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

Wind Powering America's Regional Stakeholder Meetings & Priority State Reports

FY11 Summary

June 2013

NOTICE

Available electronically at http://www.osti.gov/bridge

Available for a processing fee to U.S. Department of Energy
and its contractors, in paper, from:
U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831-0062
phone: 865.576.8401
fax: 865.576.5728
email: mailto:reports@adonis.osti.gov

Available for sale to the public, in paper, from:
U.S. Department of Commerce
National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
phone: 800.553.6847
fax: 703.605.6900
email: orders@ntis.fedworld.gov
online ordering: http://www.ntis.gov/ordering.htm

 Printed on paper containing at least 50% wastepaper, including 20% postconsumer waste

Contact

Ian Baring-Gould
Wind Powering America Technical Director
National Renewable Energy Laboratory
15013 Denver West Parkway, MS3811
Golden, CO 80401
Phone: 303-888-8888
E-mail: ian.baring_gould@nrel.gov

Acknowledgements

The Wind Powering America team would like to thank the following regional meeting attendees who contributed reports at the meetings: Grace Anderson, Bill Auberle, Sara Baldwin, Jen Banks, Thurman Brendlinger, Bonnie Christiansen, Corrie Christol, Steven Clarke, Lisa Daniels, Alex DePillis, Karan English, Alex Fuller-Young, Andrew Gohn, Rich Hamilton, John Hansen, Jeneane Harter, Jeff Herholdt, Sue Jones, Tom Kaiserski, Rita Kilpatrick, David Loomis, Josh Mathis, Dan McGuire, Kylah McNabb, Jonathan Miles, Erika Myers, Amanda Ormond, Alice Orrell, Victoria Pebbles, Tom Potter, Francis Pullaro, John Sarver, Vijay Satyal, Mark Sinclair, Tim Stearns, Katie Stokes, Ted Vogel, and Steve Wegman.

This work was supported by the U.S. Department of Energy under Contract No. DE-AC36-08GO28308 with the National Renewable Energy Laboratory.

Abbreviations and Acronyms

ASPA	American Samoa Power Authority
CNMI	Commonwealth of the Northern Mariana Islands
FEMA	Federal Emergency Management Agency
GW	gigawatt
kW	kilowatt
kWh	kilowatt-hour
MW	megawatt
NREL	National Renewable Energy Laboratory
RPS	Renewable Portfolio Standard
U.S. DOE	U.S. Department of Energy
USVI	U.S. Virgin Islands
WAPA	Water and Power Authority (U.S. Virgin Islands)
WPA	Wind Powering America
WWG	Wind Working Group

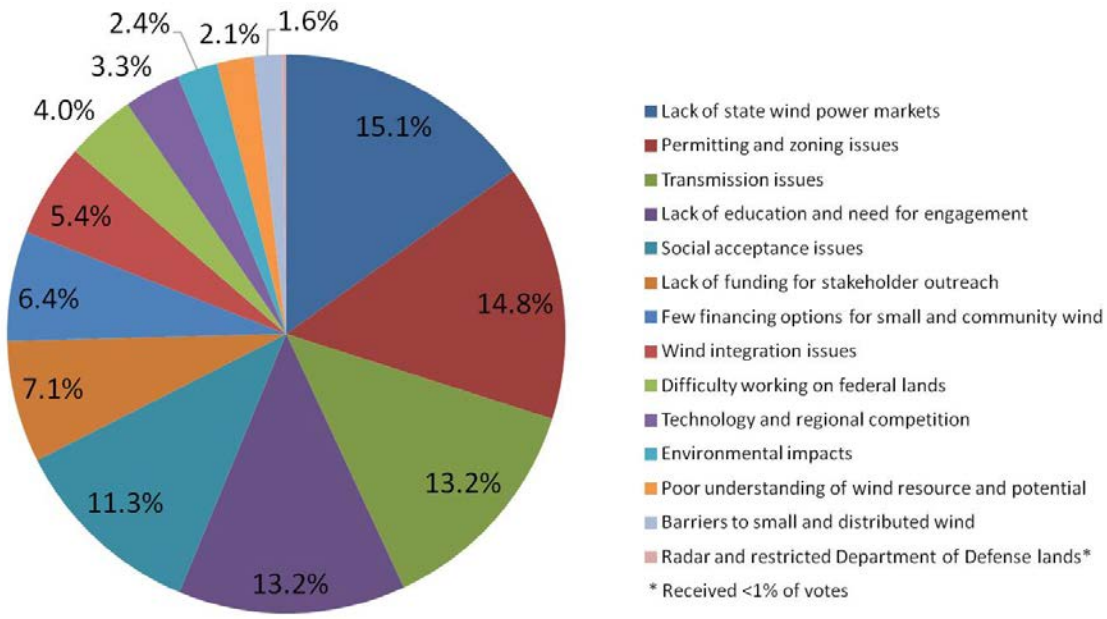
Executive Summary

The principal technology acceptance goals of the U.S. Department of Energy's (DOE's) Wind Program are 30 states achieving at least 100 megawatts (MW) of installed capacity by 2010 and 15 states achieving at least 1 gigawatt (GW) of installed capacity by 2018. For fiscal year (FY) 2011, the annual target was 30 states with at least 100 MW and six states with 1 GW of installed capacity. At the end of FY 2011, 29 states achieved 100 MW of installed capacity: Arizona, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Utah, Washington, West Virginia, Wisconsin, and Wyoming. Fourteen states had more than 1 GW of installed wind capacity: California, Colorado, Illinois, Indiana, Iowa, Kansas, Minnesota, New York, North Dakota, Oklahoma, Oregon, Texas, Washington, and Wyoming (Figure 1). During FY 2012, the Granite Reliable Power Windpark pushed New Hampshire over the 100-MW threshold, making it the 30th state to reach 100 MW of installed capacity and fulfilling that programmatic goal.

DOE's Wind Powering America (WPA) initiative provided extensive support in almost all of these states since its inception in 1999. Beginning in 2007, WPA funded 3-year contracts with the self-defined high-priority states of Alaska, Arizona, Indiana, Maryland, Massachusetts, Michigan, Nebraska, Nevada, North Carolina, Ohio, Utah, Virginia, and Wisconsin. Other medium- and lower-priority states had reserved smaller grant-based funding to support stakeholder engagement activities, primarily through state energy offices. (See Figure 2 for medium- and lower-priority state designations.) As a final deliverable of the 3-year priority state contracts, representatives of these states were asked to produce a summary report describing the current market for wind deployment, which activities were effective in expanding the wind development dialog, and which barriers continue to hamper development.

Beginning in 2010, DOE conducted an assessment of WPA activities to determine whether the methods the department had used to help grow the wind industry to provide 2% of the nation's electrical energy should be the same methods used to achieve 20% of the nation's energy from wind (as described in the report 20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply). After the assessment, it was determined that the initiative's state-based activities should be phased out as part of a shift to regional-based approaches. To assist with this transition, WPA hosted a series of 1-day regional meetings at six strategic locations around the country and a single teleconference for island states, U.S. territories, and remote communities. Locations were chosen based on regional diversity and the unique characteristics of a region but were not meant to define regions that the program may use in the future. The WPA team invited state representatives, Wind Working Group members, and other interested stakeholders from every region to attend and share experiences. These events will assist WPA staff and participants to identify persistent deployment barriers, prioritize these barriers, and highlight successful approaches to address the identified barriers.

This report summarizes the results of the inaugural regional meetings and the state reports with a focus on ongoing wind deployment barriers in each region. As part of the discussion process, attendees voted on the critical barriers in their regions and discussed the top issues in each region during breakout sessions. The following figure provides a breakdown of these barriers by the percentage of votes received.



Section 2 explores these barriers in detail. Regional responses are provided in the individual regional reports in Section 3. Attendees also provided recommendations for the regional initiative (see Section 4). Some of the key recommendations include:

- The acceptability of large-scale wind deployment and under what conditions is largely determined at the state level. Although regional groups can be helpful to address cross-border issues, decisions that impact wind deployment often occur at the state level. Funding should be allocated with this in mind.
- In some cases, states have different and potentially competing drivers for wind deployment. A regional approach must be cognizant of this and must not operate at such a high level that the real issues are not addressed.
- Longer-term commitments to regional organizations, with direct support to state entities, will be required to make a program of this nature successful.
- Collaboration combined with expanding on existing structures is key to successful regional organizations.

Contents

List of Figures

List of Tables

1 Introduction

The mission of the U.S. Department of Energy's (DOE's) Wind Powering America (WPA) initiative is to educate, engage, and enable critical stakeholders to make informed decisions about how wind energy contributes to the U.S. electricity supply and local economy. Since 1999, WPA has supported education and stakeholder engagement activities by providing technical assistance and funding for direct engagement, producing informational resources, and implementing collaboration opportunities, primarily at the state level. These activities have helped the wind industry move from a small boutique market of approximately 2,000 megawatts (MW) in a few states in 2000 to more than 60,000 MW covering much of the nation at the end of 2012.

The principal technology acceptance goals of the DOE's Wind Program are 30 states achieving at least 100 MW of installed capacity by 2010 and 15 states achieving at least 1 gigawatt (GW) of installed capacity by 2018. The annual target for FY11 was 30 states with at least 100 MW and six states with 1 GW of installed capacity. At the end of FY11, 29 states achieved 100 MW of installed capacity[1] and 14 states had more than 1 GW of installed wind capacity[2] (Figure 1). The 2012 commissioning of the Granite Reliable Power Windpark pushed New Hampshire over the 100-MW threshold, making it the 30th state to reach 100 megawatts of installed capacity prior to the end of FY2012.

