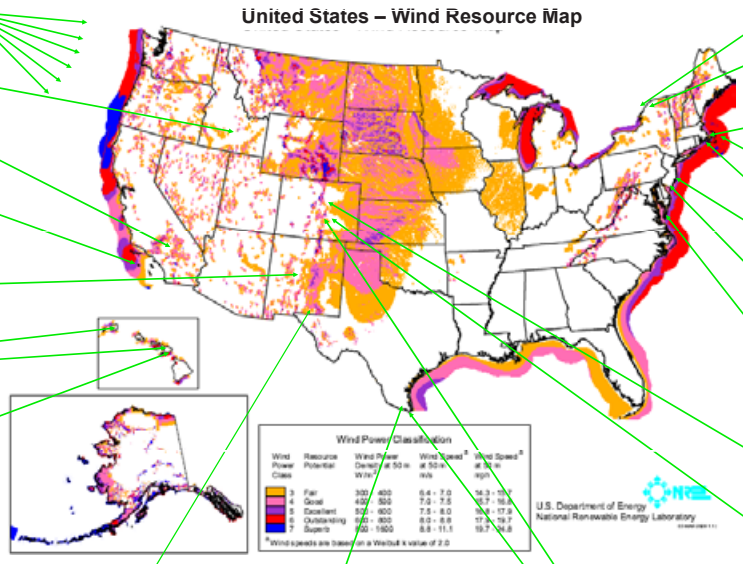
Federal Wind Resource Assessment Activities

Installation of 50-m Met tower by AEI of West Texas A&M at GSA Border Station site in Donna, TX.

NREL's Mini-SODAR unit deployed at Fort Carson, CO site. Unit was installed alongside a 50-m Met tower. Mini-SODAR installed by Atmospheric Systems Corporation.

60-m Met tower installation at Naval Magazine on ridgeline in western Guam. Installation by DNV-GEC.

New Federal Wind Projects in Progress



- BLM – 14 Western States Numerous Met towers installed; applications for wind project development
- DOE – Idaho Natl Lab, ID SODAR & 50-m Met [2008-9]
- Marine Corps – Barstow, CA 1.5-MW Turbine [2008]
- Navy – San Nicholas Is, CA 50-m Met [2008-9]
- DOE – Sandia Nat Lab, NM 30-m Met [2008-9] 50-m Met [2009-10]
- Navy – TBD, Hawaii 50-m Met [2009-10]
- DOD/DOE – Hawaii Two 50-m Mets [2009-10] 50-kW Turbine [2010]
- Navy – Yokusuka, Japan 60-m Met [2009-10]
- Navy – Okinawa, Japan 60-m Met [2009-10]
- Navy – Guam 2 50-m Mets [2008-9]
- Army – Fort Bliss, NM 2 50-m Mets [2007-8]
- GSA – McAllen, TX 50-m Met [2008-9]
- GSA – Donna, TX 50-m Met [2008-9]
- Army – Ft Carson, CO 50-m Met & SODAR [2007-9]
- Air Force – Schriever AFB, CO 30-m Met [2007-8]
- NREL – Golden, CO 2.2-MW Turbine [2009] 1.5-MW Turbine [2009]
- NASA – Wallops Island, VA Met study complete [2006-8] 1.5-MW Turbine RFP [2010]
- USCG – Cape May NJ 100-m Met [2007-9] Turbine RFP [2010]
- Army Natl Guard – Sea Girt, NJ SODAR & 30-m Met [2008-9] Turbine RFP [2010]
- Army Natl Guard – Cape Cod, MA 2 600-kW Turbines [2009-10]
- Natl Park Service – Truro, MA 50-m Met complete [2006-7] Turbine RFP [2009-10]
- AFCEE – Cape Cod, MA Wind study complete [2007] 2.5-MW Turbine [2009]
- GSA – Massena, NY 50-m Met [2009-10]
- GSA – Alexandria Bay, NY 50-m Met [2009-10]

WINDPOWER 2009 | Chicago, IL | May 4-7, 2009 | NREL/PO-500-45410

www.windpoweringamerica.gov

Social Acceptance of Wind Power in the United States: Evaluating Stakeholder Perspectives by Suzanne Tegen and Eric Lantz (www.nrel.gov/docs/fy09osti/45554.pdf)

National Renewable Energy Laboratory

SOCIAL ACCEPTANCE OF WIND POWER IN THE UNITED STATES: EVALUATING STAKEHOLDER PERSPECTIVES

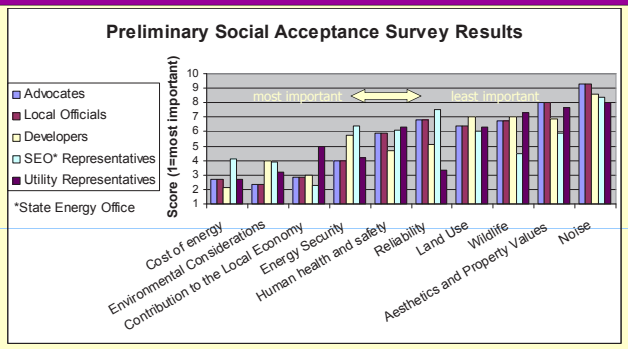
Suzanne Tegen, NREL · Eric Lantz, NREL

As the wind industry strives to achieve 20% wind energy by 2030, maintaining high levels of social acceptance for wind energy will become increasingly important. Wind Powering America is currently researching stakeholder perspectives in the U.S. market and reviewing findings from wind energy projects around the world to better understand social acceptance barriers. Results from European studies show that acceptance varies widely depending on local community values. A preliminary survey shows similar results in the United States. Further research will be conducted to refine our understanding of key social acceptance barriers and evaluate the best ways to mitigate negative perspectives on wind power.

WPA conducted a preliminary survey to assess stakeholder priorities on the following social acceptance issues:

- Aesthetics and property values
- Contribution to local economy
- Cost of energy
- Environmental considerations
- Energy security
- Human health and safety
- Land use
- Noise
- Reliability
- Wildlife.

Preliminary Social Acceptance Survey Results



Community Perspectives Vary Depending on Stakeholder Priorities

Support for offshore wind:
- 78% of Delaware residents
- 25% of Cape Cod residents.

Justifications:
Delaware: Electricity rates, climate change, and air quality outweigh aesthetics.
Cape Cod: Marine life, aesthetics, and recreational use are more important than electricity rates and energy independence.

Attachment to place is important in both contexts.

Cape Cod, Massachusetts
(Map from the Energy Information Administration)

Hull, Massachusetts

Survey results from Firestone, J.; Kempton, W.; & Krueger, A. (2009). Public Acceptance of Offshore Wind Power Projects in the USA. *Wind Energy* , 12:183-202.

Preliminary Survey Results: Stakeholder Rankings

As stated in reviewed literature, perspectives vary across stakeholder groups. Below are individual rankings from five stakeholder groups (also shown in bar graph above). Scores are averages from individual rankings in each category. This survey is a preliminary exercise.

"Contribution to the local economy" and "Environmental" both ranked in the top three for each group of stakeholders. "Noise" ranked in the bottom two for all but one stakeholder group, and "Land use" was in the bottom three for all but one stakeholder group.

Advocates	Local Officials	Developers	State Energy Office Reps	Utility Reps
1. Environmental	1. Contribution to local economy	1. Cost of energy	1. Reliability	1. Human health and safety
2. Cost of energy	2. Environmental	2. Local economic contribution	2. Local economic contribution	2. Environmental
3. Local economic contribution	2. Energy security	3. Environmental	3. Environmental	3. Local economic contribution
4. Energy security	4. Human health and safety	4. Human health and safety	4. Human health and safety	4. Reliability
5. Human health and safety	5. Reliability	5. Reliability	5. Wildlife	5. Noise
6. Land use	6. Aesthetics and property value	6. Energy security	6. Aesthetics and property value	6. Cost of energy
7. Wildlife	7. Wildlife	7. Aesthetics and property value	7. Energy security	6. Aesthetics and property value
8. Reliability	8. Land use	8. Wildlife	8. Cost of energy	8. Energy security
9. Aesthetics and property value	9. Noise	9. Land use	9. Noise	9. Land use
10. Noise	10. Cost of energy	10. Noise	10. Land use	10. Wildlife

Negative Media Headlines Focus on Wildlife and Noise

Los Angeles Times
Wind turbines generate a health hazard for birds
May 17, 1992

...apped after noise nuisance fears
Western Mail Wales News walesonline.co.uk

September 23, 2006
Why wind generates only bluster
By ANGELA JAMESON, The TIMES ONLINE, UK

USA TODAY
Wind turbines taking toll on birds of prey
By John Ritter, ALTAMONT PASS, Calif. — The big turbines that stretch for miles along these rolling, grassy hills have churned out clean, renewable electricity for two decades in one of the nation's first big wind-power projects. 1/4/05

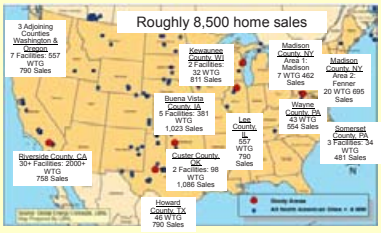
Celebrities protest vast wind farm proposed off Mass. coast
BOSTON (AP) — The rich and famous have long flocked to the beaches of Cape Cod and the island seclusion of Martha's Vineyard and Nantucket — a land of sailboats and quaint vacation homes.
USA Today Aug 11, 2003

Lessons Learned from Current Literature Review

Mitigating social acceptance barriers: advice from Paul Gipe and Michael Vickerman
- Provide aesthetic uniformity
- Keep turbines spinning
- Bury power lines when possible
- Consider "good neighbor" payments
- Harmonize structures involved in project
- Control and minimize land disruption
- Avoid advertising
- Do not attempt to camouflage
- Provide public access to projects.

Gipe, P. (2002). Design as if People Matter: Aesthetic Guidelines for a Wind Power Future. In M. Pasqualetti, P. Gipe, & R. Righter, *Wind Energy in View: Energy Landscapes in a Crowded World* (pp. 173-210). San Diego: Academic Press.
Vickerman, M. (2009). *Tiptoe Through the Minefields: Permitting Wind Projects in Wisconsin*. www.RENEWIsconsin.org.

Property values: Do Wind Farms Impact U.S. Property Values? Ongoing research by Ben Hoen (LBNL) suggests they do not.



Further Research: Improving Understanding of Social Acceptance

Stakeholder and Public Perceptions
- Create a database of existing surveys
- Implement additional survey work to fill knowledge gaps.

Planning for Deployment
- Evaluate the role of state and local planning in facilitating new development
- Support proactive planning processes through State Wind Working Groups.

Distributional Justice
- Assess current developer strategies for facilitating social acceptance
- Evaluate the distribution of benefits from wind energy projects and how local ownership or community payments can reduce local opposition to projects.

WINDPOWER 2009 | Chicago, IL | May 4-8, 2009 | NREL/PO-500-45554

www.windpoweringamerica.gov

Technology, Performance, and Market of Wind-Diesel Applications for Remote and Island Communities by Ian Baring-Gould and Martina Dabo
(www.nrel.gov/docs/fy09osti/45553.pdf)

National Renewable Energy Laboratory

U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

WIND POWERING AMERICA

TECHNOLOGY, PERFORMANCE, AND MARKET OF WIND-DIESEL APPLICATIONS FOR REMOTE AND ISLAND COMMUNITIES

E.I. Baring-Gould • National Renewable Energy Laboratory • Golden, Colorado
M. Dabo • TDX Power (Formerly with Alaska Energy Authority) • Anchorage, Alaska

The market for wind-diesel power systems in Alaska and other areas has proven that the integration of wind turbines with conventional isolated generation is a commercial reality. During the past few years, the use of wind energy to reduce diesel fuel consumption has increased, providing economic, environmental, social, and security benefits to communities' energy supply.

NW100 turbines over bulk fuel tanks in Kasigluk, Alaska.

MEDA AE59, 800-kW turbines in San Cristobal, Galapagos.

Markets

Rapidly expanding market for wind-diesel technologies:

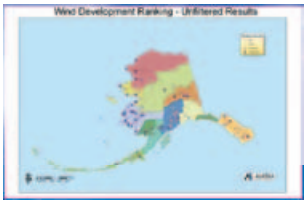
- 11 projects operating or under construction in Alaska; an additional 14 projects are funded
- Operating projects in almost every region of the world
- Expanded interest in Canada, Caribbean and Pacific Islands, and Antarctica.

Alaska

- 116 communities have a strong wind potential
- New State Energy Plan released in January 2009 shows strong wind potential in many communities (http://www.aidea.org/aea/)
- Rural communities have a potential of 90 MW to 240 MW of installed capacity
- $100 M USD renewable energy fund helps to fund remote wind projects.

Canada

- 40-190 MW potential in large communities and mines with loads above 10 MW, with a potential to save between loads 25 mil – 120 mil l of diesel savings/yr.
- 30-130 MW potential MW in smaller communities with loads less then 10 MW, with a potential to save between loads 16 mil – 77 mil l of diesel savings/yr.



Communities where wind could play a significant role in reducing power costs.

Project Examples

Kotzebue, Alaska Wind Farm consisting of 15 AOC 15/50 or Entegrity EW50 (50 kW); one Vestas V17 (65 kW); and one Northern Power Systems Northwind 100/19 (100-kW).

Kotzebue Alaska

Large coastal hub community in Northwestern Alaska with a population of ~3,100

- 2-MW peak load with 700-kW minimum load and 915-kW of installed wind
- Average penetration of ~5% with wind generating 1,064,242 kWh in 2007
- Diesel fuel saving of more than 71,500 gal (270,600 l) in 2007
- Good turbine availability (92.8% 1/02 to 6/04) due to strong technical support.

Toksook Bay, Alaska

Power system that supplies the ~800 people of the communities of Toksook Bay and Nightmute in coastal Southwest Alaska

- Average load just under 370 kW (both Toksook and Nightmute)
- Three NW100-kW turbines and resistive community heating loads
- Installed in the fall and winter of 2006
- 24.2% average wind penetration with much higher instantaneous penetration
- Almost 700 MWh generated by wind last year, saving almost 46,000 gal (174,239 l) of fuel
- First-year turbine availability of 92.4% - currently under warrantee
- Average net capacity factor of 26.0% from August 2007 to July 2008.