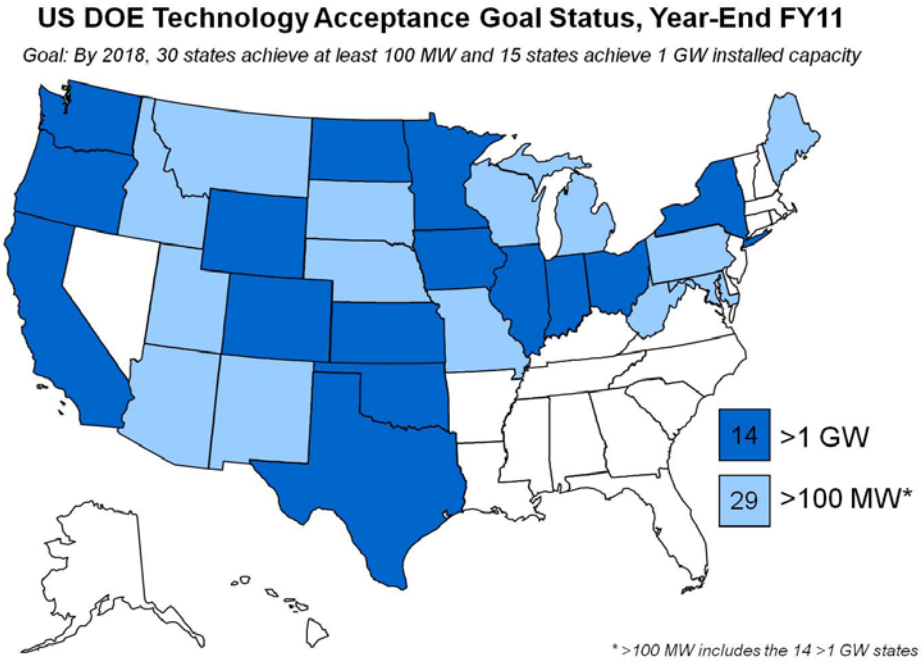


Figure 1. FY2011 year-end state installed capacity status

[1] Arizona, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Utah, Washington, West Virginia, Wisconsin, and Wyoming

[2] California, Colorado, Illinois, Indiana, Iowa, Kansas, Minnesota, New York, North Dakota, Oklahoma, Oregon, Texas, Washington, and Wyoming

Through the later part of the decade, the Wind Program and WPA supported the appropriate deployment of wind technologies by expanding the state-based Wind Working Groups (WWGs). WPA provided funding for 3-year priority state activities and similar federal funding for medium- and lower-priority states (see Figure 2 for state designations), combined with implementing regional activities through the development of the Regional Wind Energy Institutes and the support of other regional stakeholder groups. Following an effort to determine how WPA can be most effective in helping the nation move toward the scenario outlined in the 20% Wind Energy by 2030 report, WPA investments in priority states are transitioning to a regional focus, increasing intra-state coordination and strategic planning. This regional approach is intended to maintain and build on the existing state-level WWG networks and promote information sharing among regions with similar circumstances.

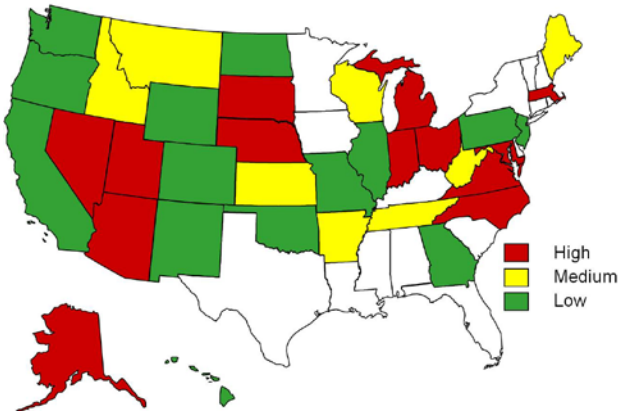


Figure 2. 2007 Wind Powering America priority states

To assist with the transition to regional-focused activities, WPA hosted a series of 1-day regional meetings at strategic locations around the country. Locations were chosen based on regional diversity and the unique characteristics of a region but were not meant to define regions that the program may use in the future. A conference call opened the discussion for states that are not connected to the national grid; although not a physical region, they share many of the same development and technical challenges. WPA invited state representatives, WWG members, and other interested stakeholders from every region to attend and share experiences. The findings from these events assist WPA staff and participants to identify persistent deployment barriers, prioritize these barriers, and highlight successful approaches to address the identified barriers. In 2011, WPA hosted meetings in the following locations:

- Great Lakes: Ann Arbor, Michigan, March 18
- Great Plains: Lincoln, Nebraska, March 29
- Mid-Atlantic and Southeast: Arlington, Virginia, March 16
- Northeast: Boston, Massachusetts, March 22
- Northwest: Richland, Washington, March 25
- Southwest: Las Vegas, Nevada, March 14
- Island states conference call: April 25.

At the regional meetings, attendees identified current wind deployment barriers and then voted to identify the most urgent barriers. Participants then attended breakout sessions to discuss these barriers, identifying the key elements, national approaches that could help address specific aspects of the barriers, and approaches that could help address the barriers in the region. Following a report from each breakout group, general discussions addressed the remaining barriers and identified the challenges that the WWG network may experience during the planned transition to a stronger regional approach for national wind stakeholder engagement. The workshop discussions identified possible solutions but not how to implement these solutions. WPA requested comments and input from relevant stakeholders who were unable to attend the meetings.

Chapters 2–4 of this report summarize the findings from the regional meetings, and Chapter 5 summarizes individual state reports.

2 Regional Stakeholder Meetings

2.1 Meeting Participants

Due to federal funding availability and an expected DOE funding opportunity announcement, WPA staff had to quickly organize the regional meetings and invite state WWG members in spring 2011. All meetings were open to the public and were advertised in the WPA biweekly e-newsletter. Approximately 200 people representing more than 30 states and territories attended the meetings. Figures 3 and 4 provide an attendance summary.

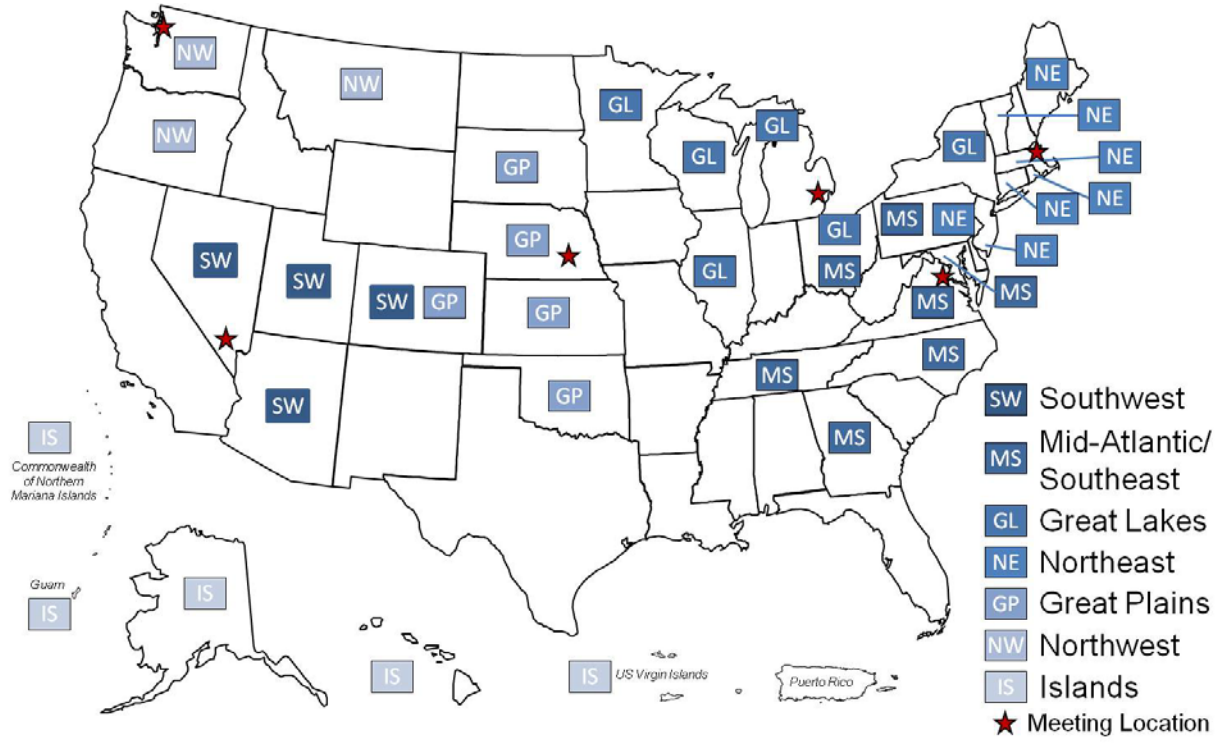


Figure 3. Map of regional meeting state participation and meeting locations

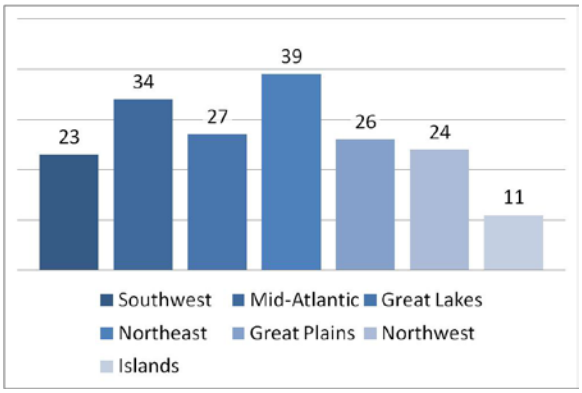


Figure 4. Regional meeting attendance

Meeting participants represented many types of organizations, but in general they can be categorized as follows: non-governmental organizations, federal agencies, the wind industry, other related industry, state government organizations, educational institutions, wind developers, members of the public, and utilities. Figure 5 provides a breakdown of all attendees by organization type.

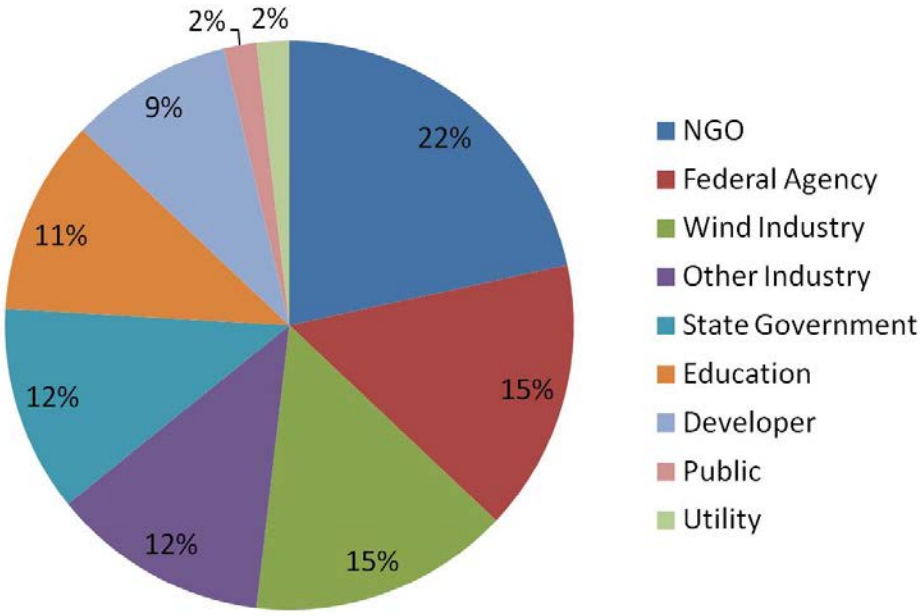


Figure 5. Analysis of regional meeting attendees' organization types

As shown, most of the attendees were from the wind industry, and many were WWG members. Non-governmental organizations include organizations whose primary focus is wind energy or whose main interests intersect with wind energy. Federal agencies include government laboratories, tribes, and other organizations directly funded by the federal government. The wind industry includes original equipment manufacturers, component manufacturers, law firms with a strong wind focus, consultants, and other companies with a strong relationship to wind power. Other industry is comprised of corporate entities whose primary business is outside of the wind space.

Although not scientifically significant, the attendees represent a strong cross-section of the wind industry. Therefore, we feel the results of the barrier discussion represent a good understanding of the issues facing wind development in states.

2.2 Wind Development Barriers Identified by Participants

As a result of the regional stakeholder meetings, attendees identified several national-level issues that are delaying wind technology implementation. As part of the discussion process, attendees voted on the critical barriers in their regions. Figure 6 provides a breakdown of these barriers by the percentage of votes received.

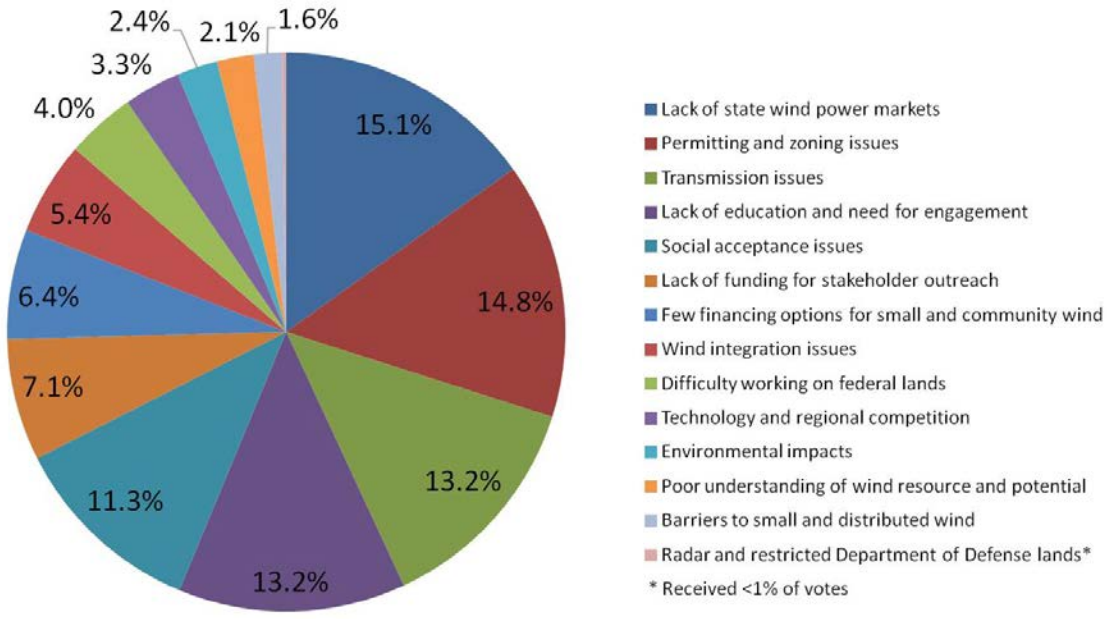


Figure 6. Percentage of votes for barriers identified during regional stakeholder meetings

Attendees discussed the top issues in each region during breakout sessions. Regional responses are provided in the individual regional reports in Section 3. The following discussion presents each of the identified issues in detail.

2.2.1 Lack of State Wind Power Markets

The lack of state markets was ranked as the main issue across the nation. Many factors are driving this issue (as described below), but the simple challenge is a lack of motivation to install wind technology in land-based or offshore markets and prospective wind developers to secure a power purchase agreement, which would allow closure on projects.

2.2.1.1 Aspects

The following is a sample of aspects of this barrier identified by regional breakout session participants:

- In many cases, the existing renewable portfolio standard (RPS) is not strong enough to continue to drive state and regional markets. In addition, some states contribute to weak state markets through a low RPS, set-asides for higher-cost options, or lack of in-state set-asides.
- An RPS can be weakened with other technologies or compliance multipliers, such as the Delaware allowance, in which fuel cells *capable* of operating on renewable fuels can take credit for *any* energy generation, regardless of the actual fuel use.
- There are limited mechanisms to stimulate new project development in the near future.
- Legislators and regulators are heavily influenced by non-renewable and local power industries.

- The United States lacks a national policy, carbon pricing, a national RPS, and a policy framework to address externalities.
- There is a poor link between costs to ratepayers and local economic development.
- Smaller projects lack a mechanism for capturing value (e.g., reduction in distribution or transmission costs) or for making them economic.
- Federal and state incentives are unstable (e.g., the Production Tax Credit and investment tax credit).
- There is a lack of integrated resource planning on a regional basis (wind, distributed generation, transmission, conservation, etc.) and a lack of goals.
- The current price of new wind projects is compared unfavorably to existing overcapitalization of coal and nuclear power plants and low natural gas prices, resulting in a soft market for wind power.
- The market needs a standard way to set the feed-in tariff rate sufficient to finance projects, as well as a standard contract or offer (aligned with the banks' needs).
- Finding development capital for smaller, community-based projects is difficult. Some states, such as Maine, do not have development funds for community projects. Smaller, local businesses with a tax liability, such as banks, may not be educated about community wind and are less likely to get involved with community wind projects.
- Small wind projects (defined as 100 kilowatts [kW] and smaller) face many challenges, but a lack of understanding about the technology is a key issue. A number of states have good policy and net-metering frameworks for small wind, but a lack of understanding of the resource and proper siting is hampering expanded use of this technology.

2.2.1.2 Potential Solutions

Participants identified the following potential solutions to a lack of state wind power markets:

- Reduce costs through lower transmission study fees and increased technical development to reduce turbine costs and/or improve performance. Capture procurement efficiencies through collaboration among developers (including utilities).
- Include a local benefits requirement in policy to limit out-of-state or regional sources.
- To address weak prices and the lack of a national RPS, develop a national RPS and national energy policy highlighting renewable energy as national security and including goals for all renewable energy sources.
- Set feed-in tariffs high enough to be used, generating an adequate rate of return for the developer.

- Adopt green pricing, whereby the price is not subject to fuel adjustment charges of fossil fuels. Examples: Austin Energy's model,[3] Minnesota's House Bill 805.[4]
- Expand incorporation of the risk of cost increases driven by non-renewable sources into projections required by state regulators.
- Expand implementation of regional energy plans or integrated resource plans by utilities, including a plan for how to obtain electricity in the future. This will lead to greater stability and allow utilities to begin investing to achieve these plans.
- Account for externalities by including them in the integrated resource plan. Price externalities through carbon trading or taxation.
- Improve cost recovery on smaller projects by reforming utility regulation.
- Implement programmatic environmental impact studies or a defined Finding of No Significant Impact[5] as appropriate to help fast-track small projects.
- Expand the ability of independent power producers to sell power directly to businesses, government entities such as the Department of Defense, and universities.