Three Northern Power Systems Northwind 100/19 (100-kW) on special permafrost foundations.

Other Documented Wind-Diesel Power Systems

Medium Penetration

- San Clemente Island, USA
- Kasigluk, USA
- Denham, Australia
- Flores Island, Azores, Portugal
- San Cristobal, Galapagos, Ecuador.

High Penetration

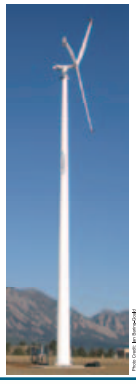
- Wales, USA
- St. Paul, USA
- Coral Bay, Australia
- Utsira, Norway
- Mawson Station, Antarctica (Australia).

Technology Advances

Advances that Can Improve the Application of Remote Systems

- Advanced Power Control
- Secondary dispatchable loads
  - Electric or hybrid electric vehicles
  - Electric heating through thermal loads
  - Water desalination
- Medium-scale turbines for remote applications
- Advances in software models
  - Expanded modeling capabilities in resource assessment, performance, control, and electrical response have improved the ability to understand wind-diesel systems
- New ownership models including power purchase agreements
- Advances in diesel technology, low load, and fuel injected.

Electric Utility ATV at Summit Station, Greenland.



Entegrity EW50 (50 kW) on tubular tower.

Industry Challenges

Technical

- Lack of dispatchable load and controllers to allow higher-penetration systems
- Lack of guidelines and standards
- Lack of an established technology track record
- High and undocumented installation and operation expenses

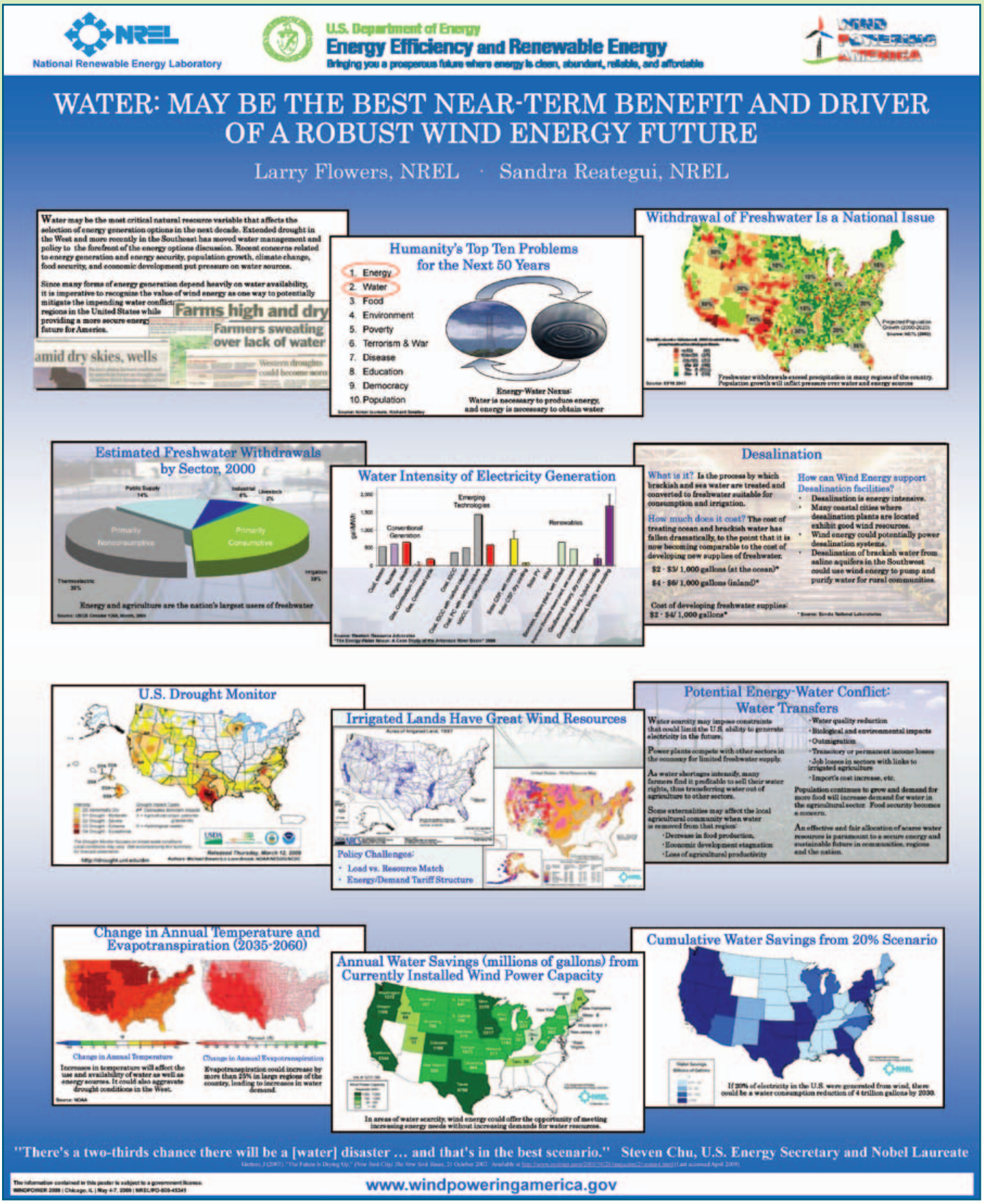
Institutional

- Poor understanding of the technology by decision makers
- Lack of trained personnel and the ability to keep trained personnel in communities
- Vested interests in maintaining the existing infrastructure and systems
- Environmental, siting, or other development concerns.

Policy

- High capital cost and general discounting of sustainability
- Perceived risk and associated higher financial costs
- Subsidized diesel fuel markets
- Lack of consideration of environmental impacts of diesel power generation
- Lack of funding to support the development of diesel alternative systems
- Complicated and multi-jurisdictional permitting processes
- Lack of regional implementation approaches.

Water: Maybe the Best Near-Term Benefit and Driver of a Robust Wind Energy Future by Larry Flowers and Sandra Reategui (www.nrel.gov/docs/fy09osti/45341.pdf)



Wind for Schools: Developing Educational Programs to Train the Next Generation of Wind Energy Experts by Ian Baring-Gould, Marguerite Kelly, Larry Flowers, and Jonathan Miles
(www.nrel.gov/docs/fy09osti/45472.pdf)

WIND FOR SCHOOLS: DEVELOPING EDUCATIONAL PROGRAMS TO TRAIN THE NEXT GENERATION OF WIND ENERGY EXPERTS

I. Baring-Gould, L. Flowers, M. Kelly, National Renewable Energy Laboratory, Golden, CO
J. Miles, U.S. Department of Energy, Washington, D.C.

Introduction

Wind turbine at Sanborn Central School in Forestburg, South Dakota.
Photo credit: East River Electric Power Cooperative

As the world moves toward a vision of expanded wind energy, the industry is faced with the challenges of obtaining a skilled workforce and addressing local wind development concerns. Wind Powering America's Wind for Schools Program works to address these issues. The program installs small wind turbines at community "host" schools while developing wind application centers at higher education institutions. Teacher training with interactive and interschool curricula is implemented at each host school, while students at the universities assist in implementing the host school systems while participating in other wind course work.

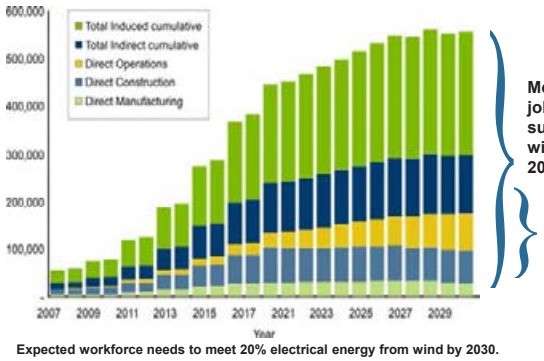
Objectives

One requirement for any expanding industry is the availability of talented and trained workers. Additionally, as wind energy continues to expand, the best way to overcome local concerns and combat misinformation is to educate the public about the real issues and benefits of the expanded use of wind energy.

Project Goals

- Engage rural America in the concept that wind offers an alternative energy and economic future for rural America
- Engage rural school teachers and students in energy education, specifically wind
- Equip college juniors and seniors with an education in wind energy applications to provide the growing U.S. wind industry with interested and trained engineers.

Wind for Schools is an activity focused on expanding the U.S. wind energy industry with the workforce that will be needed to guarantee the future development of wind technology in the United States.



Expected workforce needs to meet 20% electrical energy from wind by 2030.

Methods

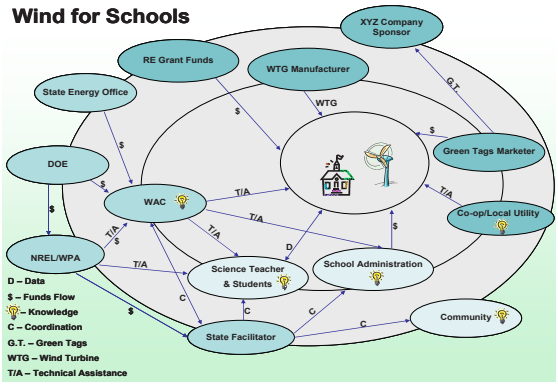
The Wind for Schools Program is one element of a larger activity to support expanded workforce development needs for the U.S. wind industry.

General Program Approach

- Build in-state capacity to provide technical assistance for community projects
- Work with state universities to develop college-level wind energy programs, incorporating wind curricula and small turbine installations at schools
- Work with the American Wind Energy Association and The NEED Project on K-12 curriculum to incorporate wind energy education into the classroom
- Use a low-cost replicable system for installation at host K-12 schools
- Work collaboratively with the community and local utility to implement a sustainable school project
- Ensure (to the extent possible) that all program elements can be implemented outside of the DOE Program
- Provide Laboratory-based technical assistance as needed to assist in implementing curricula and wind turbines
- Provide a means to implement programs if independent funding can be obtained through an auxiliary Wind for Schools Program.

Wind for Schools Project Team

State Facilitator: This individual or organization assists the program in developing the Wind for Schools activity within each state. Their primary responsibility is to identify candidate K-12 schools and support the project's development by working with the community, teachers, and school administration.
Wind Application Center (WAC): Center formed at a university in each state to train engineering students in wind technology deployment and analysis. WAC students gain valuable experience by providing technical assistance to school installations in addition to taking classes in wind energy.
Host school, science teacher, school administration, and community: A Wind for Schools host school installs a small wind turbine and implements a wind-energy-focused educational curricula that includes its turbine and turbines from other schools. The host school provides land for the project, interconnection, facilities, and limited financial support and agrees to make data from the turbine available.
WPA/NREL/DOE: Provides technical and financial assistance to the WAC and facilitator over the first few years of the project in each state to help set up the activity. Provides wind measurement equipment to assess potential school sites and assists in the development of curricula at both the university and K-12 level.
Community: The community (including the local power company and business groups) will assist in project development, funding, and implementation.



Schematic of the Wind for Schools Program showing key linkages.

Results

Wind for Schools system installed at Greenbush High School in Kansas. Photo credit: Ruth Douglas Miller

Initial Project Results

- Active programs in six states
- Three additional states expected to be added in 2009
- Turbines installed in more than 15 schools with 12 more expected by summer's end
- Teacher training programs to be implemented in each state; one completed
- Several Wind Applications Center graduates already working in the wind industry
- Strong interest in many other states.

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www.windpoweringamerica.gov

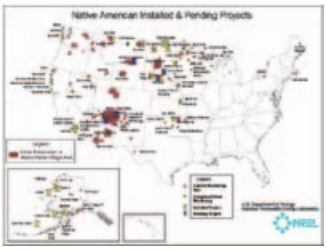
Wind Power Across Native America: Opportunities, Challenges, and Status by Antonio Jimenez, Robert Gough, Larry Flowers, and Roger Taylor
(www.nrel.gov/docs/fy09osti/45411.pdf)

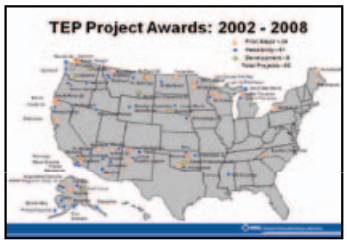
National Renewable Energy Laboratory

WIND POWER ACROSS NATIVE AMERICA: OPPORTUNITIES, CHALLENGES, AND STATUS

A. Jimenez, NREL R. Gough, Intertribal COUP
L. Flowers, NREL R. Taylor, NREL

Existing and Pending Native American Wind Projects: 50 kW and Larger (March 2009)





In-Place Projects

1 - TDX Power, Inc. (St. Paul Island, AK)
- 1x 225-kW turbine
- High-penetration wind-diesel system for TDX industrial area
- Installed 1999
- Financing: Commercial financing

2 - Alaska Village Electric Cooperative (AVEC) (Wales, AK)
- 2x 66-kW turbines
- High-penetration wind-diesel system
- Installed 2000

3 - Alaska Village Electric Cooperative (AVEC) (Selawik, AK)
- 2x 66-kW turbines
- High-penetration wind-diesel system
- Installed 2000

4 - Alaska Village Electric Cooperative (AVEC) (Toksook Bay, AK)
- 4x 100-kW turbines
- High-penetration wind-diesel system
- Installed 2006

5 - Alaska Village Electric Cooperative (AVEC) (Kasigluk, AK)
- 3x 100-kW turbines
- High-penetration wind-diesel system
- Installed June 2006

6 - Kotzebue Electric Association (KEA) (Kotzebue, AK)
- 10 x 66-kW turbines
- 1x 65-kW turbine
- 1x 100-kW turbine
- Initial installation: 1997, subsequently expanded
- Low-penetration wind-diesel system

7 - Assiniboine-Sioux Tribes (Fort Peck, MT)
- 2x 50-kW turbines
- Energy will be used within the reservation
- Installed July 2006
- Financing: TEP grant

8 - Turtle Mountain Chippewa (Belcourt, ND)
- 660-kW Vestas V47
- Installed in 2008 at Turtle Mountain Community College
- DOE TEP grant