2.2.1.3 Potential Regional Solutions

Participants identified the following potential regional solutions to a lack of state wind power markets:

- Create a renewable-friendly independent system operator capacity market.
- Provide a better explanation of the value of a regional or inter-region RPS, allowing the development of lower-cost resources as compared to relying on local, higher-cost resources.
- Frame wind energy in the context of 21st-century jobs and economic development.
- Develop regional clean energy manufacturing clusters.
- Base targeting on polling or surveying.
- Examine green pricing models, especially regional. Provide consensus and best practices for the region.
- Examine feed-in tariff models, especially regional ones. Provide consensus and best practices for the region.
- Create a regional integrated resource plan.
- Establish some form of regional equipment procurement.

---

[3] See www.austinenergy.com/energy%20efficiency/Programs/Green%20Choice/ for information on Austin Energy's successful model.

[4] House Bill 805 promotes wind projects 25 MW and less through incentives to buy locally generated and owned wind.

[5] A Finding of No Significant Impact is a document that briefly presents the reasons why an action will not have a significant effect on the human environment, resulting in no requirement to prepare an environmental impact statement.

2.2.2 Permitting and Zoning Issues

As described in the following sections, meeting attendees identified a lack of defined and credible guidelines for permitting and zoning of wind projects of all sizes as a barrier. Permitting and zoning vary among counties and townships, making it difficult to permit a project in multiple jurisdictions or take a more regional approach to wind turbine project development. This issue is closely tied to the issues of social acceptance and education. Without clearly defined guidelines, individuals of the community supporting or opposing a project are free to recommend any requirements that support their interest, generally without the need to clearly defend their recommendations with hard science or even justification. It is then up to local or state officials to enact guidelines that they think balance their constituents' desires, in some cases without understanding how this compares to what is commonly considered acceptable or what may be standard in other regions. Excessive cost and arduous regulatory requirements and inconsistent and even overreaching local zoning ordinances threaten to stall potential wind projects across the country. In addition, poorly sited projects can give wind development a bad reputation.

2.2.2.1 Aspects

The following is a sample of aspects of this barrier identified by regional breakout session participants:

- The permitting and siting paths are confusing.
- Wind energy's potential benefits are not well understood, and few resources exist to educate local officials about wind energy. There is a need to provide information to decision makers at all levels, including citizens, volunteers, regulators, governors, etc.
- At times the respective roles of the state and local elected officials are not clear, and collaboration between the two may be strained by distrust and competing interests.
- There are no metrics for measuring project impacts regarding wildlife, noise, safety, watersheds, property values, and shadow flicker. This makes comparisons among wind projects and other energy sources difficult.
- Competing experts make it difficult to sort fact from fiction.
- "Turbine envy"[6] leads to perceived economic injustice and a mistrust of neighbors' motivations.
- Local planning bodies are overwhelmed trying to become experts on every wind issue, and they can't admit to a lack of knowledge without losing credibility.
- Finding trusted experts who are perceived to be neutral is a major challenge. (Foundations and universities may be the best options.)
- Coordination among regulatory agencies and appropriate permitting requirements are needed at the national, state, and local levels.

[6] "Turbine envy" is a term that describes landowners who are upset because their property was not selected for siting a wind turbine.

2.2.2.2 Potential Solutions

Participants identified the following potential solutions to permitting and zoning issues:

- Distribute the risk and reward of project development by implementing lease pools, a possible effective solution to "turbine envy." Lease pools also reduce the outside capital costs required to procure larger turbines by expanding the potential for local investment.
- Use model ordinances to suggest effective ways to manage wind development.
- Identify trusted, neutral parties to educate local officials with unbiased information. Access to trusted, neutral parties eliminates the need for planning staff to become experts in wind development. Informational presentations to decision makers are useful for providing background on wind energy and project-specific details. The public could participate in periodic "ask the expert" panel events.
- Impacts from wind development should be compared to effects from conventional power sources. Funding to support education and outreach is required.
- Create a wind development roadmap that can inform local decision making by describing what local officials can expect to see over the course of a project. This would also help guide developers and local proponents through opposition in a more effective and efficient manner.
- Develop a default ordinance for siting wind projects, allowing counties to adopt the default or a tailored ordinance.
- Use mediators trained in wind energy issues on a regional basis. Mediators must be seen as objective and unbiased. An example of this can be found in Michigan, which has trained 15 mediators on regional wind energy issues.
- Establish a voluntary state siting-review board to offer unbiased information and provide siting assistance to counties.
- Explore ways of creating a consortium to promote consistent data collection and effective data sharing, especially to local decision makers. Protocols are needed for consistent data collection, sharing, and analysis. European data might be helpful.
- To realize potential economies of scale from offshore wind, establish a regulatory framework at the federal and state levels.

2.2.2.3 Potential Regional Solutions

Attendees identified several regional-based solutions to permitting and zoning issues.

- The state should develop a model ordinance tailored to the region to use as a default unless counties develop their own ordinances. It's important to have a clear understanding of each clause in any siting ordinance and ensure that it's grounded in the authority of the local jurisdiction.
- The state or a regional entity should develop a voluntary siting-review board to support local decision makers. The process and selection of trusted experts should be carefully designed.

- A clearinghouse for credible guidelines and information to use in educating decision makers and developing permitting and siting standards should be established.

In each region, attendees identified several organizations that could assume the role of a regional coordinator for deployment activities. In some regions, coordination groups already exist (e.g., the Great Lakes Wind Collaborative, the New England Wind Energy Education Project).

2.2.3 Transmission Issues

Transmission is a major wind development barrier for states in several regions. Many states have rejected ideas and plans for a national, interconnected grid. Representatives from states within similar regions feel they are dealing with different issues at the state level than at the regional level. At the local level, states are working on transmission issues, but there is a need for greater industry and stakeholder engagement in this process. Also, a disconnect exists between the utility's bottom line to build transmission lines and the need to address issues such as "space on the lines."

2.2.3.1 Aspects

The following is a sample of aspects of this barrier identified by regional breakout session participants:

- Improving the transmission infrastructure is time-intensive and expensive.
- In many parts of the country, the current infrastructure is insufficient.
- Determining cost allocation is challenging (project versus public). Unclear obligations hinder progress, compounded by utilities that may profit from transmission constraints.
- High queue fees and a long analysis schedule create a strong barrier to project development.
- Transmission is often viewed as unimportant, even for those who desire more wind development.
- There is a lack of resource or portfolio planning; therefore, transmission infrastructure is not aligned with the resource.
- There is limited national coordination.

2.2.3.2 Potential Solutions

Participants identified the following potential solutions to transmission issues:

- Use high-power transmission lines (DC cables) to connect load centers to resources (e.g., Tres Amigas in Clovis, New Mexico).
- Implement wind energy resource zone boards to identify regions for expedited transmission. (Michigan has some experience with this solution.)
- Integrate pricing models for offshore and land-based wind.
- Use system economic and development models to evaluate solutions for efficiently matching power demand and generation (e.g., building new transmission in remote areas as opposed to

a more distributed model in which power is generated closer to the load center and existing transmission infrastructure is used or upgraded).

- Effectively communicate the need for transmission infrastructure, including direct and ancillary benefits (jobs, synergistic opportunities). Link the transmission infrastructure with wind power.
- Implement necessary improved regional planning.
- Analyze the wind energy export market potential (local market expansion and export to the East Coast). Export solves the barrier of an RPS being too low, which as mentioned previously has become its own barrier to wind development.

2.2.3.3 Potential Regional Solutions

Attendees identified several regional solutions to transmission issues.

- Adopting regional transmission plans, such as the creation of a 10- and 20-year plan by DOE's Regional Transmission Expansion Planning program, would be beneficial. Financing excess capacity in transmission projects that banks won't fund would be a way for the federal government to address "right size" issues. The developer could repay the cost when the capacity is used. Landowner concerns need to be addressed with new methods of compensation; the federal government could fund additional compensation dollars. Finally, cost allocation principles could be developed to help determine who pays and how much.
- Fragmented jurisdictions should be addressed with renewed effort to form strong regional transmission organizations, especially in the Northwest. Regional transmission organizations would allow balancing authorities to share the resources (including spinning reserve, transmission infrastructure, and generation planning) within their boundaries and to maximize the resource in the region. There is an energy imbalance market, related to the Western Governors' Association Regional Transmission Expansion Program, and a more local model of this approach may be applicable in place of a wider regional transmission organization process. Local energy imbalance markets would also enable entrepreneurs to offer balancing services.
- One regional solution to transmission issues would be to focus on education. Southwest representatives, for example, felt it would be beneficial for WPA to understand current regional transmission issues (e.g., proposed lines, routes, etc.) so that WPA can assist in addressing the need for education. Education is needed for the public, developers, and those involved in regional and sub-regional planning activities. Information should be easily accessible and understood by a broad range of individuals and organizations, which is not the case now due to the complexity and size of the issue in the region.
- Another way to address this issue might be to work with people from other technologies in the renewable energy community and band together as a consortium behind transmission. Transmission issues are not limited to wind energy.
- Continued work on economic development models to show how transmission contributes to economic development in communities could be a tool for educating those working on transmission issues.

2.2.4 Lack of Education and Need for Engagement

As nascent industries mature, the support or opposition they receive from the general public and the environmental community has a direct correlation to the long-term success and viability of the industry. Negative attitudes about industries can develop well in advance of any proposed projects if communities have not had the opportunity to receive factual and unbiased information regarding the industry.

The wind industry is maturing rapidly, and wind projects receive increasing attention from the environmental community and the general public. Unfortunately, not all of this attention is supportive of the industry. While some communities and states embrace wind power as a powerful economic development tool and symbol of energy independence, concerns and misconceptions about wind energy still abound among key stakeholder groups, including citizens, media, utilities, local governments, and local communities. The need for on-the-ground education and stakeholder engagement is ever-present as the wind industry continues to grow and develop. Proactive education is needed to lay a solid foundation of wind energy understanding and to dispel common myths and misconceptions; additionally, reactive education is needed to address issues and concerns that arise in response to specific projects and/or proposed developments. Both approaches are important to the long-term success of the wind industry.