9 - Oglala Sioux (Pine Ridge, SD)
- 65-kW NordTank
- Installed in 2008
- Honor the Earth, Intertribal COUP, *Native*Energy, and private donors, DOE WPA Anemometer
- DOI /BIA Economic Development Turbine & Installation Training
- Supplies electricity to KILI radio station

10 – Sisseton-Wahpeton Community College (Sisseton, ND)
- 2x 65-kW - Nortank
- Installed in 2008
- USDA, U.S. Dept. of Education, Sisseton-Wahpeton Tribe

11 - Spirit Lake Sioux (Fort Totten, ND)
- 1x 100-kW turbine
- Meets part of casino load
- Installed 1996
- Financing: TEP grant

12 - Turtle Mountain Band of Chippewa (Belcourt, ND)
- 1x 100-kW turbine
- Meets part of wastewater treatment plant load
- Installed 1996
- Financing: TEP grant

13 - Rosebud Sioux (Rosebud Reservation, SD)
- 1x 750-kW turbine
- Energy sold to Basin Electric and Ellsworth AFB
- Green tags sold to *Native*Energy and to Ellsworth AFB through WAPA
- Installed: 2003
- Financing: TEP grant, RUS loan

14 - Blackfeet (Browning, MT)
- 1x 100-kW turbine
- Energy sold to local utility
- Installed 1996
- Development supported by TEP
- Financing: TEP grant

15 –Campo Band of Kumeyaay (Campo Reservation, CA)
- 50 MW
- Installed 2005
- Privately owned project: leasing land from the Tribe

16 - Three Affiliated Tribes (Fort Berthold, ND)
- 1x 66-kW turbine
- Energy sold to local utility
- Installed 2005
- Financing: TEP grant

Pending Projects

17 - Northern Cheyenne (Lame Deer, MT)
- 30 MW
- Development (pre-construction) work financed with TEP grant
- Tribe will retain an equity interest

18 - Rosebud Sioux (St. Francis, SD)
- 30 to 60 MW
- Development (pre-construction) work financed with TEP grant

19 – Lower Brule (SD)
- 225-MW project in development stage

20 - Navajo Nation (AZ, NM, UT)
- 500-MW wind farm in development
- Gray Mountain , AZ

21 – Hopi (AZ)
- 15 MW
- Privately owned project: leasing land from the Tribe
- Hopi planning to follow up with a wind project in which the tribe will retain an equity interest

Business Models

- Tribally owned: e.g., TDX Power, Blackfeet, Rosebud, others
- Joint venture: No current examples. Tribes evaluating lessons learned from community wind and tribal casino experiences
- Land lease to third-party owner: e.g., Campo Kumeyaay Nation.

Projects on Tribal Land Are *Different*

- Inability to directly monetize Production Tax Credit (PTC) and accelerated depreciation (affects projects with tribal equity interest)
- Tribal tax advantages: Not as valuable as the PTC. Projects with non-tribal partners may lose these tax advantages
- More stringent environmental regulations (federal NEPA)
- Agreements require multiple levels of review and approvals: Tribal, BIA, FWS, EPA, THPO/SHPO
- Since 1887, land status varies within an Indian reservation (checker-boarding): Trust, Allotted, Fee, Tribal, Individual Indian, Extended Families, and Non-Indians. Needed permissions and tax status vary depending on ownership status
- Tribal sovereignty/Tribal policies/Native American law: Applicable laws and jurisdictions vary with regard to projects and contracts
- Optimal business structure with Tribal equity interest has not emerged
- Clean Renewable Energy Bonds (CREBs) not expressly available to Tribes
- Tribes often do not control significant tribal loads such as casinos.

Campo Kumeyaay Nation Reservation, California. Photo credit: Robert Gough

Tribal Wind Opportunities and Issues

- Abundant wind resources, especially throughout the West
- Transmission access to Federal and non-Federal grids
- Renewable energy for climate change mitigation wedge
- Renewables and energy efficiency in Tribal "Green Collar" economies
- Environmental justice regarding past Federal policies
- Federal outreach programs (DOE TEP, WPA, DOI/BIA MAP, USDA 9006)
- Federal green energy preference under Energy Policy Act of 2005
- Tribal wind-Federal hydro integration study under Section 2606
- Intertribal ownership interest in Native Energy, a green tag broker (supporting Tribal wind projects by purchasing green tags at beginning of project)
- Tribal Energy Resource Agreements (TERA): Tribes can assume Federal permitting responsibilities for renewable and conventional energy projects.

KILI turbine at Pine Ridge Reservation, South Dakota. Photo credit: Robert Gough

NorthWind 100 turbine in Toksook Bay, Alaska. Photo credit: Northern Power Systems

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www.windpoweringamerica.gov Tribal Energy Program: www.eere.energy.gov/tribalenergy/

Wind Powering America: Outreach in Priority States by Marguerite Kelly and Larry Flowers (www.nrel.gov/docs/fy09osti/45342.pdf)

National Renewable Energy Laboratory

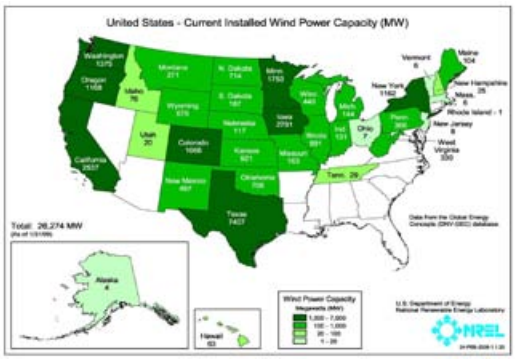
U.S. Department of Energy
Energy Efficiency and Renewable Energy
Bringing you a prosperous future where energy is clean, abundant, reliable, and affordable

WIND POWERING AMERICA – OUTREACH IN PRIORITY STATES

Marguerite Kelly, NREL Larry Flowers, NREL

The Priority State Challenge
In order for the U.S. to reach a goal of 20% of electrical power from wind energy by 2030, states need to implement wind energy to a much greater degree. Wind Powering America (WPA) works to assist priority states to address market barriers and move toward a more favorable wind energy future.

Priority State Outreach Goals
- Develop effective state human capacity through a state Wind Working Group (WWG)
- Implement 100 MW and beyond
- Foster enabling policy environment.



Regional Wind Energy Institutes (RWEIs)

Regions have common problems
- Little or no enabling policy
- Weak in-state advocacy
- Small or no commercial in-state wind projects
- Strong coal-based utility presence.

Many issues are regional or local
- Mid/Atlantic: NIMBY, land values, avian, ridge law, coal-based, offshore, policy, air quality
- Great Lakes: transmission, wind resource, comparative economics, water, coal
- Southwest: water, transmission, coal-based.

RWEI Sessions

Outreach teams in priority states achieve successes along the road to 20% Wind Energy by 2030

A helicopter delivers a met tower in Clark County, Nevada. Nevada has launched aggressive transmission planning initiatives.

Nebraska installed four Wind for Schools project systems and has 80 MW of wind under construction at Elkhorn Ridge.

South Dakota installed a Skystream system as part of the Wind for Schools project at Sanborn Central School in Forestburg and passed the 100-MW mark with the Tatanka Wind Farm.

Michigan received the Carpe Ventem Award for Harvest Wind, its first utility-scale wind farm. The Michigan WWG developed siting guidelines, and the Great Lakes Renewable Energy Association developed a county wind energy plan.

Massachusetts moved ahead with community wind under a newly expanded net metering policy.

Utah received the Carpe Ventem Award for the 18.9-MW Spanish Fork Wind Farm, the state's first utility-scale project, and set a goal of 20% renewables by 2025.

Wind development in Indiana accelerated following the release of the Tall Towers Wind Study, which measured the wind resource at 100 meters. Development is now underway in 15 counties.

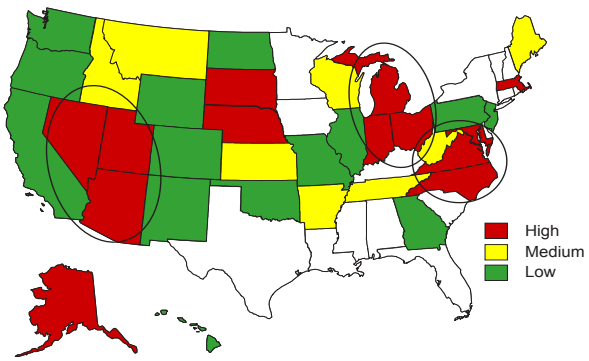
Ohio became the 25th state to enact an RPS, requiring 25% of its energy to come from advanced and renewable energy technologies. The Ohio WWG implemented an innovative business matchmaking program for wind energy component manufacturers and integrators.

Maryland created a small wind rebate program, an online wind calculator, and small wind model zoning ordinance.

The Arizona State Wind Outreach Team is providing assistance to the Navajo Nation to develop the Gray Mountain Project—one of the best wind resource sites in the state.

Alaska installed three new wind projects at Savoonga, Delta Junction, and Hooper Bay, and the Alaska WWG worked to streamline and facilitate wind project permitting.

Wind Powering America Priority States



JMU students installing anemometers at Quinby, Virginia. The Virginia WWG held workshops across the state, some in collaboration with the Appalachian Regional Commission, to educate local stakeholders.

North Carolina now has an RPS, a wind tax credit, and a green pricing program. Appalachian State continues to operate the Small Wind Research and Demonstration Facility at Beech Mountain.

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www.windpoweringamerica.gov

Wind Shear and Turbulence Profiles at Elevated Heights: Great Lakes and Midwest Sites by Dennis Elliott, Marc Schwartz, and George Scott
(www.nrel.gov/docs/fy09osti/45455.pdf)

Wind Shear and Turbulence Profiles at Elevated Heights: Great Lakes and Midwest Sites

Dennis Elliott, Marc Schwartz, George Scott

WINDPOWER 2009 • May 4-7, 2009 • Chicago, IL

National Renewable Energy Laboratory

Background

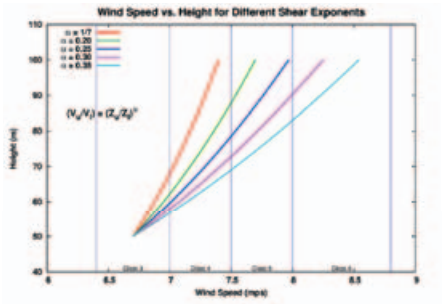
- Considerable uncertainty exists in extrapolating wind resource data available from typical measurement heights (50 m – 60 m) to turbine hub-heights of 80 m – 100+m
- Numerical model data and available wind maps for heights of 80 m – 100 m are largely unvalidated
- Tall-tower and remote sensing (sodar & lidar) wind data are needed to evaluate wind shear and turbulence profiles over turbine rotor heights that can extend well above 100 m

Objectives

- Analyze wind resource characteristics at elevated heights (50 m – 200+m) including shear and turbulence profiles for some areas of the Great Lakes and Midwest
- Show case studies and comparisons for
  - — Indiana towers located in areas of different surface roughness
  - — Iowa towers with heights up to 200+m and different surface roughness

Variation in Average Wind Shear

- Measurement data indicate that average wind shear exponents at elevated heights, such as 50 m – 100 m, can vary considerably among sites
- Considerable uncertainty can exist in estimates of wind speed at 80 m – 100 m heights from extrapolation of data at 50 m
- Even in areas of similar wind climate, such as northern Indiana, variations in surface roughness and terrain among sites can cause average shear exponents to vary from about 0.2 to 0.35 between 50 m – 100 m



Indiana Analysis

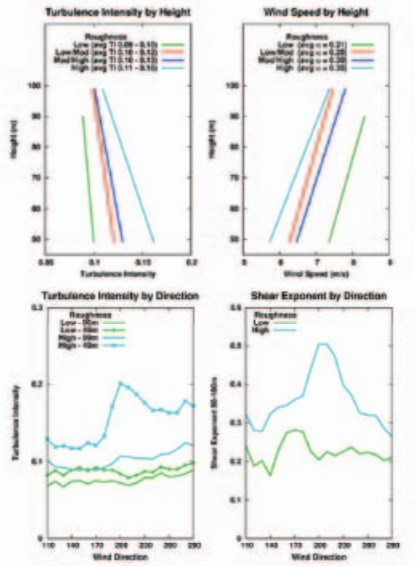
- Four tall towers located in different types of surface roughness
- Highest anemometers 90 m – 100 m
- Approximately one year of data collected from each site
- Wind shear and turbulence profiles evaluated by roughness type and height
- Wind speeds of at least 3 m/s required for the analysis
- Data excluded from directions with tower shadow effects

LaGrange, IN – High roughness, prevailing strong winds from S-SW

Geetinsville, IN – Moderate/high roughness, prevailing strong winds from S-SW

Carthage, IN – Low/moderate roughness, prevailing strong winds from S-SW

Goodland, IN – Low roughness, prevailing strong winds from S-SW

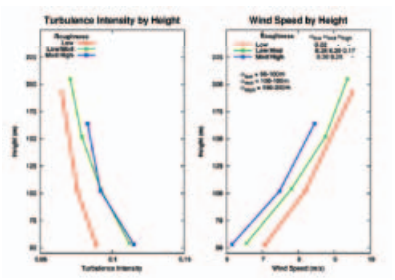


Indiana Analysis Results

- Notable variations in the annual wind shear exponents at elevated heights (50 m – 100 m) among the 4 sites
  - —Highest shear exponent (0.35) at site with highest surface roughness
  - —Lowest shear exponent (0.21) at site with lowest surface roughness
- Notable variations in the turbulence intensity (TI) profiles among the 4 sites
  - —Considerable TI difference at 50 m (16% vs 11%) between high and low roughness sites
  - —Significant TI difference at 100 m (11% vs 9%) between high and low roughness sites
- Analysis of shear and TI by wind direction highlight the effects of surface roughness, especially in the prevailing wind directions

Iowa Analysis

- Three very tall towers with measurements at several heights from about 50 m – 200 m
- Approximately one year of data collected at each site
- Terrain and surface roughness conditions varied among the sites
  - —Mason City, exposed hilltop site in rolling terrain, low roughness
  - —Homestead, exposed site in rolling terrain, low/moderate roughness
  - —Altoona, exposed site in rolling terrain, moderate/high roughness near town
- Wind shear and turbulence profiles evaluated by height, roughtness and time of day
- Wind speeds of at least 3 m/s required for the analysis
- Data excluded from directions with tower shadow effects
- Data excluded for heights with insufficient data
  - —Excluded 157 m at Mason City and 213 m at Altoona