In addition, the environmental community can heavily influence public opinion, so it is imperative to proactively address the concerns and issues raised by this group. A coordinated, multi-layered, regional engagement program for the environmental community and the general public will help foster continued growth in the wind industry and prevent significant backlash or inappropriately negative perceptions about wind from taking hold in communities across regions and the country.

2.2.4.1 Aspects

The following is a sample of aspects of this barrier identified by regional breakout session participants:

- When engaging any population, it is important to understand the demographic. Information about the people who live in a certain area and the issues they encounter will help tailor available information to meet their needs. Individuals in a community have varied experiences and understanding of wind energy. Providing different levels of information (i.e., basic, intermediate, and advanced) will simplify the transfer of information and meet multiple needs.
- Provide various ways to access wind energy information. Most information can be found on the Internet, but approximately one-fourth[7] of the U.S. population does not have Internet access, and many people with access are not comfortable using it and place a different value on information provided via that media. Attending agricultural events and working with leaders, residents, and respected individuals in the community can help disseminate information to interested parties.

[7] www.internetworldstats.com/am/us.htm

- Credible information is essential to acceptance. The National Renewable Energy Laboratory (NREL) is generally seen as a credible source, while the integrity of sources such as the American Wind Energy Association and other industry members will be questioned. The media have a tremendous influence on public opinion, and the media also have a regional element.
- Each state within a region can be vastly different from one another in terms of politics, culture, regulations, utility framework, land uses (and land ownership), and dominant ideology. Therefore, within each region the need for state-specific outreach efforts and support is absolutely critical to addressing the range of deployment issues.

2.2.4.2 Potential Solutions

Participants identified the following potential solutions to a lack of information and need for engagement:

- Increase accessibility to credible data.
    - Implement search engine optimization techniques for credible documents so that they will rank high in search results.
    - Information contained within power purchase agreements and other project documents is proprietary; enable greater transparency so individuals can better understand and value project information.
- Develop a "wind truth" website to counter misinformation and help users navigate through available data and information.
- Target young people and young decision-makers to support wind and clean energy and foster workforce development. Use polling and surveys to learn which messages work.
- Explain the relevance of wind and how it is important to rural populations.
    - What does 20% to 30% wind energy by 2030 look like?
    - How does wind energy affect water and other externalities?
    - Develop models that allow economic benefit to more than one stakeholder.
    - Explain energy independence and security on a local and state basis.
        - How can wind compete with coal combined with interstate competition?
- Research how people engage with wind and develop better outreach models.
- Partner with organizations such as 25 x '25, 4H, agricultural radio stations and networks, agricultural extension groups, Future Farmers of America, National Association of Farm Broadcasters, National Rural Electric Cooperatives Association, and state rural energy offices.
- Help rural electric cooperatives understand how they can financially benefit through the development of models and incentive programs.
- Bridge the urban-rural connection through sister-school programs.

- Informational organizations (like WPA) need to take better advantage of social media and advances in communications technology, including:
    - Utilize Facebook, Twitter, YouTube, etc. These are the best and least expensive ways to spread the wind energy message.
    - Develop an American version of the Danish Wind Energy Association's Wind with Muller project. There are no readily available counterparts to this in the United States, and it would be a valuable tool for K-12 education.
- Develop better media tools for the industry.
    - Develop a portal of easy-to-access materials to assist organizations with making presentations and to explain wind power more effectively. Include a photo bank of all aspects of wind power projects.
- Create a repository of case studies related to wind power and all the associated issues. Include all Wind Energy Applications Training Symposium presentation materials.

2.2.4.3 Regional Solutions

Given the convergence of the aforementioned regional aspects, a regional communications effort will help effectively foster acceptance and understanding of the wind industry and lead to more successful projects. Attendees identified the following best practices to be incorporated into the effort:

- Identify the target audiences and develop an audience database by state and by region (noting congruence wherever possible).
- Identify all media utilized by the audiences, with a special focus on social media.
- Develop the communication channels, processes, and messengers necessary to reach the media, with a special emphasis on Internet videos.
- Develop key messages to be delivered by the messengers via the processes and channels, with a special emphasis on weekly talking points.
- Provide technical support to assist in the development and delivery of the messages. (The WPA staff has traditionally provided this key element.)
- Implement a process for monitoring the messages as they travel through the communication channels (a media monitoring service).
- Implement a process for adjusting messages that did not travel through the channels intact (usually an analysis of the monitored media followed by an iteration of the messages).

Attendees noted that these best practices create a two-way engagement and education campaign that is proactive and reactive. When implemented on a regional level, it allows for messages that are:

- Based on the common environment
- Coordinated across states

- Consistent across states, thereby creating a regional movement that delivers targeted and consistent messaging and information (which will help minimize confusion and information overload).

Attendees also noted that message consistency is critical in any education effort. Messages that are not consistent are not absorbed and adopted by the public. Messages cannot be consistent unless they are coordinated. To achieve any degree of success, it is absolutely critical that the messages and the messengers:

- Are verifiable. People may not readily internalize or adopt messages that are not verifiable, and it is important that solid information is presented.
- Are trusted. People generally do not adopt information from sources they do not trust.
- Are accurate. People generally do not adopt information they believe is inaccurate, but it can be very hard for lay people to determine accuracy.
- Have integrity. Media with integrity will not publish information from sources without integrity.
- Are fair. Although both sides of an issue should be examined, the quality of the information on both sides should be based on the same standard, ensuring the same level of scientific quality. Additionally, the magnitude of the impact should also be assessed and described. It is unfair to the people in the community who support a project if a vocal minority dominates the news coverage.

Developing a regional stakeholder engagement program that incorporates the best practices outlined above would require the following elements:

- Identification of the region to be served and the states and local jurisdictions within the region. For example, potential regions could include the Great Basin or the Southwest with their unique mountain and range topography, as compared to just political boundaries.
- Identification of an existing regional organization that has credibility with the environmental community and the general public (e.g., the Western Governors' Association, one of the most trusted organizations in the West).
- Creation of a regional entity to act as the outreach program manager. This entity develops and executes the campaign and reports to WPA (and, for example, the Western Governors' Association).
- Identification of trusted, non-biased, third-party state and local entities that would work with the regional entity to deliver consistent, coordinated messages, such as state energy offices and state-based clean energy advocacy organizations. These organizations have credibility and existing outreach programs that could be expanded to include the regional messages. They also have existing outreach media channels that could be leveraged. The state entities would work with the regional entity to deliver the proactive messages that are monitored and adjusted by the regional entity.

2.2.5 Social Acceptance Issues

Social acceptance barriers involve many members of the community, including neighbors, local industry, and the general public. People in communities where wind projects are being developed must navigate a lot of information to determine the project's impact and whether that impact is acceptable. When provided with credible information on concerns such as environmental impacts, costs and benefits, safety, flicker, noise, and other possible impacts, it is easier to make a well-informed decision. Local, public support or opposition is a determining factor in wind energy development. An important distinction when approaching the opposition is position versus interest. Immovable opposition may be a result of the scale of the landscape change associated with wind energy development and fundamental distrust of the process.

2.2.5.1 Aspects

The regional meeting attendees identified three audience groups for social acceptance issues:

- #1: *Supporters* are open to or in favor of wind power or a particular wind project. Supporters tend to be local, progressive, property rights advocates, environmentally motivated, and supportive of economic development. In many cases, they see wind development as a way to support rural communities and farms that are in decline. Supporters are generally few in number at the onset of project development and may not be as vocal about their views as opponents, stemming from a desire to allow the community to assess its own path forward.
- #2: *The undecided* wonder, "What's in it for me?" and "What impact will it have on me?" People in this group can be easily influenced to move into the other audience groups. This group is large and often includes potential lease holders, elected officials, those who are ambivalent to the area or local issues, or people who hold strong local ties but understand that the community is being impacted by energy alternatives. They are not sure whether wind development is a potential solution.
- #3: *Opponents* represent a wide range of viewpoints, from people who are skeptical about development or the companies that are proposing development to those who are ideologically opposed and don't perceive benefits for them and/or the community as a result of the project. The drivers for this group can also include supporters of the "character of place" of local communities: long-time residents or people who have moved to the area because of the local conditions, which they feel will be negatively impacted by wind development. Many support the development of wind and other renewable technologies but feel their community should be exempted from development impacts. In many cases, opponents may use information about potential project impacts that is not scientifically justified or is sensationalized. Opponents may cite examples of poorly developed projects and argue against any proposed project development.

The proportion of the population in each category can be illustrated using a standard bell curve, in which the Y-axis is the number of people and the X-axis is acceptance level. Audience groups #1 and #3 occupy the tails of the bell curve while group #2 occupies the middle and majority of the area under the curve.