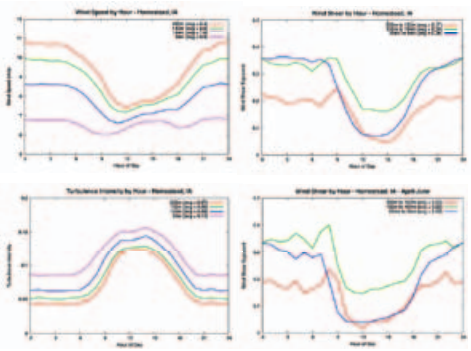


Iowa Analysis Results

- Profiles of average shear exponents differ among the 3 sites
  - —Low layer (50 m –100 m) shear exponents varied by site's surface roughness type
  - —Mid layer (100 m – 150 m) shear exponents can be similar or exceed those at heights of 50 m –100 m
  - —Upper layer (150 m – 200 m) shear exponent less than lower layers
- Average TI profiles differ among sites
  - —Lowest TI at low roughness site, at all heights
  - —TI decreases with height, but there is less decrease at the low roughness site than other sites

Iowa Iowa Analysis Results – Homestead Diurnal Variations

- Diurnal variations in average wind speed increase with height, from <1 m/s at 50 m to >3 m/s at 200 m
- Average shear exponent is highest in 100 m – 150 m layer, especially during April – June
- Nocturnal shear exponent decreases above 150 m
- Average turbulence intensity is very low at night, especially at heights above 100 m



Conclusions

- Analysis of tall-tower data proved beneficial to evaluate and better understand the variability of wind shear and turbulence profiles at elevated heights
- Surface roughness effects on wind shear and turbulence profiles can be significant at heights up to 100 m
- Wind shear exponents at heights of 100 m –150 m can exceed those at heights of 50 m –100 m
- Large differences in shear exponents at elevated heights can exist among sites, even in local areas of similar wind climate

Recommendations

- Measurement data at elevated heights are needed to validate model-derived wind resource estimates and shear extrapolations
- Use of tall towers and remote sensing equipment (sodar and lidar) provide opportunities to evaluate wind resource characteristics at elevated heights

Wind Powering America Web Site

NREL recently published *EERE Web Site Year-End Report FY08*, which compiles EERE Web site statistics and identifies content that receives the most visitors. Statistics for the Wind Powering America Web site are compelling: The WPA State and U.S. Wind Resource Maps page ranked second only to the EERE home page in number of visits, and four other WPA pages ranked in the Top 20.

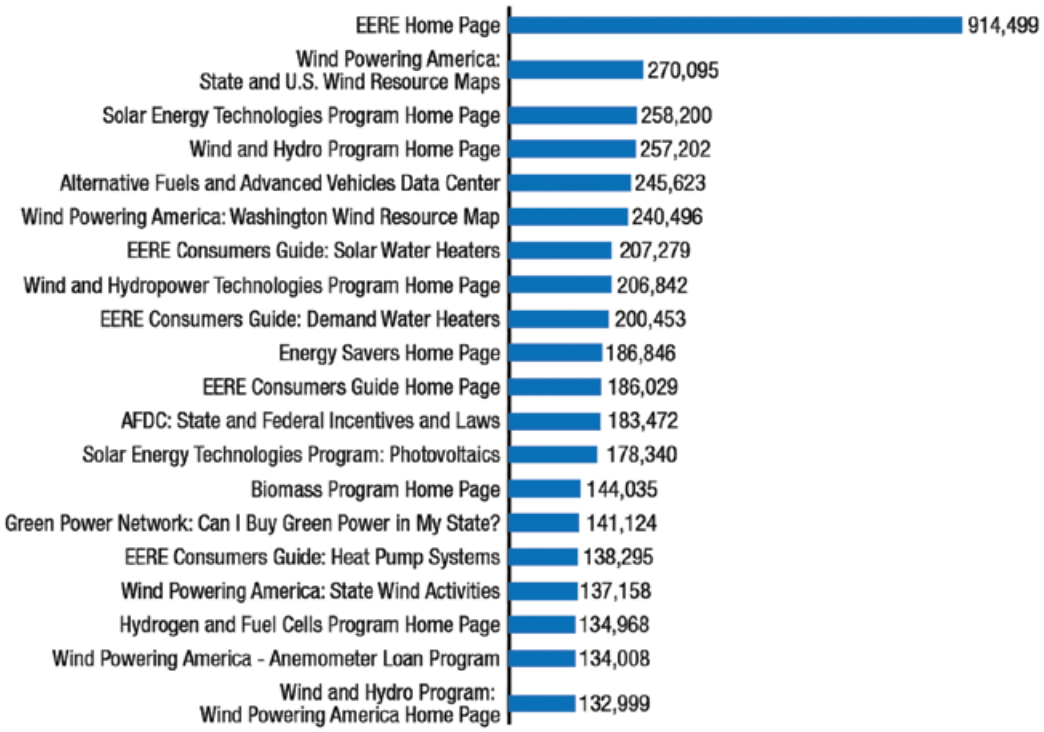
The Wind and Hydropower Technologies site as a whole (which includes WPA pages) ranked third for the total number of visitors among Top 20 EERE Web sites. (The complete report is available at http://www1.eere.energy.gov/communication-standards/pdfs/eere_2008_year_web_report.pdf)

WPA Webmaster Julie Jones incorporated the following updates to the WPA Web site (www.windpoweringamerica.gov) in FY09:

- Added the following audio interviews and transcripts produced by the National Association of Farm Broadcasters: John Hansen, Nebraska Farmers Union President; Dave Drescher, John Deere Wind Energy Vice President; Jimmy Bricker, Purdue Extension Director in Benson County, Indiana; Mark Willers, Minwind Energy CEO; Kansas Governor Mark Parkinson; Steve Wegman, South Dakota Wind Energy Association Executive Director; and Jay Haley, Partner with EAPC Architects Engineers (www.windpoweringamerica.gov/audio.asp)
- Added the following Webcast presentations, audio recordings, and transcripts: Community Acceptance of Wind, 2008 Wind Technologies Market Report, Municipal Utility Wind Project Case Studies, Electric Cooperative Wind Project Case Studies, and Wind Turbine Maintenance Programs (www.windpoweringamerica.gov/audio.asp)
- Updated the New England Wind Forum projects and state pages (www.windpoweringamerica.gov/newengland/)
- Added a clickable U.S. map showing states with Wind Working Groups and updated the information for each state (www.windpoweringamerica.gov/wind_working_groups.asp)
- Updated the information for each state anemometer loan program (www.windpoweringamerica.gov/anemometer_loans.asp)
- Added school wind projects and educational programs (www.windpoweringamerica.gov/schools.asp)

1.3 Top 20 Web Pages

While the top 20 Web site areas refer to groups of pages on the EERE Web site, the top 20 Web pages show the 20 most visited individual Web pages. As the entry point for most visitors to EERE, the EERE home page continues to be the most visited page in the EERE Web enterprise, as it has been in years before.



Wind and Hydropower Technologies Program: Wind Powering America - Microsoft Internet Explorer

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Wind & Hydropower Technologies Program

About the Program | Program Areas | Information Resources | Financial Opportunities | Technologies | Deployment | Home

Wind Powering America

About Wind Powering America

Program Areas
- States
- Regions
- Agricultural Community
- Native Americans
- Public Lands
- Public Power
- Schools
- Small Wind
- Economic Development
- Policy
- Siting

Awards

Perspectives

Resources & Tools
- Anemometer Loans
- Wind Working Groups
- Wind Maps
- Videos
- Audio
- Publications
- News
- Events
- Past Events

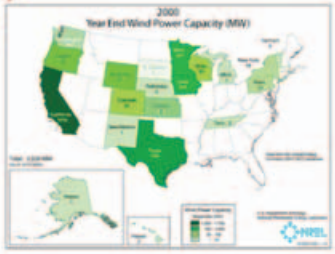
Quick Links to States
AK AL AR AZ CA CO CT DC DE FL GA HI IA ID IL IN KS KY LA MA MD ME MI MN MO MS MT NC ND NE NH NJ NM NV NY OH OK OR PA RI SC SD TN TX UT VA VT WA WI WV WY

Wind Powering America is a commitment to dramatically increase the use of wind energy in the United States. This initiative will establish new sources of income for American farmers, Native Americans, and other rural landowners, and meet the growing demand for clean sources of electricity.

Through Wind Powering America, the United States will achieve targeted regional economic development, enhance our power generation options, protect the local environment, and increase our energy and national security.

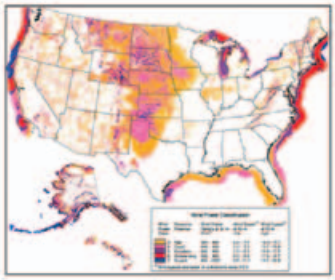
Installed Wind Capacity ›

After reaching 1,000 MW of wind energy in 1985, it took more than a decade for wind to reach the 2,000-MW mark in 1999. Since then, installed capacity has grown to 28,635 MW (as of April 30, 2009). Today, U.S. wind energy installations produce enough electricity on a typical day to power the equivalent of more than 6.5 million homes.



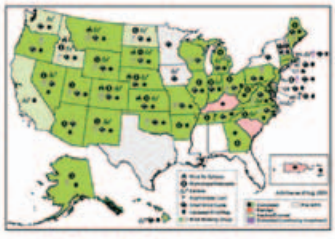
Wind Resource Maps ›

Wind resource maps help to evaluate whether an area of interest should be further explored.



State Activities ›

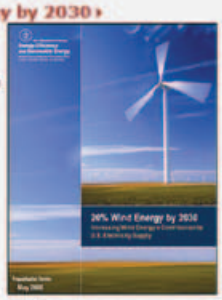
Wind Powering America concentrates its efforts in "stuck" markets, i.e., avoids investing resources in markets that are fully commercial and active; develops innovative pilot projects; replicates successes; and develops and disseminates targeted information, analyses, and tools — WPA augments the efforts of DOE's wind research program, the American Wind Energy Association (AWEA), and other wind related organizations to identify and address gaps in technical information and tools needed for its program areas. Examples include: development and access to simplified spreadsheet tools for initial analyses of wind project economics and economic development impacts, development and distribution of state specific wind maps and small wind application guidebooks, and publication of a brochure that focuses on wind opportunities, case studies, and economics for rural electric coops. Visit our state pages or use the navigation to the left to access each of these resources.



Printable Version

20% Wind Energy by 2030 ›

Wind power could provide 20% of U.S. electricity needs by 2030, according to a DOE report titled "20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply." The report identifies the steps that need to be addressed to reach the 20% goal, including reducing the cost of wind technologies, building new transmission infrastructure, and enhancing domestic manufacturing capability. For more information, see the 20% Wind Energy by 2030 Web site, and the full text of the report (PDF 4.0 MB). Download Adobe Reader.



Economics of Wind — Interview with Larry Flowers

Oklahoma Horizon — a TV show that cover stories across Oklahoma, the nation, and internationally showcases people and businesses that contribute to Oklahoma's economic success and quality of life — interviewed Wind Powering America's Larry Flowers about the economics of wind power. Click on the video to the right to watch the video or read the transcript.

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- Added a feature box about Small Wind Turbine Independent Testing to the Small Wind page. While Wind Powering America provides Small Wind Electric Systems Consumer's Guides to help homeowners, ranchers, and small businesses decide if wind energy will work for them, the Small Wind Turbine Independent Testing information will give consumers greater confidence that the systems they install will perform within specified wind regimes as advertised by the manufacturer (www.windpoweringamerica.gov/small_wind.asp)
- Posted a coordinated wind events calendar and added a clickable U.S. map showing states with wind-related events. Reviewers and contributors include the American Wind Energy Association, National Wind Coordinating Committee, Western Area Power Administration, Utility Wind Integration Group, state Wind Working Groups, and more. The calendar boasts more than 50 wind-related events that can also be downloaded via an Excel file for importing into an online calendar (www.windpoweringamerica.gov/calendar.asp).

NREL lead: Marguerite Kelly

NREL contractors: Julie Jones, Sustainable Energy Advantage LLC

Social Acceptance

- Eric Lantz and Larry Flowers represented WPA and the U.S. DOE in IEA Task 28: Social Acceptance of Wind Power. They presented to the working group on the status of the U.S. wind industry and current U.S.-based social acceptance research, and they ensured that the IEA task serves U.S. interests by providing input and direction on the task objectives as well as the scope and content of the forthcoming state-of-the-art report.

NREL lead: Larry Flowers

FY09 publication:

Social Acceptance of Wind Power in the United States: Stakeholder Perspectives by Suzanne Tegen and Eric Lantz (www.nrel.gov/docs/fy09osti/45554.pdf)

Partnerships

McGuire at the Farm Progress Show. Photo credit: Dan McGuire.

NREL's Becki Meadows speaks with attendees at the Farm Progress Show. Photo credit: Dan McGuire.

A Wisconsin farm couple featured on the cover of the July/August Wisconsin Agriculturalist visited the WPA booth at the Farm Progress Show to discuss their project: a Jacobs 20-kW wind turbine that helps provide electricity for a large grain-storage facility on the couple's farm. Photo credit: Dan McGuire.

American Corn Growers Foundation

One of the most successful and effective programs ever launched by the American Corn Growers Foundation (ACGF) is its Wealth from the Wind program, which focuses on wind energy outreach and education. ACGF members and American Corn Growers Association (ACGA) members in Nebraska, Illinois, South Dakota, and other states bring the wind energy message to rural America.

ACGF outreach coordinator Dan McGuire represented WPA at several events targeting rural stakeholders:

National Association of Farm Broadcasters Trade Talk (Kansas City, Missouri, November 2008)

McGuire represented WPA at the annual Trade Talk event in Kansas City, providing interviews to broadcasters from the following stations and networks about wind energy and its benefits for agricultural stakeholders:

- KPMX/KSIR from Sterling, Colorado (covering the South Platte River Valley, including Northeast Colorado, and reaching producers in Nebraska, Kansas, and Wyoming)
- KASM from Albany, Minnesota
- Mid-America Ag Network from Wichita, Kansas
- KMIT from Mitchell, South Dakota
- KCIM and KKRL from Carroll, Iowa
- USDA Rural Radio
- WJAG/KEXL from Norfolk, Nebraska
- Von Ketelsen, Farm Services Director, Fort Dodge, Iowa
- Brownfield Ag News for America Network
- COW 97.1 Country and the ZOO 105.5 FM, Onalaska, Wisconsin.

Farm Progress Show (Decatur, Illinois, August 2009)

NREL's Becki Meadows joined McGuire at the WPA exhibit. The Farm Progress Show attracts thousands of farmers, ranchers, and rural residents from Illinois, Ohio, Indiana, Michigan, Missouri, Nebraska, Iowa, and other states. Meadows and McGuire answered inquiries regarding small wind turbines, Section 9007 and REAP grants, and possible grant funding from federal stimulus funds.

Dakotafest (Mitchell, South Dakota, September 2009)

Nearly 35,000 people attended Dakotafest, which this year featured 540 exhibits and a renewable energy forum. McGuire staffed an exhibit and participated in a live radio program on WNAX with a focus on wind energy. Jarrod Johnson, Commissioner of South Dakota's Schools and

Public Lands, heard McGuire's interview regarding transmission and immediately drove 2 hours to the event in Mitchell to meet with McGuire and discuss ways to work together.

Husker Harvest Days (Grand Island, Nebraska, September 2009)

Wind energy was a recurring theme at this year's Husker Harvest Days show. Three wind turbines were installed on the show grounds, including a Skystream turbine on a 45-foot tower. Attendees visiting the WPA exhibit asked about leasing land for wind development and why Nebraska lags behind other states in wind energy development. McGuire conducted a 15-minute interview on wind energy with KRGI radio from Grand Island and also provided technical wind energy information to the editor of Nebraska Farmer. McGuire, who also serves as the Wind for Schools facilitator in Nebraska, met with school board members as well.

Dan McGuire staffs an exhibit at Dakotafest. Photo credit: Dan McGuire.

New England Wind Forum

WPA launched the New England Wind Forum (NEWF) in 2005 to provide a single comprehensive source of up-to-date, Web-based information on a broad array of wind energy issues pertaining to New England. WPA, Massachusetts Technology Collaborative's Renewable Energy Trust, the New Hampshire Office of Energy and Planning, the Maine State Energy Program, and the Connecticut Clean Energy Fund provide funding for NEWF. WPA will resume publishing the New England Wind Forum newsletter in 2010 after a funding interruption in 2009.

NREL contractor: Sustainable Energy Advantage LLC

A 100-kW Northwind 100 turbine installed at the Farm Progress show site generated a lot of interest and drew attendees to the WPA exhibit for more wind energy information. Photo credit: Dan McGuire.

Western Area Power Administration/Public Power Partnerships

Western Area Power Administration (Western) leads WPA's Public Power Partnership effort in coordination with the NREL WPA technical lead. The FY09 plan focused on activities with the nation's 3,000 electric cooperatives and public power utilities, including key partners American Public Power Association (APPA) and National Rural Electric Cooperative Association (NRECA). Wind technology deployment and technical assistance activities conducted in FY09 include:

Awards Program

- Western coordinated the 2008 Wind Cooperative of the Year Award for the U.S. DOE's Wind Technologies Program and NRECA. Representatives from Western, NRECA, DOE, Utility Wind Integration Group, and NREL selected Michigan's Wolverine Power Supply Cooperative to receive this year's award, which was presented to Wolverine representatives at the 2009 NRECA TechAdvantage Conference in New Orleans in February 2009. Wolverine demonstrated leadership by being the first utility in Michigan to commit to a

large-scale wind project. Wolverine worked with project developer and owner John Deere to address all transmission and interconnection issues and signed a power purchase agreement for the full output of the 49-MW project.

- Western coordinated the 2008 Wind Power Pioneer Award for the U.S. DOE's Wind Technologies Program and APPA. Representatives from DOE, NREL, the American Wind Energy Association (AWEA), APPA, and UWIG reviewed 16 nominations and selected Cowlitz County and Klickitat County Public Utility Districts for this year's award. At APPA's Annual Conference in Salt Lake City, Utah in June 2009, Cowlitz and Klickitat representatives received the award for the 205-MW White Creek Project in Washington state.

Utility Market Assessment Research

Western surveyed 2009 Webinar participants to identify opportunities for improvement and solicit suggestions for new Webinars. Findings include:

- The majority of participants are non-utility, for-profit personnel, but consumer-owned utility participation ranged from 11% to 26%.
- The majority of participants do not belong to the APPA, NRECA, UWIG, AWEA, or National Wind Coordinating Collaborative (NWCC).
- The majority of participants learned about the Webinars through e-mail correspondence.
- The primary area of interest for the majority of participants changes on a monthly basis and closely reflects the subject matter.
- The vast majority of participants (> 75%) agree or strongly agree that the Webinars address their information needs.
- The vast majority of participants (> 90%) agree or strongly agree that the speakers are experts in their respective fields.
- The vast majority of participants (> 80%) feel that the length of the Webinars (2 hours) is "just right."
- The vast majority of participants (> 90%) agree or strongly agree that the registration and connection process is easy.

APPA and Western initiated a telephone survey (still underway) with past recipients of anemometers borrowed by consumer-owned utilities and Tribal authorities through the Western/NREL anemometer loan partnership. Survey questions will attempt to identify successes and challenges with the loan program, follow-on activities by recipients to develop wind, and technical assistance that might move wind development forward.

Utility Partnership Activities

- Western and WPA developed a scholarship program in partnership with UWIG to encourage consumer-owned utility involvement in UWIG workshops and meetings. Thirty $500 scholarships were available to electric cooperatives and public power utilities to attend UWIG spring or fall technical workshops. Eight scholarships were provided in FY09.
- Western completed a $95,000 wind technology transfer grant with APPA that will enable APPA to continue to work with its 2,000 public power members on wind technology transfer and activities related to the 20% by 2030 scenario.
- Western completed a $90,000 wind technology transfer grant with NRECA that will enable NRECA to continue to work with its 1,000 electric cooperative members on wind technology transfer and activities related to the 20% by 2030 scenario.

Technical Assistance to Consumer-Owned Utilities

- Western assisted on three regional planning committees to ensure that wind topics are integrated into agendas: Acquisition and Integration of Wind Power for Northwest Public Power Utilities, Portland, Oregon (November 2008); Southwest Renewable Energy Conference, Flagstaff, Arizona (September 2009); Utility Energy Forum, North Lake Tahoe, California (May 2009).
- Western conducted its Fourth Annual Wind Interconnection Workshop at Western's Electric Power Training Center in Golden, Colorado (January 2009).
- Western coordinated 11 successful Webinars in FY09 in partnership with NREL, WPA, APPA, NRECA, AWEA, UWIG, NWCC, and the Northwest Public Power Association. Approximately 1,100 electric utilities and interested parties participated in the Webinar series.

Events

Western exhibited the WPA display at 17 regional and national consumer-owned utility and industry events, distributing several thousand DOE and wind technology transfer materials to approximately 3,570 utility representatives and interested parties.

January 2009

- NRECA New Technologies Conference (Tucson, Arizona)

February 2009

- National Rural Electric Cooperative Association Annual Meeting and Technology Conference (New Orleans, Louisiana)
- National Association of Regulatory Utility Commissioners 2009 Winter Meeting (Washington, DC)
- Energy and Environmental Utility Conference (Phoenix, Arizona)

March 2009

- American Public Power Association Engineering and Operations Conference (Austin, Texas)

April 2009

- NWPPA Engineering and Operations Conference (Spokane, Washington)
- 28th Annual Utility Energy Forum (Lake Tahoe, California)
- Sixth Annual North Carolina Sustainable Energy Conference (Raleigh, North Carolina)

May 2009

- NWPPA Annual Conference (Boise, Idaho)
- NRECA Connect Conference (Las Vegas, Nevada)

June 2009

- American Public Power Association Annual Meeting (Salt Lake City, Utah)
- Delta-Montrose Energy Association Energy Forum (Montrose, Colorado)

July 2009

- Illinois Wind Working Group Annual Conference (Bloomington, Illinois)
- APPA Economic Development Conference (San Francisco, California)

September 2009

- APPA Business and Finance Conference (Savannah, Georgia)
- NWPPA Innovative Technology Conference (Redmond, Oregon)
- Southwest Renewable Energy Conference (Flagstaff, Arizona).

Communications

Western's FY09 activities include:

- Coordinated with the APPA and NRECA to ensure that UWIG events are announced to their 3,000 member utilities, usually via list serves and through a special quarterly newsletter announcing wind activities to APPA and NRECA members
- Developed a distributed wind technology transfer poster that was presented at the 2009 NRECA Annual Conference in New Orleans in February 2009. Approximately 1,500 electric cooperative managers and directors viewed the poster
- Produced ten issues of the bi-weekly electronic Green Power and Market Research newsletter, which is distributed to approximately 1,500 electric cooperatives and public power utilities. See past newsletter issues at www.wapa.gov/es/nhnewsback.htm
- Completed the *Wind Handbook for Electric Cooperatives* and distributed approximately 700 copies to electric cooperative and public power utility officials
- Produced three public power wind case studies: *Delaware Ventures into 'Bluewater': Installation of the First Offshore Wind Farm in the United States, Examination of a Municipal Utility's Commitment to Wind Energy Generation: Princeton Municipal Light Department*, and *Wind Power in Nebraska: Addressing Historical Challenges in the Public Power Sector to Become a Leader in the 21st Century Wind Development*. Western has now published 15 case studies

- Reproduced nine AWEA publications for distribution at consumer-owned utility events
- Developed an article about the 2009 WINDPOWER Conference for consumer-owned utilities (see www.wapa.gov/es/pubs/esb/2009/jun/jun092.htm)
- Updated the Wind Workshop in a Box program, including new marketing materials to advertise the updated wind technology transfer product.

Anemometer Loan Program

Western continues to work with NREL on the 20-meter anemometer loan program, making 17 new loans in FY09.

Wind Presentations

Public power and electric cooperative wind presentations were delivered to the following audiences:

- Municipal Electric Power Association of Virginia Conference
- South Dakota Utility Conference
- Gathering of East River Electric Cooperative, City of Vermillion, and Clay County Commissioners
- APPA National Conference
- Municipal Agency of Nebraska and Nebraska Public Power District
- Municipal Electric Utilities of Wisconsin Annual Meeting
- Florida Municipal Electric Association and Florida Municipal Power Authority Annual Meeting
- 28th Annual Utility Energy Forum
- 2009 WINDPOWER Conference.

FY09 New Wind Energy Projects (Complete and Under Construction Only)

State	Project Name	MW	Status
Alaska	Pillar Mountain Wind Project	4.5	Under construction
Arizona	Dry Lake Wind Project I	63	Complete
California	Pine Tree Wind Project	120	Complete
	Shiloh II Wind Energy Project	150	Complete
	U.S. Marine Corp Logistics Base	1.5	Complete
	Windland	3	Complete
Colorado	Peetz Expansion/Northeastern Colorado Wind Energy Center (Siemens)	151.8	Complete
	Peetz Expansion/Northeastern Colorado Wind Energy Center (GE)	22.5	Complete
	NREL National Wind Technology Center	2.3	Complete
Idaho	Cassia Gulch Wind Farm	18.9	Complete
	Cassia Wind Farm	10.5	Complete
	Mountain Home Wind Farm (formerly Hot Springs & Bennett Creek Wind Farms)	42	Complete
Illinois	Top Crop Wind Farm Phase I	102	Complete
	Rail Splitter Wind Farm	100.5	Complete
	EcoGrove I	100.5	Complete
Indiana	Fowler Ridge Wind Farm (Clipper)	100	Complete
	Fowler Ridge Wind Farm (Vestas)	300.3	Complete
	Fowler Ridge Wind Farm Phase II	199.5	Complete
	Hoosier Wind Project	106	Complete
	Meadow Lake Wind Farm Phase I	200	Complete
	Whispering Willow Wind Farm	199.65	Complete
Iowa	Story County Wind Energy Center II	150	Complete
	Crane Creek Wind Farm	99	Complete
	Barton I	80	Complete
	Pioneer Prairie Wind Farm Phase II	102.3	Complete
	Crystal Lake II (Clipper)	190	Complete
	Gamesa I	4	Complete

State	Project Name	MW	Status
Kansas	Flat Ridge I Wind Farm	100	Complete
Maine	Kibby Mountain	66	Complete
	Beaver Ridge Wind Project	4.5	Complete
	Stetson Mountain	57	Complete
	Fox Island Wind	4.5	Complete
Massachusetts	Princeton Municipal Wind Project	3	Complete
	Deer Island	1.2	Complete
	Falmouth	1.65	Complete
	Massachusetts Military Reservations — Air Force	1.5	Complete
Michigan	Stoney Corners Wind Farm Phase I	14	Complete
Minnesota	Gamesa II	1.7	Complete
	Hilltop Power	2	Complete
	Willmar Turbines	4	Complete
	Moraine II Wind Project	49.5	Complete
Missouri	Farmers City Wind Farm	146	Complete
Montana	Glacier/McCormick Ranch Wind Farm Phase II	103.5	Complete
Nebraska	Elkhorn Ridge Wind Energy Project	81	Complete
New Mexico	High Lonesome	100	Complete
New York	High Sheldon Wind Farm	112.5	Complete
	Noble Altona Wind Park	97.5	Complete
	Noble Chateaugay Wind Park	106.5	Complete
	Noble Wethersfield Wind Park	126	Complete
	Noble Bellmont Wind Park	21	Complete
North Dakota	Rugby Wind Farm	149.1	Complete
	Luverne Wind Farm Phase I	49.5	Complete
	Ashtabula Wind Center Phase II	120	Complete
	Prairie Winds ND I	115.5	Complete
	Wilton Wind II	49.5	Complete
Oklahoma	Red Hills Wind Farm	123	Complete
	Blue Canyon V (Third Phase)	99	Complete