According to the attendees, issues relating to social acceptance include:

- Public officials generally lack knowledge of many power sector and utility issues, leading to confusion regarding which information is credible and/or appropriate for consideration. There are also many competing interests for the time and attention of public officials and regulators.
- There is a great deal of misinformation, mal-information, and misunderstanding about wind technology, and it is often propagated and used out of context.
- Opposing forces are powerful. Examples: Public Action Committees producing "bad wind" public service announcements in North Carolina and professional real estate associations banding together against turbine deployment on ridges.
- There is a lack of outreach by pro-wind organizations, especially around projects that can be used to counter largely grassroots, local opposition.
    - Can this be "solved" by tying private developer funding to outreach; e.g., Gamesa-"branded" Wind for Schools projects in the region?
    - Funds for outreach are poorly coordinated. A new regional model would help support development of regionally consistent informational resources.
- Many supporters are unable to explain the fiscal hedge that wind can provide to municipal power, small cooperative energy groups, or individuals interested in distributed generation.
- The potential for local jobs and wind business expansion is not well understood; these could be key concepts to emphasize with public officials.
- Some view wind energy development as a politically partisan issue due to its green and renewable labels. However, many wind energy issues are non-partisan, such as rural economic development, property rights, energy security, stable energy rates, personal responsibility, and open market policies. All parties must engage in the dialog because the development of the market crosses most political boundaries.
- There are few credible subject matter experts with relevant credentials who can be called on by local communities and no way for decision makers to identify and contact these experts.
- People often view wind power as new, different, and in many ways foreign; this leads to suspicion and a willingness to accept some of the seemingly outlandish claims made by opponents.

2.2.5.2 Potential Solutions

Participants expressed that approaches to each audience group should be tailored to address each group's distinct position and motivations. Identifying the players in each group is an important first step. Ongoing efforts continue with the objectives of retaining and building the strength of supporters in group #1, taking steps to influence the undecided in group #2 and the detractors in group #3 to become supporters, and diffusing the influence of detractors in group #3. A successful approach is greatly assisted by the developer having a "good neighbor" policy and sound understanding of local and state laws governing zoning.

Participants stated that for all groups, outreach efforts need to begin early and in an open fashion, either through community meetings or market conditioning activities like Wind for Schools

programs at local schools, which can be good vehicles for advancing the social acceptance of wind energy early in project formulation.

Approaches for supporters (group #1) include:

- Ensure supporters have at least a minimal level of information about the wind project so that they can be credible advocates.
- The project developer or a credible third party should organize the supporters and keep them engaged.
- Identify local champions with strong influence and social connections.
- Encourage local economic development planners to complete economic analyses (tax revenue) early even if results are preliminary. It's important that local governments or a trusted and neutral party generate the analyses.
- Help supporters to assume a moderate, rational approach so that project benefits are not overstated, which could result in lost credibility.

Approaches for the undecided (group #2) include:

- Be sure to prepare an answer to the question, "What's in it for me?" and make sure the local benefits are clear.
- Be the first to answer the question, "How will this impact me?" If proponents do not answer the question, opponents will, and they may provide misleading information without relative context.
- Approach the undecided early and maintain contact. A consistent presence through a "drip campaign" (website, landowner groups) is important.
- Rely on trusted third parties to generate and deliver information. Best sources of information include WPA education infrastructure, the local university, peer-reviewed information, and best practices.
- Be honest and transparent, and have an open-door policy. Recognizing legitimate concerns is important. To the extent possible, make information readily available, and use models so that people understand how wind turbines work.
- Organize wind farm tours for experiential learning. If tours are not possible, bring the "wind farm" to meetings by inviting former or current county managers, public officials, and stakeholders from places where wind power has had a relevant impact.
- Invest in surveys during the planning stage to understand local sentiments and concerns and provide information to the undecided.
- Undertake a broad and strategic communications effort, leveraging information distribution opportunities. This could include social media if dialogue can be guided or moderated.
- Encourage the use of novel leasing mechanisms (i.e., pooling) and pursue full or at least partial disclosure of lease agreements.

Approaches to move opponents (group #3) to supporters or at the very least limit their influence include:

- First, in many cases the opponents have real concerns leading them to oppose the project, and these must be acknowledged and addressed to the extent possible. Additionally, the project's implementation will have impacts on the community, which must be openly discussed early in the project.
- "Free rider" opponents are against the project because they receive no direct clear benefit yet feel they will be negatively impacted. For these opponents, explaining financial pooling and how financial compensation through local payments will impact the community may influence them to become supporters.
- One-on-one conversations, especially between the developer and detractors, are critical for determining the real issues and addressing those concerns.
- Understand and educate others about laws governing zoning (i.e., zoning can be used to protect health and safety and not to ban wind).
- Identify individuals who are ideologically opposed and "out" detractors who are not local or who receive benefits for opposing the project.
- Decide on a strategy to deal with misinformation and respond in a controlled way. Address misinformation point by point in public meetings. Address the larger issues with correct information. Address these issues before inaccurate information becomes a mainstream consideration.

Many tools and methodologies to help address the issues that are introduced in this section have already been discussed in the Potential Solutions section of the topic, including Lack of Education and Need for Engagement (Section 2.2.4).

All breakout session participants stressed the need for credible, unbiased, and accessible information for the public, stakeholders, and decision makers as critical to the acceptance of a project and of wind energy in general. A database of information summarizing the experiences of different stakeholders would be helpful. Information could be collected with a survey and be utilized for planners and other organizations such as planning boards, governors, utilities, and others. It could be a place where people could connect with experts who could provide appropriate information for the decision-making process. Outreach is another way to address social acceptance issues. Credible, unbiased information is important, but the next step is getting the information to those who need it. Targeted surveys with follow-up responses and meetings that bring together proponents and opponents are a few examples of ways to educate people on wind energy topics. Other options would include expanding stakeholder collaboration with appropriate national, regional, or state organizations, such as through pro-renewable wildlife associations or community development organizations like the Rotary Club.

As mentioned above, the information provided to stakeholders and decision makers should be based on impartial research. With increased funding challenges, it is important to look at other organizations, such as the National Institute of Health and the National Academy of Sciences, to see how they are able to conduct independent research with industry funding. Regardless of the

funding sources, more credible studies, including examining the actual impacts of wind development in the regions, will be important.

Developing local dialog would also be helpful in the discussion and development of projects, as would developing some methodology to bracket impacts, potentially geographically, to provide a better understanding of project impacts and benefits. This could also be expanded to consider the development of standard guarantees for abutter incentives, a process in which local standing and project proximity is weighted in the development decision process. A methodology to assess local ordinances and education around the development of ordinances or county bylaws would also be helpful.

Other potential methods to address stakeholders include:

- Better articulate the benefits of wind energy, including:
    - Explain wind energy's fiscal hedge using present value analogy; local proponents need a better way to explain fiscal arguments and in a language that the local public officials and decision makers can understand. The fully burdened cost of energy should also be part of the discussion with decision makers and regulators.
    - Advocate for decisions to be based on analysis from a level playing field that includes all aspects of generation, cost comparison, water use, local jobs, local economy development, and simple environmental comparison, not including potential carbon impacts but known impacts of other energy generation: fly ash accumulation; nuclear contamination, security, and proliferation; and oil spill damages.
    - Explain the national security benefits of wind, homegrown energy that does not support foreign governments ($1.2 billion of imported fuels for energy generation).
    - Know what topics resonate in which regions and target these (e.g., land rights in the Northwest and Southeast).
- Pre-package programs for stakeholder groups.
- Leverage state university system "workforces" to get undergraduate and graduate students involved (academic support, well-reasoned science are hard to overcome in arguments).
- Address limits of power purchase agreements and equipment lease shortcomings in local and state regulations.
- Address workforce development needs on a regional basis, including:
    - Certification programs
    - Training workers for multiple projects
    - Addressing ways to make sure jobs at wind sites stay local and companies don't import labor for long-term operations.
- Develop better ways to explain the cost and impacts of buying energy across state lines.
- Expand ways to explain complementary technologies (e.g., solar, wind, natural gas, etc.).

- Explain subsidies such as the Production Tax Credit for wind and the other subsidies that oil and gas receive.
- Transition the conversation from 1-year or election-cycle fiscal planning.
- Be aware of political "stakeholders" and politicians.
    - Read their bios.
    - Understand who has funded their campaigns.
- Provide hardcore and defendable economic analysis of specific projects and different energy choices.
    - Use footnotes and disclose the source of the assumptions. To further educate readers, full disclosure is best.
- Consider utilizing advanced mapping and analytics to provide better tabular data, mapping capabilities, and visualization of wind power in the United States.

2.2.5.3 Potential Regional Solutions

Attendees identified the following regional-based solutions:

- Several regional actions should be implemented simultaneously with the audience-specific approaches described above. Regional studies, including local economic impact and property values, are important for informing the debate. These studies should include economic impacts of the project on taxing bodies, school districts, and employment and should inform best practices for the project. Process development studies should also focus on types of development projects in the state or region to understand the project life cycle and to develop good processes and controls. To ensure that the value of regional studies is realized, there should be a master plan in place and necessary analytical infrastructure to receive and manage incoming data. It is also important to ensure studies are conducted by a trusted source (national laboratories, universities, non-government organizations).
- A project in Michigan yielded several lessons, such as how working early and often with town and county residents during the development of a large wind project was a successful approach. Most critical for success was early engagement of the public for large community meetings. The company invited area leaders from businesses, Future Farmers of America, churches, and the community and began a listening tour. The metric used was cups of coffee per megawatt, and the extensive outreach effort worked.

2.2.6 Lack of Funding for Stakeholder Engagement

Meeting participants identified funding for stakeholder outreach and education as very important to continued wind development. The federal government has traditionally funded research, development, demonstration, and deployment for other energy technologies, and meeting participants questioned why the U.S. government doesn't adequately fund social acceptance work for wind energy and whether other organizations could fund these efforts.