State	Project Name	MW	Status
Oregon	Willow Creek Wind Farm	72	Complete
	Biglow Canyon Phase II	149.5	Complete
	Hay Canyon	100.8	Complete
	Pebble Springs Wind Power Project	98.7	Complete
	Wheat Field/Winter Wheat Wind Farm	96.6	Complete
	Vansycle II Wind Farm	98.9	Complete
	Echo 8-9/Madison-Mader Wind Farm	20	Complete
Pennsylvania	Locust Ridge II Wind Farm	102	Complete
	Highland Wind Project/Krayn Wind Farm	62.5	Complete
	North Allegheny Wind Farm	70	Complete
Rhode Island	Town of Portsmouth	1.5	Complete
South Dakota	Wessington Springs Wind Project	51	Complete
	Buffalo Ridge Wind Farm	50.4	Complete
Texas	Peñascal Wind Farm	201.6	Complete
	Notrees Phase IA	90.75	Complete
	Notrees Phase IB	60	Complete
	Majestic Wind Farm	79.5	Complete
	Pyrong Wind Farm (Roscoe Wind Farm Phase III)	249	Complete
	Roscoe Wind Farm Phase IV	197	Complete
	Goat Mountain Wind Ranch Phase II	69.6	Complete
	EC&R Panther Creek III Wind Farm	200	Complete
	Great Plains Wind Park	114	Complete
	Sunray Wind Farm- Phase I	9	Complete
	Sunray Wind Farm- Phase II	40.5	Complete
	Papalote Creek Wind Farm	179.85	Complete
	JD Wind Phase 7	10	Complete
	JD Wind Phase 8	10	Complete
	JD Wind Phase II	10	Complete
	Panther Creek II Wind Farm	115.5	Complete
	Barton Chapel	120	Complete
	Langford Wind Farm	150	Complete
Utah	Milford Wind Corridor Project Phase I (Clipper)	145	Complete
	Milford Wind Corridor Project Phase I (GE Wind)	58.5	Complete

State	Project Name	MW	Status
Washington	Harvest Wind Wind Energy Project (White Creek III)	100	Complete
	Windy Point/Flats Phase I (REPower)	40	Complete
	Windy Point/Flats Phase I (Siemens)	96.6	Complete
	Wild Horse Wind Power Project Expansion	44	Complete
Wyoming	Glenrock III	39	Complete
	McFadden Ridge	28.5	Complete
	High Plains	99	Complete
	Rolling Hills Wind Farm	99	Complete
	Casper Wind Power Project	16.5	Complete
	Campbell Hill Wind Project	99	Complete
	Silver Sage Wind Power Project	42	Complete

Data compiled by DNV Global Energy Concepts Inc. Updated project information is also available on the American Wind Energy Association's Web site at www.awea.org/projects/.

2009 Wind Component Manufacturing Activities

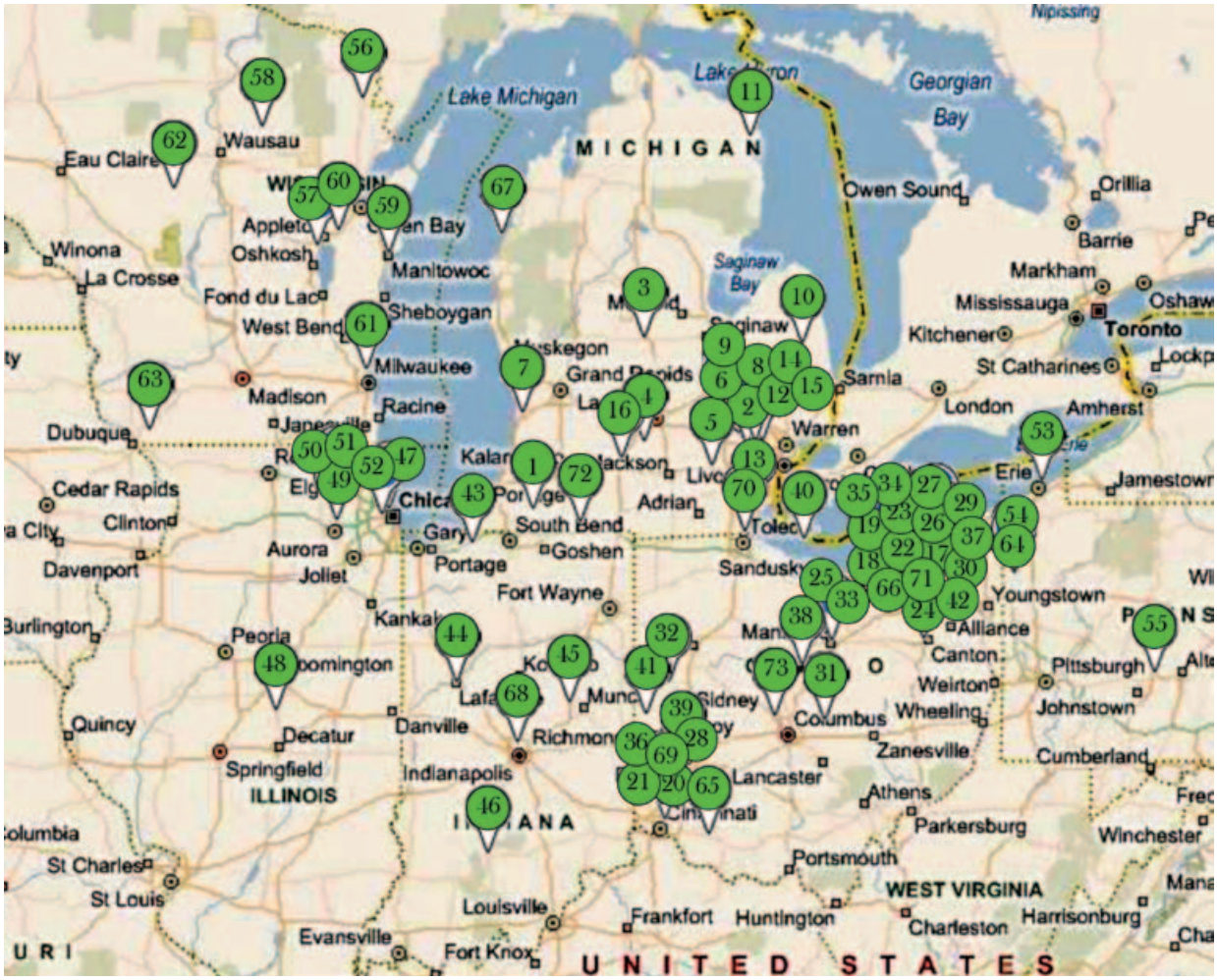
State	Company	Activity	Jobs	Source
Arizona	Southwest WindPower	reduction	14	http://azdailysun.com/articles/2009/07/01/news/20090701_front_199127.txt
Arkansas	LM Glasfiber	reduction	80	www.thecitywire.com/?q=node/4498
	LM Glasfiber	reduction	150	www.fox16.com/mostpopular/story/LM-Glasfiber-will-layoff-150/-RJw_qNcc0enW_4GI0cBgg.cspx
	Mitsubishi	announcement	400	www.rechargenews.com/energy/wind/article196149.ece
California	Continental Wind Power	announcement	300 - 500	http://pacbiztimes.com/index.php?option=com_content&task=view&id=943&Itemid=1
Colorado	Bach Composite Industry	announcement	100 - 150	www.colorado.gov/cs/Satellite/GovRitter/GOVR/1251566676696
	Creative Foam	announcement	50 - 150	AWEA, www.timescall.com/tcbusiness/business-story.asp?ID=14877
	Dragon Wind	online		AWEA
	Vestas	delay in job growth		www.denverpost.com/business/ci_13655311
Idaho	Nordic	opening		http://commerce.idaho.gov/news/2009/04/pocatello-wind-turbine-manufacturer-eager-to-get-started.aspx
	Nordic	expansion		www.americanchronicle.com/articles/view/108256
Indiana	Windstream	announcement	260	http://archives.chicagotribune.com/2009/nov/23/news/chi-ap-in-windenergyfacilit
Iowa	Acciona	reduction	58	www.westbranchtimes.com/article.php?id=4185
	Clipper	reduction	70	www.kcrg.com/news/local/37883834.html
	TPI	production cut	will prevent 80 temporary workers from becoming full-time employees	www.newtondailynews.com/articles/2009/07/15/r_gofiqvdrsdksrxn7c9mznq/index.xml
Kansas	Siemens	announcement	400	http://press.siemens.us/index.php?s=43&item=1078
Michigan	Carlton Creek Iron Works	closed	188	www.whitelakebeacon.com/news.php?story_id=18534
	Danotek	online		AWEA
	Great Lakes Towers	announcement	50 - 150	AWEA; www.metromodemedia.com/innovationnews/greatlakestowers0102.aspx
	Mariah Power	online		AWEA

State	Company	Activity	Jobs	Source
Minnesota	Moventas	delay		www.startribune.com/business/43639137.html?elr=KArksUUUU
	Suzlon	reduction	160	www.ksfy.com/news/local/47111817.html
Montana	Fuhrlander	delay due to focus on German facility construction	n/a	
Nebraska	Katana Summit	reduction	70	www.columbustelegram.com/articles/2009/08/05/news/local/doc4a79915589c4f527643197.txt
New Hampshire	Goss International	newly expanded into wind		www.reuters.com/article/pressRelease/idUS196187+29-Oct-2009+PRN20091029
North Carolina	PPG Industries	reduction	90 (75 layoffs, 15 early retirement)	www2.nccommerce.com/eclipsfiles/20533.pdf
North Dakota	DMI	reduction	100	www.agweek.com/articles/index.cfm?article_id=43189&property_id=5
	DMI	reduction	60	https://secure.forumcomm.com/?publisher_ID=40&article_id=114051
Ohio	LAH Development	announcement	100	www.areadevelopment.com/newsitems/5-26-2009/ohio-greenville-wind-turbine-factory.shtml
	SUREnergy	announcement	25	AWEA http://urban.csuohio.edu/news/economic_news/econ_news_08_18_09.html
Oklahoma	DMI	reduction	50	www.tulsaworld.com/business/article.aspx?subjectid=48&articleid=20090106_48_E1_DMIInd371700
	Trinity Structural Towers	closed	131	www.tulsaworld.com/news/article.aspx?articleID=20081119_49_ul322537
Pennsylvania	Gamesa (Ebensburgh)	reduction	141	www.altoonamirror.com/page/content.detail/id/524688.html?nav=742
	Gamesa (Fairless Hills)	job elimination due to facility limitations	184	http://philadelphia.bizjournals.com/philadelphia/stories/2009/01/05/daily46.html
South Dakota	MFG	reduction	30	
	MFG	rehire	30	
	Tower Tech	delay due to focusing on construction of Abilene facility	n/a	

State	Company	Activity	Jobs	Source
Texas	EMA Electromecanica	announcement	13	AWEA; www.windtoday.net/articles/Argentina_Based_EMA_Electromecanica_S_A__to_Locate_Manufacturing_Facility_in_Sweetwater__TX-76807.html
	Tower Tech	online	150	AWEA
	Tower Tech	reduction	25	www.reporternews.com/news/2009/jul/03/no-headline---towertech/
	Zarges Aluminum Systems	announcement	100	AWEA; www.mccallumsweeney.com/uploads/NEWS-133-09-Zarges%20News%20Texas%20Plant_02_04_09.pdf
Washington	Renewable Energy Composite Solutions	newly expanded into wind	200	www.allbusiness.com/company-activities-management/company-locations/13153480-1.html
	Strategic Composites	announcement	600	www.thenewstribune.com/news/northwest/story/761937.html
Wisconsin	Energy Composites Corporation	announcement	400	AWEA; www.areadevelopment.com/newsitems/4-2-2009/wisconsin-energy-composites-turbine-factory.shtml
	Wausaukee Composites	reduction	61	
	Wausaukee Composites	rehire	22	

Data compiled by Frank Oteri, NREL (frank.oteri@nrel.gov). Data may not be exhaustive.

Wind-Related Manufacturing in the Great Lakes Region



1. K & M Machine Fabricating Inc. - Cassopolis, MI (hubs and gearbox housings)
2. Great Lakes Gear Tech Inc. - Canton, MI (gears)
3. Merrill Fabrication - Alma, MI (bases and housings)
4. Dowding Industries - Eaton Rapids, MI (transmission housings, components)
5. Danotek Motion Technologies - Plymouth, MI (generators)
6. Creative Foam Corp. - Fenton, MI (composites)
7. Genzink Steel - Holland, MI (generator frames)
8. Citation Corp. – Novi, MI (gearbox covers and housings)
9. Three M Tool & Machine Inc. – Commerce, MI (gearbox housings, forward housings)
10. E-T-M Enterprises – Watertown, MI (fiberglass, blade components)
11. ATI Casting Service – Alpena, MI (castings, foundry)
12. Global Wind Systems – Novi, MI (turbines)
13. Great Lakes Towers – Monroe, MI (towers)
14. Prestolite Wire LLC – Southfield, MI (wire)
15. Akebono Corporation – Farmington Hills, MI (brakes)
16. Johnson Systems Inc. – Marshall, MI (towers)
17. Rotek Inc. – Aurora, OH (slew bearings)
18. Avon Bearings Corp. – Avon, OH (bearings)
19. Kalt Manufacturing – North Ridgeville, OH (large components)
20. Magna Machine Co. – Forest Park, OH (rotor hubs, support bases)
21. Cast-Fab Technologies Inc. – Cincinnati, OH (Ductile Iron Component Castings)
22. Cardinal Fastener & Specialty Co. – Bedford Heights, OH (bolts)
23. Federal Gear Corp. – Willoughby, OH (gears)
24. Canton Drop Forge – Canton, OH (gear blanks)
25. Michael Byrne Manufacturing Co. Inc. – Mansfield, OH (speed increasers)
26. Advanced Manufacturing Corp. – Cleveland, OH (gear boxes)
27. Dyson Corp. – Painesville, OH (fasteners)
28. Webcore Technology Inc. – Miami, OH (composites)
29. Horsburgh & Scott Co. – Cleveland, OH (gears)
30. Hamby Young – Aurora, OH (substations)
31. Owens Corning Composites – Granville, OH (composites)
32. Minster Machine Co. – Minster, OH (machine castings, components)
33. Hyundai Ideal Electric Co. – Mansfield, OH (electric motors, generators)
34. Eaton Corp. – Cleveland, OH (electrical)
35. Swiger Coil Systems LLC – Cleveland, OH (generator coils)
36. Connector Manufacturing Co. – Hamilton, OH (small components)
37. EGC Enterprises Inc. – Chardon, OH (bolts)
38. HPM America – Mount Gilead, OH (general mechanical manufacturer)
39. Tuf-Tug Products – Moraine, OH (fall protection safety gear)
40. Benjamin Co. – Put-In-Bay, OH (components)
41. LAH Development – Greenville, OH (turbines)
42. Parker Hannifin – Mayfield Heights, OH (brakes)
43. ATI Casting Service – LaPorte, IN (castings)
44. Fairfield Manufacturing Co. Inc. – Lafayette, IN (gears)
45. Brevini – Muncie, IN (gearboxes)
46. Bedford Machine and Tool Inc. – Bedford, IN (rotor hubs, plates)
47. Finkl & Sons – Chicago, IL (components)
48. Trinity Structural Towers - Clinton, IL (towers)
49. Centa Corp. – Aurora, IL (couplings)
50. Winergy – Elgin, IL (gear drives)
51. Winergy/Siemens – Elgin, IL (gear drives)
52. Brad Foote Gear Works Inc. – Cicero, IL (gearboxes)
53. GE Energy – Erie, PA (components)
54. Hodge Foundry Inc. – Greenville, PA (components castings)
55. Gamesa – Ebensburg, PA (blades)
56. Wausaukee Composites Inc. – Wausaukee, WI (housings)
57. Plexus Corp. – Neenah, WI (electric components)
58. Merit Gear Corp. – Antigo, WI (gears)
59. Tower Tech Systems Inc. – Manitowoc, WI (towers)
60. Bassett Mechanical – Kaukauna, WI (embed rings, template rings, forms)
61. Milwaukee Gear Co. – Milwaukee, WI (gears)
62. Energy Composites Corp. – Wisconsin Rapids, WI (composites)
63. Wausaukee Composites Inc. – Cuba City, WI (housings)
64. VEC Technology LLC – Greenville, PA (blades)
65. Milacron Inc. – Mount Orab, OH (turbine housings)
66. American Tank & Fabricating – Cleveland, OH (components)
67. MasTech – Manistee County, MI (turbines)
68. Vela Gear – Indianapolis, IN (gear drives, gearboxes)
69. McSwain Manufacturing – Cincinnati, OH (gearbox, main shaft bearing, components)
70. Edco Inc. – Toledo, OH (die castings)
71. Graco – North Canton, OH (fluid handling equipment)
72. Michigan Tool – Sturgis, MI (components)
73. Ashland Performa

Data compiled by Frank Oteri, NREL. Manufacturer list includes existing and planned locations.

2009 Renewable Energy Legislation Update

Arizona	Arizona passed landmark legislation to incent renewable energy manufacturers and headquarter operations to locate in the state. Qualified operations will receive a refundable corporate income tax credit of up to 10% of the total capital investment of the project and real and personal property tax reductions of effectively 77% for projects with a minimum capital investment of $25 million.
Arkansas	The Arkansas 87th General Assembly created Act 736, which provides incentives for wind turbine blade and component manufacturers in the form of a limited income tax exemption. The value of the exemption is calculated based on a number of variables, including the amount of investment made, the number of jobs created, the tier status of the county where the facility is located, and wages paid.
Indiana	Although a version of a Renewable Portfolio Standard (RPS) passed through the Indiana House and Senate, the bill failed in joint conference. Indiana's net metering policy allows for net metering systems up to 10 kW at homes and schools served by investor-owned utilities. A stronger version of the net metering rule passed through the Indiana House and Senate as part of the RPS bill, but it failed in joint conference.
Kansas	By the end of the 2009 Legislative Session, a net metering law for investor-owned utilities and the first mandatory renewable energy standard were signed into law by Governor Mark Parkinson. The Renewable Energy Standards Act, which codifies the goal of major Kansas utilities generating 10% of their power from renewable sources by 2011 (15% by 2016 and 20% by 2020), is already on track to be ahead of schedule.
Maine	Maine enacted a new Community Energy Law to spur renewable energy projects (but it recognizes that wind is the most adaptable). Local residents or investors must own at least 51% of the project and must have the formal support of the host community. The law is actually a suite of options for owners to use: for smaller projects, there is a feed-in tariff, and larger projects have the option of either a long-term contract or a REC multiplier to help finance the project. The following key points summarize the law: • Total program size (pilot program) is no more than 50 MW of locally owned renewable energy developments, including community wind. • Individual projects can be no larger than 10 MW each. • The PUC decides on the total capacity per transmission territory that is eligible for the incentives, depending on the size of each of the three major service territories. For instance, on the high end, Central Maine Power is limited to 25 MW (of the 50 MW total); on the low end, Maine Public Service is limited to 4 MW. • Consumer-owned utilities can opt in. • Program participants have a choice of either a long-term contract with a utility or the use of a Renewable Energy Credit multiplier (1.5 times). • The program's cost containment was ensured by limiting any contract payment term to a level not to exceed 10 cents/kWH (feed-in tariff), a total amount not to exceed project costs, and a term not to exceed 20 years. • The PUC is developing this program in conjunction with a new 100% green standard offer to help grow the market for these types of locally owned projects.

Michigan	Enacted in October 2008, Public Act 295 includes a Renewable Portfolio Standard (RPS) of 10% by 2015, a Wind Energy Resource Zone Board, and new provisions for net metering. It is estimated that the 10% RPS will increase Michigan's wind energy capacity from the present 129 MW to 2,400 MW by 2015. A Wind Energy Resource Zone Board was established to identify high potential wind energy areas that could be eligible for expedited siting for transmission improvements. The board issued a final report in October 2009 recommending four regions. New net metering provisions established a simplified, "retail rate" policy for 20-kW systems and smaller. PA 295 also allows net metering for renewable energy systems larger than 20 kW and up to 150 kW.
Nevada	The Nevada Legislature increased the state's Renewable Portfolio Standard to 25% by 2025. In addition, legislation was passed that requires NV Energy (the state's largest utility) to designate renewable energy zones and to include plans for building transmission to access those zones. Nevada also created a new Renewable Energy and Energy Efficiency Authority, led by a new Energy Commissioner. The Commissioner will replace the existing Nevada Renewable Energy and Energy Conservation Task Force with a New Energy Industry Task Force (including a representative from the wind industry). The Commissioner will also create a State and Local Government Panel on Renewable Energy and Efficiency Energy and will oversee the state's new tax incentives for renewable energy projects. One of the key pieces of legislation during the 2009 session was a bill that requires the Nevada Department of Employment to establish contractual relationships with nonprofit collaboratives to provide renewable energy training. To help support this effort, another bill requires the Nevada System of Higher Education Board of Regents to develop renewable energy programs. In another bill, the Board of Regents is required to develop curriculum for renewable energy education for K-12 and "promote the development by institutions of higher education in this State of research and educational programs relating to renewable energy." In the distributed wind area, the 2009 Nevada legislature made a number of changes to the WindGenerations Program, including a new requirement for 5 MW by 2012 and a change in the rebate structure that bases the rebate on predicted energy savings.
New Jersey	On December 1, 2009, following the required commenting period, the New Jersey Board of Public Utilities approved amendments to its Net Metering/Interconnection rules N.J.A.C. 14:8-4.1 to 4.4 and new rules N.J.A.C. 14:8-4.5 and 5.1, governing the separation of interconnection rules from net metering rules. Suggestions from stakeholders, including New Jersey Small Wind Working Group members, were implemented in N.J.A.C. 14:8-5.3 and N.J.A.C. 14:8-5.8 (a). The Board proposed amending the net metering rule to remove the 2-MW net metering cap on renewable energy systems. This amendment would remove the 2-MW cap but would retain the limit on the system's capacity equivalent to electric usage on an annual basis. New Jersey's Renewable Portfolio Standards (RPS) (N.J.A.C. 14:8-2) is being amended to meet the goals set forth in the Governor's Energy Master Plan (EMP) released in October 2008. Goal 3 of the EMP calls for the state to exceed the current RPS and meet 30% of the state's electricity needs from renewable sources by 2020. On September 21, 2009, Stakeholders met at the Board of Public Utilities and provided input that would support the following mandates: 1. Increase the RPS from 20% to 30% by 2020 2. Extend the RPS out to years 2021 to 2025 3. Develop New Jersey's wind energy resources, including up to 200 MW of onshore wind by 2020. Amendments for the offshore wind goal (3,000 MW by 2020) are under development. The Energy Master Plan is available online at www.state.nj.us/emp/

South Dakota	Bill 49-41B-25.1.passed during the 2009 legislative session: Notice to commission of planned construction of certain wind energy projects. Any person who plans on constructing a wind energy project consisting of wind turbines with a combined nameplate capacity that exceeds five megawatts shall notify the commission four months prior to the planned start of construction of the project. The notification shall be for informational purposes only and shall state the planned location of the project, the number of wind turbines, the nameplate capacity of the wind turbines, the planned method of interconnection, and the estimated construction start date and construction completion date. If the information provided changes, the informational filing shall be updated to reflect the changes.
Utah	After the 2008 Legislature adopted revisions to Utah's Net Metering Policy in SB 84 – Net Metering Programs, the Public Service Commission (PSC) held public meetings and technical conferences to discuss the issues surrounding net metering deferred to the Commission in SB 84. The PSC issued a Request for Public Comment in September 2008 and held a Public Hearing in January 2009. In February, the PSC ruled on Docket No. 08-035-78 – In the Matter of the Consideration of Changes to Rocky Mountain Power's (RMP's) Schedule No. 135 – Net Metering Service (the Commission's complete ruling can be found at www.psc.state.ut.us/utilities/electric/elecindx/documents/0803578ROdtm.pdf. The key changes to net metering in Utah are as follows: 1. The total system capacity is set at 20% of RMP's 2007 peak demand (which is equivalent to 923,000 kW or 923 MW). 2. All renewable energy credits are owned by the customer or as otherwise designated by the customer. 3. Residential customers will receive kilowatt-hour credits for any excess generation they produce. Large commercial and industrial customers with demand charges that generate excess generation will be given a choice between: – Valuing excess generation at an avoided cost based rate, available as a choice between a blended (yearly average) rate or seasonally differentiated rates, or – Valuing excess generation at an alternative rate calculated by dividing RMP's Utah revenue per schedule (applicable to the net metering customer) by the schedule's corresponding kilowatt-hours usage data from the previous year's FERC Form No. 1. 4. Annual net metering report requirements: The PSC directs RMP to submit an annual net metering report that includes the number of Utah net metering installations, the respective individual capacity of each installation, the total capacity of the Utah customer-generation as of the end of the annualized billing period, any unforeseen problems or barriers in the tariff, and any other relevant measure showing how close the program is to the designated net metering cap.
Wisconsin	Legislation was introduced in spring 2009 directing the Public Service Commission to establish statewide permitting standards for wind energy systems. The bill (SB 185/AB 256) also contains provisions setting a process for reviewing and appealing decisions on wind energy systems rendered at the local level. Similar to the bill introduced in the final days of the 2007-2008 session, SB 185/AB 256 was supported by a broad coalition calling itself Wind for Wisconsin. Governor Doyle signed SB185 into law on September 30.

Data compiled from state WWG input. Additional information on renewable energy policy can be found in the NREL report *State of the States 2009: Renewable Energy Development and the Role of Policy*. It provides a detailed picture of the status of renewable energy development in each of the U.S. states using a variety of metrics and discusses the policies being used to encourage this development.

The report is available as a PDF download at www.nrel.gov/docs/fy10osti/46667.pdf.

DOE Selects 53 New Projects Focused on Wind Energy for Up to $8.5 Million

FOR IMMEDIATE RELEASE: Wednesday, May 6, 2009

WASHINGTON, DC – U.S. Department of Energy (DOE) Secretary Steven Chu today announced selection of 53 new wind energy projects for up to $8.5 million in total DOE funding. These projects will help begin to address market and deployment challenges identified in DOE's 2008 report, "20% Wind Energy by 2030." Increasing wind energy generation will be a critical factor in achieving the Obama Administration's goals for clean energy, while also supporting new green jobs. Secretary Chu made the announcement by video at the WINDPOWER 2009 Conference in Chicago this week.

"Wind energy is one of our most promising renewable energy sources," said Secretary Chu. That's why I'm pleased to make this announcement today. By continuing to make investments in renewable energy we can cut our dependence on foreign oil and invest in a clean energy agenda that creates jobs and puts money back into the pockets of consumers."

The "20% Wind Energy by 2030" report found that the Nation possesses affordable wind energy resources in excess of those needed to generate 20% of U.S. electricity needs. The report also identified major challenges, including investment in a national transmission system, larger electric load balance areas and better regional planning, reduction in wind turbine capital costs, improvement of turbine performance, siting and environmental issues, and workforce development. The full report is available at http://windandhydro.energy.gov.

Selections are being announced today in four topic areas: market acceptance, environmental impact, workforce development, and distributed wind technology. Selections of two additional topic areas (supporting wind turbine research and testing and transmission analysis; planning and assessments) will be announced at a later date. Award amounts listed below are subject to negotiation.