2.2.6.1 Aspects

Attendees identified the following aspects of the lack of funding for stakeholder engagement barrier:

- In general, there is a lack of funding to support wind development.
  - There is a disconnect between real needs and resources provided from the federal government, states, and foundations. Wind development isn't seen as a critical part of the larger agenda to "green" the nation.
  - Baseline funding is needed to support the general activities, opening the potential to leverage other funding sources that may become available. Without the base, it is impossible to find the leverage.
  - Many states are not prioritizing wind development because of limited resources. States may view development of this new industry as a federal responsibility.
  - The current economic situation is a barrier and a talent drain as human resources are recruited to work elsewhere, both domestically and internationally.
  - Raising funds requires employee time and effort, and new funding sources take time to develop.
  - Some state representatives are concerned about the regional approach and whether funds will be shared equally among the states. If divided unequally, on what basis would this division be made? Would this unfairly benefit specific states?
- Without funding, there will be no stakeholder engagement or educational programs. Individuals and organizations working on these issues will move on to other work that is funded.
  - Without active stakeholder engagement, the void of factual information will be filled by misinformation (or in the worst-case scenario, mal-information).
  - Education is important for raising awareness.
- The wind industry is new, competitive, and perceived as biased and thus cannot solely support outreach.
  - Unlike the fossil fuel industry, the wind industry is a new industry that has not yet formed an alliance to market itself. One non-profit in the discussion has attempted to secure funding from the largest developer in the state but was informed that there would be no funding support as the company believed that funding of the non-profit would "enable other developers" to take advantage of the work accomplished.
  - Industry is better able to control the work and product outcome with money that is kept in-house. Money given away to outside organizations is uncontrollable.
  - Although understanding the need for general market development, industry partners must keep projects and proprietary information confidential, limiting their ability to support specific outreach.
- There is a need for a credible messenger and message.

- If the industry funds stakeholder engagement, the message is more suspect and is not viewed as objective. According to one participant, "When we say we are federally funded through a national laboratory, the education we provide is seen to be unbiased and more reliable."
- The group discussed who might be a trusted messenger as it is important in seeking funding. Some believed that the industry was a trusted messenger (mostly WPA staff), and others that the government was a more trusted messenger. As the group was unresolved on this issue, it was suggested that DOE conduct polling to determine the public trust level for an industry-funded or government-funded educational campaign. The results will inform how to continue to fund wind energy outreach and education.
- Industry and the DOE have different goals. The DOE has a national view, trying to understand national impacts and benefits, while industry develops projects with limited local challenges, forgoing regions with the most difficult challenges.
- State activities, wind projects, and the results of any studies could be viewed as tainted if funded by industry because they wouldn't be viewed as coming from a credible source.

- A diversified funding group would restore objectivity and communicate to a broader stakeholder/beneficiary group. Potential funders include:
  - Private citizens
  - Utilities
  - Federal governments
  - State or local governments
    - States are slow to transition away from old perceptions and beliefs about what type of energy they use (e.g., "Virginia is a coal state").
    - Tight budgets limit travel, making coordination between entities difficult.
  - Wind industry
    - Foundations generally focus on large climate change policy, not specific energy-related solutions.
  - Advocacy organizations
  - Tribes
  - Unions
  - Foreign investment
  - Outdoor industry (to improve green imaging).
- The "green movement" has been a long-standing supporter of wind energy, but the Nature Conservancy and other environmental organizations are starting to discuss wind development and other renewable energy systems in terms of "energy sprawl." If this issue is not quickly discussed and addressed across the country, wind energy's best supporter could become its downfall.

2.2.6.2 Potential Solutions

Participants discussed possible ways of acquiring funding for outreach and education as well as alternative ways of educating people. They also mentioned that credibility is an important factor in the information used to educate people and organizations. Improving the credibility of information would be important for continued outreach and education efforts.

- Pursue potential avenues for funding stakeholder engagement and education, including:
  - New funding strategies from the potential funder list above
  - New taxes to fund wind energy development
  - Funding from Supplemental Environmental Programs (pollution fines) to support educational work
  - A systems benefit charge on utility bills
  - Multiple funding sources to leverage funding
  - American Wind Energy Association
  - Department of Education, Department of Commerce
  - Funders with a vested interest in the benefits that wind energy offers to specific ecosystems (e.g., water) or who do not want to see other types of energy developed.
- Find links and alignment between the objectives of existing funding sources and wind energy.
- Implement more efficient outreach (e.g., using tools such as webinars to maximize impact, peer-to-peer outreach) while recognizing the value of bringing in experts. Outreach and education shouldn't be constrained to turbine installation. On-the-ground results are needed to justify continued investment in outreach.
- Implement challenge grants to help raise funds. Current funding sources may need to be adjusted to allow challenge matching.
- Contrast investment in local wind energy jobs with investment in importing coal power from out of the area. Demonstrate wind energy's value through manufacturing opportunities and real employment income as compared with the alternatives.
- Leverage NGOs, universities, and other funding sources.
  - Start funding soft and hard resources.
  - Leverage private funding (i.e., membership dues from developers to help promote the wind industry).

Participants repeatedly discussed the issues of funding and credibility. Even with reduced federal, state, and local funding, the wind industry is rapidly becoming one of the most promising sources of funding. However, organizations that access this funding tend to be viewed as biased by the people they are trying to educate. Examples exist (e.g., in Maine) in which developers provided funding to county governments to conduct their own studies with no strings attached; however, this approach only works on a project-by-project basis. One of the key

approaches to address this issue is the need to isolate the funding source from the outreach efforts. Attendees discussed two options, both focused on funds consolidation.

- Industry funds are channeled through a third party to fund research; the industry writes a check and walks away with the process.
  - The third-party organization would need strong name recognition and a solid reputation to gain credibility with the public and the wind industry.
  - Funding would likely need to be separated from developers and projects, with only the third-party organization knowing which sources were used to fund studies.
  - Examine current models, such as Maine.
- An organization performs the research and administers the funds under a steering committee representing all states and all interests.
  - This scenario requires less direct infrastructure development.
  - It is more difficult to clearly demonstrate the objectivity of the studies because they are performed in direct support of the industry.
  - Steering committee members must be impartial and thus independent of the industry; however, this makes it difficult to find experts, other members, and industry funding.

In both of these cases, participants asked which organizations could fill these roles. Several suggestions include academia, regional or national science organizations such as the Union of Concerned Scientists, national laboratories, or a completely new group modeled after the American Wind and Wildlife Institute.

2.2.7 Few Financing Options for Small and Community Wind

Community and small-scale wind projects face challenges not applicable to larger-scale development. The small and community wind market is limited, with the lack of funding and market motivations leading to a depressed market.

2.2.7.1 Aspects

Participants stated that a strong market is needed to attract financing, and this requires financing (the classic chicken vs. egg problem).

- Transaction costs/risks are high and are not really discounted for smaller projects.
- Contract risks exist (i.e., utilities enter into contracts but require flexibility or escape clauses).
- Utilities are reluctant to deal with community-scale projects (higher transaction costs, smaller and more numerous projects). There are no drivers or a legal framework to force utilities to engage.
- Net metering laws have limits, some of which can be very low. This is sufficient for small-scale residential applications but doesn't incorporate larger projects, such as those for schools or other institutions interested in installing larger turbines. Raising the limit, even up to 100 kW nationally, would create incentives for more small wind projects.
- Poor size and cost options exist for the mid-size turbine market.

2.2.7.2 Potential Solutions

Participants identified the following potential solutions:

- Educate utilities via focused outreach to change their perspective on community wind.
- Regional aggregation of projects or the development of community wind cooperatives aggregates a number of the fees and activities. This umbrella structure might facilitate sharing (e.g., could happen under the Midwest Independent System Operator).
- Develop a process so that municipalities in poor resource areas could work with the independent system operators, allowing the municipalities to import power from outside of the area with a better resource. This entails technical assistance to municipalities, policy change, and outreach about economic benefits, financing, and aggregation.

2.2.8 Wind Integration Issues

The group discussed the fact that integration issues cover a myriad of topics, and it is of utmost concern to utilities. The group felt that while WPA-funded people can provide fundamentals on integration issues, it is too much to expect that they would be expert enough in the technical issues to contribute significantly on this issue in their states. Participants identified three main areas of support:

- WPA state representatives should understand how to counter the basic arguments raised about integration costs.
- There is a need for one-to-one backup by energy professions identified by the program or through other partner organizations like the Utility Wind Integration Group.
- State engagement individuals must be equipped with NREL materials on current studies about integration costs.

2.2.8.1 Aspects

Participants identified the following aspects of the barrier:

- There is no regional approach to producing energy.
  - Lack of regional coordination and resources
  - Increasing energy demand
  - Growing integration problems with increasing penetration of renewable energy.
- Fragmented jurisdictions cause coordination problems inhibiting integration. (For example, there are three major interconnects in the United States: Eastern, Texas, and Western. Unlike the federal highway system, the transmission system has been developed piecemeal with multiple balancing authorities, 34 of which cover the western part of the country. Efforts to consolidate the fragmentation through development of regional transmission organizations failed in the Northwest after 10 years of effort. There is currently a regional transmission organization in California and the Midwest.)

- Lack of utility resources and competing priorities affect how much time utilities can devote to understanding and accepting wind.
- There is a lack of uniformity in operation procedures and standards.

2.2.8.2 Potential Regional Solutions

Participants believed that integration issues can be addressed with large-scale policies. Variable resources like wind benefit from geospatial diversity because wind regimes in different areas have different patterns that can sometimes be used to balance the grid if linked. Protectionist policies don't recognize this need and don't allow balancing at the regional level or even national level.

Technology can help integrate wind into the system at a local level. Storage techniques or buffering techniques can be used, like electric cars (batteries can be used to store power). Battery power can be used to store off-peak energy. In Hawaii, batteries are used to buffer huge output swings in a 1.2-MW solar farm. Demand response also uses a variety of technological tools that can help smooth out the power variations found when considering variable generation technologies such as wind. The concept of demand response uses the ability to control loads to help stabilize fluctuations in load as well as the response of other generation sources.