Market Acceptance

- **American Planning Association (Chicago, IL)** — Community Planning Strategies for Successful Wind Energy Implementation — **$100,000**
- **The Cadmus Group, Inc. (Watertown, MA)** — Analysis Tool for Distributed Wind Technologies (Watertown, MA) — **$476,831**
- **Center for Energy Efficiency and Renewable Technologies (Sacramento, CA)** — Building Transmission Capacity in the Western Interconnect to Support a Low-Carbon Future — **$100,000**
- **Citizens for Pennsylvania's Future (Harrisburg, PA)** — Mid-Atlantic Regional Wind Energy Institute as Part of Wind Powering America Activities — **$94,000**
- **Clean Energy States Alliance, Inc. (Montpelier, VT)** — Wind Powering America State Outreach Project — **$100,000**

- **Consensus Building Institute, Inc. (Cambridge, MA)** — Building State Capacity to Advance Wind Energy Through the Best Practices of Collaborative Planning and Siting — **$99,785**
- **eFormative Options, LLC (Vashon, WA)** — Power Through Policy: 'Best Practices' for Cost-Effective Distributed Wind — **$200,000**
- **Energy Northwest (Richland, WA)** — 20% Wind by 2030: Overcoming the Challenges — **$100,000**
- **Environmental Law Institute (Washington, DC)** — Model State Enabling Legislation for Wind Power Siting — **$50,000**
- **Great Lakes Commission (Ann Arbor, MI)** — Great Lakes Wind Collaborative: Best Practices to Accelerate Wind Power in the Great Lakes Region and Beyond — **$99,740**
- **Illinois State University (Normal, IL)** — Topic 2A: Illinois Wind Workers Group — **$99,941**
- **The Land Institute (Salina, KS)** — The Southwest Power Pool Collaborative — **$100,000**
- **The Mountain Institute, Inc. (Morgantown, WV)** — Overcoming Barriers to Wind Development in Appalachian Coal Country — **$99,776**
- **North Carolina State University (Raleigh, NC)** — Wind Powering America: The Next Steps in North Carolina — **$99,347**
- **Oklahoma State University (Stillwater, OK)** — Wind Powering Oklahoma — **$87,296**
- **Power Advocate, Inc. (Boston, MA)** — Overcoming Supply Chain Challenges to Wind Power in the U.S. — **$100,000**
- **Princeton Energy Resources International, LLC (Rockville, MD) - Mid-Atlantic Wind** — Overcoming the Barriers: Topic Area 2A: Wind Powering America — **$100,000**
- **RENEW Wisconsin (Madison, WI)** — Sowing the Seeds for a Bountiful Harvest: Shaping the Rules and Creating the Tools for Wisconsin's Next Generation of Wind Farms — **$93,348**
- **The South Carolina Energy Office (Columbia, SC)** — Wind Powering America: A New Wind Economy for South Carolina and Georgia — **$109,810**
- **Southern Alliance for Clean Energy (Knoxville, TN)** — Tennessee Valley and Eastern Kentucky Wind Working Group — **$100,000**
- **State Of Montana, Office of the Governor (Helena, MT)** — Montana's Response To "20% Wind by 2030: Overcoming the Challenges" — **$100,000**
- **Sustainable Energy Advantage, LLC (Framingham, MA)** — New England Wind Energy Education Project — **$99,746**

- **University Of Delaware (Newark, DE)** — Empowering Coastal States and Utilities Through Model Offshore Wind Legislation and Outreach — **$99,967**
- **West Virginia Division of Energy (Charleston, WV)** — 20% Wind by 2030: Overcoming the Challenges in West Virginia — **$100,000**
- **Windustry (Minneapolis, MN)** — Regional Community Wind Conferences — **$100,000**

Environmental Impact

- **Bat Conservation International, Inc. (Austin, TX)** — Win(d) Solutions for Wind Developers and Bats — **$118,800**
- **Board of Trustees of the University of Illinois (Champaign, IL)** — Are Flying Wildlife Attracted to (or Do they Avoid) Wind Turbines? — **$180,835**
- **Deepwater Wind Holdings, LLC (Hauppauge, NY)** — Block Island Offshore Wind Project Bird and Bat Monitoring Program — **$295,360**
- **Jones & Stokes Associates, Inc. (Sacramento, CA)** — An Analytical Impact Assessment Framework for Wildlife to Inform the Siting and Permitting of Wind Energy Facilities — **$93,340**
- **Kansas State University (Manhattan, KS)** — Environmental Impacts of Wind Power Development on Population Biology of Greater Prairie Chickens — **$299,998**
- **Michigan State University (East Lansing, MI)** — Bat and Avian Migration Along the Lake Michigan Coastline: A Pilot Study to Inform Wind Turbine Siting — **$99,951**
- **The Nature Conservancy (Minneapolis, MN)** — Energy by Design: Science-Based Wind Energy Siting — **$95,210**
- **Pandion Systems, Inc. (Gainesville, FL)** — A Habitat-Based Wind-Wildlife Risk Tool With Application to the Upper Great Plains Region: Collisions and Habitat Displacement — **$294,491**
- **Texas Tech University (Lubbock, TX)** — Assessment of Lesser Prairie Chicken Population Distribution in Relation to Potential Wind Energy Developments — **$146,334**
- **Versar, Inc. (Columbia, MD)** — Spatially-Explicit Bat Impact Screening Tool for Turbine Siting — **$142,916**
- **Western EcoSystems Technology, Inc. (Cheyenne, WY)** — Greater Sage-Grouse Telemetry Study for the Simpson Ridge Wind Resource Area — **$100,000**
- **Western Michigan University (Kalamazoo, MI)** — Genetic Approaches to Understanding the Population-Level Impact of Wind Energy Development on Migratory Bats — **$99,933**

Workforce Development

- **Arizona State University (Tempe, AZ)** — Power System Operation and Planning for Enhanced Wind Generation Penetration — Collaborative Work Force Development — **$400,000**
- **The Board of Regents of the UW System (Madison, WI)** — A Continuing Education Short Course and Engineering Curriculum to Accelerate Workforce Development in Wind Power Plant Design, Construction, and Operations — **$119,135**
- **DNV Global Energy Concepts Inc. (Seattle, WA)** — Knowledge Boosting Program for New Wind Industry Professionals — **$269,691**

- **Lakeshore Technical College (Cleveland, WI)** — POWER — Purposeful Partnerships Coordinating Wind Education Resources — **$199,236**
- **Laramie County Community College (Cheyenne, WY)** — Laramie County Community College: Utility-Scale Wind Energy Technology — **$198,594**
- **Oklahoma Department of Commerce (Oklahoma City, OK)** — Development of a National Safety Standard for Wind Turbine Maintenance Technicians — **$400,000**
- **Pennsylvania State University (University Park, PA)** — Wind Energy Workforce Development — Engineering, Science, and Technology — **$398,456**
- **Southwest Applied Technology College (Cedar City, UT)** — Southern Utah Wind Power Educational Consortium for Workforce Development — **$50,000**
- **Texas State Technical College West Texas (Sweetwater, TX)** — Valley Wind Program — **$198,206**
- **University of Massachusetts (Amherst, MA)** — Offshore Wind Energy Systems Engineering Course Development — **$252,687**
- **University of Wisconsin (Madison, WI)** — Integration of Wind Energy Systems into Power Engineering Education Programs at UW-Madison — **$399,931**
- **University Wisconsin-Milwaukee (Milwaukee, WI)** — Southeast Wisconsin Wind Energy Educational Collaborative — **$330,184**
- **University of Wyoming (Laramie, WY)** — Fellowships for Students Pursuing Interdisciplinary M.S. with a Focus in Wind Energy — **$195,703**

Distributed Wind Technology

- **Cascade Engineering, Inc. (Grand Rapids, MI)** — Cascade Engineering, Inc. Application — Swift Wind Turbine — **$100,000**
- **TALCO Electronic (San Diego, CA)** — Proven Energy New 6-kW Wind Turbine Testing Solicitation — **$34,518**
- **Viryd Technologies (San Diego, CA)** — Testing the Viryd 8000 to Verify a Lower Cost of Energy — **$65,000**

Wind Powering America FY09 Publications

Technical Reports

Economic Development Benefits from Wind Power in Nebraska: A Report for the Nebraska Energy Office
(www.nrel.gov/docs/fy09osti/44344.pdf)

Economic Development Impacts of Community Wind Projects: A Review and Empirical Evaluation
(www.nrel.gov/docs/fy09osti/45555.pdf)

Generating Economic Development from a Wind Power Project in Spanish Fork Canyon, Utah: A Case Study and Analysis of State-Level Economic Impacts
(www.windpoweringamerica.gov/pdfs/economic_development/2009/ut_spanish_fork.pdf)

An Overview of Existing Wind Energy Ordinances
(www.nrel.gov/docs/fy09osti/44439.pdf)

Technology, Performance, and Market Report of Wind-Diesel Applications for Remote and Island Communities
(www.nrel.gov/docs/fy09osti/45810.pdf)

Wind for Schools: Developing Education Programs to Train the Next Generation of the Wind Energy Workforce
(www.nrel.gov/docs/fy09osti/45473.pdf)

WINDPOWER Conference Posters

Cooperative Extension Service and Wind Powering America Collaborate to Provide Wind Energy Information to Rural Stakeholders
(www.nrel.gov/docs/fy09osti/45412.pdf)

Social Acceptance of Wind Power in the United States: Evaluating Stakeholder Perspectives
(www.nrel.gov/docs/fy09osti/45554.pdf)

Water: Maybe the Best Near-Term Benefit and Driver of a Robust Wind Energy Future
(www.nrel.gov/docs/fy09osti/45341.pdf)

Wind Energy Opportunities, Challenges, and Progress Within the Federal Government
(www.nrel.gov/docs/fy09osti/45410.pdf)

Wind for Schools: Developing Educational Programs to Train the Next Generation of Wind Energy Experts
(www.nrel.gov/docs/fy09osti/45472.pdf)

Wind Power Across Native America: Opportunities, Challenges, and Status
(www.nrel.gov/docs/fy09osti/45411.pdf)

Wind Powering America — Outreach in Priority States
(www.nrel.gov/docs/fy09osti/45342.pdf)

Wind Shear and Turbulence Profiles at Elevated Heights: Great Lakes and Midwest Sites
(www.nrel.gov/docs/fy09osti/45455.pdf)

National Association of Farm Broadcasters Interviews

WPA continued contracting with the National Association of Farm Broadcasters (NAFB) to provide monthly wind energy interviews for use on rural radio stations. NAFB broadcast the following segments in FY09, and Webmaster Julie Jones also posted the segments on the WPA Web site:

States Striving to do Their Part for 20% Wind Goal, but Challenges to Overcome
featuring John Hansen, Nebraska Farmers Union President
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2042)

Legislation Helps State Address Unique Barrier to Wind Development
featuring John Hansen, Nebraska Farmers Union President
(www.windpoweringamerica.gov/media/2008/nafb_hansen2.mp3)

Why Does Ag Equipment Company Get Involved in Wind Industry? Benefits
featuring Dave Drescher, John Deere Wind Energy Vice President
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2079)

Despite Challenges, Wind Energy Development Worth the Effort
featuring Dave Drescher, John Deere Wind Energy Vice President
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2083)

One County, 646 Wind Turbines: Electricity an Exported Commodity
featuring Jimmy Bricker, Purdue Extension Director in Benton County, Indiana
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2120)

Growing Wind Industry Great, But Have to Grow a Workforce
featuring Jimmy Bricker, Purdue Extension Director in Benton County, Indiana
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2123)

Minwind: a Farmer-Owned Concept Others Can Put to Work
featuring Mark Willers, CEO of MinWind Energy
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2151)

Overcoming Challenges to Community Wind Will Result in Big Benefits
featuring Mark Willers, CEO of MinWind Energy
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2175)

Changes, Better Understanding Bring Utilities on Board with Wind Energy
featuring Mark Parkinson, Kansas Lieutenant Governor
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2199)

Wind Energy Powering Economic Development in Rural Communities
featuring Mark Parkinson, Kansas Lieutenant Governor
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2209)

Working to Overcome Barriers to Meeting 20% U.S. Wind Vision
featuring Mark Parkinson, Kansas Governor
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2219)

For States to Reach Full Wind Potential, National Effort Needed
featuring Steve Wegman, South Dakota Wind Energy Association Executive Director
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2338)

Wind Energy Brings Jobs to Rural America
featuring Steve Wegman, South Dakota Wind Energy Association Executive Director
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2358)

Wind Brings Great Deal of Economic Development Potential to the Table
featuring Jay Haley, Partner with EAPC Architects Engineers
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2386)

Fact Sheets

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Arizona
(www.nrel.gov/docs/fy09osti/44144.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Idaho
(www.nrel.gov/docs/fy09osti/44145.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Maine
(www.nrel.gov/docs/fy09osti/44146.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Massachusetts
(www.nrel.gov/docs/fy09osti/44914.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Montana
(www.nrel.gov/docs/fy09osti/44147.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Nevada
(www.nrel.gov/docs/fy09osti/44271.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in New Mexico
(www.nrel.gov/docs/fy09osti/44273.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in North Carolina
(www.nrel.gov/docs/fy09osti/44916.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Pennsylvania
(www.nrel.gov/docs/fy09osti/44274.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in South Dakota
(www.nrel.gov/docs/fy09osti/44275.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Tennessee
(www.nrel.gov/docs/fy09osti/44915.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Utah
(www.nrel.gov/docs/fy09osti/44268.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in West Virginia
(www.nrel.gov/docs/fy09osti/44276.pdf)

Economic Benefits, Carbon Dioxide Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts of New Wind Power in Wisconsin
(www.nrel.gov/docs/fy09osti/44277.pdf)

Economic Development Benefits of the Mars Hill Wind Farm
(www.nrel.gov/docs/fy09osti/44824.pdf)

Economic Development Impacts in Colorado from Four Vestas Manufacturing Facilities
(www.nrel.gov/docs/fy09osti/44620.pdf)

Economic Development Impacts of Colorado's First 1,000 Megawatts of Wind Energy
(www.nrel.gov/docs/fy09osti/44317.pdf)

Federal Wind Energy Assistance through NREL
(www.nrel.gov/docs/fy09osti/44965.pdf)

Wind Energy and Economic Development in Nebraska
(www.nrel.gov/docs/fy09osti/45340.pdf)

Wind for Schools Project Power System Brief (revision)
(www.nrel.gov/docs/fy09osti/45685.pdf)

Other

2008 Wind Energy Projects (poster)
(www.nrel.gov/docs/fy09osti/44823.pdf)

NAWIG News, the Quarterly Newsletter of the Native American Wind Interest Group, Spring 2009
(www.nrel.gov/docs/fy09osti/45413.pdf)

NAWIG News, the Quarterly Newsletter of the Native American Wind Interest Group, Fall 2009
(www.nrel.gov/docs/fy10osti/46407.pdf)

Wind for Schools: A Wind Powering America Project (revision)
(www.nrel.gov/docs/fy09osti/45684.pdf)

Wind Powering America FY08 Activities Summary
(www.windpoweringamerica.gov/filter_detail.asp?itemid=2148)

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