A solution to lack of uniformity in operational procedures/standards is to emulate the American Board of Code and Standards developed for the solar industry. Adoption of a national clean energy standard would address the current lack of national energy policy. A potential solution related to the Southwest that could be applied nationally is the concept of a Regional Utility Integration Center that would:

- Provide training on integration and other technical issues to WPA state and regional partners to make them more effective.
- Work with Power System Engineering Research Center universities to create and deliver training to operators on wind integration issues.
- Encourage more universities to join the Power System Engineering Research Center to enable training to more individuals.
- Encourage each utility to conduct wind integration studies to determine accurate costs.
- Encourage the use of Western's Electric Power Training Center to train operators.
- Add an integration module to existing curriculum.
- Motivate utilities to send their employees to wind power and operation training opportunities.
- Develop and deploy integration study curriculum.
- Partner with utilities on in-house trainings.

Some potential solutions that are outside of the purview of more general program activities but are worth mentioning include:

- Modify the existing law that utilities submit an Integrated Resource Plan to the power marketing agency and require that they participate in a regional resource plan developed by a power marketing agency.
- Create a regional power planning council that could assist in utility, state, and regional integration issues.
- Complete the second tier of study work resulting from the Western Wind and Solar Integration Study.
- Educate utilities and Public Utilities Commissions on the role that wind can play in the national energy portfolio.

2.2.9 Difficulty Working on Federal Lands

A large amount of land is under federal control, especially in the West (for example, more than 80% in Nevada). For this reason, most large-scale wind development will require access to or transmission across federal lands. Therefore, working with federal land managers is a requirement but also a time-consuming and difficult process that has slowed wind development across the West.

2.2.9.1 Aspects

Participants identified the following aspects of this barrier:

- A lack of consistency among Bureau of Land Management offices
  - Offices have differing approaches and requirements for implementing the National Environmental Protection Act, as well as different methods of addressing potential impacts to threatened and endangered species.
  - Different offices have unique cultures and interpret policy differently.
  - Interagency collaboration to address jurisdictional boundaries is limited.
- Transmission
  - Permitting is difficult, especially when multiple Bureau of Land Management offices are involved.
  - Rulings vary among locations.
- Tribal lands
  - Tribes are sovereign and typically desire to maintain some ownership rights for projects developed on their lands.
  - Leadership changes frequently.
  - Tribes typically lack access to capital for projects and cannot benefit from federal tax subsidies such as the Production Tax Credit.
  - Combined with the needs of transmission and lack of access to tax benefits, few projects are economically viable.

- Projects on tribal lands require approvals from the tribes and the Bureau of Indian Affairs, which can slow projects dramatically since the Bureau has limited wind development experience.

2.2.9.2 Potential Regional Solutions

Participants identified the following regional solutions:

- Address federal lands issues within a regional context.
  - Use mitigation banks to address eco-regional issues instead of within a specific office.
  - Conduct regional workshops and trainings with federal, state, and local agencies, developers, NGOs, and environmental consultants. As appropriate, other state and local regulatory agencies should be included in local discussions.
    - Share information regarding solutions from different locations.
    - Expand education of development on federal lands.
    - Train agency staff on technologies and impacts.
    - Educate developers on the National Environmental Policy Act and other permitting constraints.
- Develop regional databases. Solicit NGOs and private entities to share information, such as studies, environmental impact statements and environmental assessments, and mitigation strategies.
- Include tribes (this is probably too large an issue for state WPA groups), and involve tribal members in the process earlier. Tribes may be potential stakeholders on regional workshops and trainings.

2.2.10 Technology and Regional Competition

Competition among technologies and across state boundaries can negatively impact the industry, with specific segments of the market siphoning off resources that could be used for wider stakeholder development activities. Representatives from the Mid-Atlantic, Southeast, and Northeast regions discussed this in the context of developing the offshore wind market, and representatives from the Great Lakes region identified competition around wind equipment manufacturing.

The development of offshore wind has the potential to detract from land-based wind development as policy makers and the public see the potential that offshore wind could provide without understanding that it may be many years away. With a shift in focus to offshore wind, there could be misconceptions regarding jobs, economic development, and near-term market opportunity. Offshore wind has viewshed and other social acceptance advantages (it is less likely that people will complain about a project 20 miles from the coastline), but it comes at a penalty of higher relative cost and larger permitting challenges. Another casualty is that those promoting offshore wind may downplay the advantages of land-based wind in the pursuit of expanded offshore wind development. The solutions to this potential barrier lie in perceptions. It is

important to keep perceptions of land-based and offshore wind in line with market reality. Another suggestion is to view land-based wind as a step to offshore.

2.2.10.1 Aspects

Participants identified several aspects to the issue of competitions among states, including:

- State representatives are focused internally and want economic development to happen in their own states.
  - There is a fine line between a state's interests and regional cooperation.
- There is a lack of overarching federal guidance. A shared vision and necessary financial provisions are needed.
- Governmental policies can be for or against other states (i.e., feed-in tariffs).
- Politics must be transcended to address issues.
- Each state has different public power methods and considerations.
- States and utilities view adders such as fuel adjustment charges differently.
- The load and the resource must be identified.
- Manufacturing is a regional issue.

2.2.10.2 Potential Regional Solutions

Meeting participants identified the following possible regional solutions to competition:

- Expand economic modeling to be more regional in nature instead of state-specific.
- Highlight positive impacts and benefits of a regional approach to manufacturing and the associated development.
- Improve communication among different regional federal agencies and local groups to allow better discussion and quality dialogue on regional issues.

2.2.11 Environmental Impacts

Participants in all of the regional meetings discussed wind energy's environmental impact issues, but the topic was not addressed in a breakout session outside of the context of education. Meeting attendees did not highly rank the direct environmental impact or associated issues of getting wind plants approved based on their environmental impacts in any region of the country. This was surprising, especially in areas where environmental issues are preventing wind farms from being developed. It should be noted that these meetings were held prior to the general industry understanding of the potential impacts of the new U.S. Fish and Wildlife Draft Eagle Conservation Plan.[8] Additionally, project developers only comprised about 10% of the

[8] www.fws.gov/windenergy/eagle_guidance.html

conference attendees, and although they may have felt strongly that environmental issues were critical, they were too small a percentage of the total participants to raise the issue's ranking.

2.2.12 Poor Understanding of Wind Resource and Potential

A poor understanding of a region's wind resource can stem from the lack of on-site measurement using tall towers, specifically in parts of the country where taller towers will be needed to develop wind, such as the Mid-Atlantic, Southeast, and many areas of the Midwest. Regions may also lack offshore data collection. Data collected by private wind development companies from on-site tall tower measurement remain private information. If the policy makers are to better understand the wind resource, more data must be available in the public domain.

Wind maps help estimate wind resources, but they rely heavily on modeling tools and estimations. The wind maps provided to the public by NREL and AWS Truepower are mainly based on low-to-the-ground atmospheric data stations and national-level meso-scale modeling tools. The maps were developed by projecting wind speeds at each station to a determined map height based on observed wind shear exponents or an exponent derived from modeling or estimated from regional experience and local land cover. Because of the lack of on-site tall tower testing in the Mid-Atlantic and Southeast regions of the United States, the wind shear exponent used in the models do not always reflect actual boundary layer flow or spatial and temporal correlation.

Additionally, to find the potential wind capacity numbers for each state, a factor of 5 MW per square kilometer has been historically applied to the amount of land with winds strong enough to generate utility-scale energy. While this factor is practical for wind generation on flat, open land, for ridge tops, like the Appalachian Mountains of the Mid-Atlantic and Southeast regions, it is more appropriate to estimate wind power capacity with a factor of 15 MW per mile. The capacity numbers also exclude many areas that would be suitable for development, such as forest areas. For these reasons, the potential capacity figures for each state, and especially for the Mid-Atlantic region, may be very conservative estimates.

The Mid-Atlantic and Southeast regions lack the resources and funds for a large-scale study to collect raw data using taller towers or remote sensing. However, in the past, anemometer loan programs using shorter towers, typically up to 30 meters, have helped the region understand the wind resource for small wind applications. They have also been able to access expanded modeling programs based on work performed by organizations such as the Environmental Protection Agency and the National Oceanic and Atmospheric Administration.

2.2.12.1 Potential Solutions

Attendees identified several actions to overcome this barrier.

- Implement an expanded wind measurement campaign that includes measurements above 50 meters using taller towers, existing communications towers, or remote sensing. This data would be part of the public domain to be shared with state representatives, local governments, and utilities.
- Because of the large expense of remote sensing equipment, regions could purchase LIDAR or SODAR units for each state to share. This technology would allow more areas to be tested,

resulting in a better understanding of the wind resource for the region. However, if remote sensing equipment is implemented, there should also be a campaign to encourage banks to accept remote sensing data when considering financing for future wind projects. As part of the campaign, it would be beneficial to work with the wind industry to obtain and validate data, tools, and technology.

- Summarize the roles of the individual states in contributing to the 20% Wind Energy by 2030 vision and communicate these roles to influential stakeholders.

2.2.13 Barriers to Small and Distributed Wind

Participants discussing barriers to small and distributed wind defined small wind as less than 100 kW and distributed wind as greater than 100 kW.

2.2.13.1 Aspects

Participants identified the following barriers to small and distributed wind:

- Few available financing options
- Expensive turbine costs
- Lack of incentives at the state level
- Limited market for small wind
- Issues with interconnection agreements and net metering laws
- Co-op resistance to customer-owned generation
- No requirement for the inclusion of wind energy in a state's energy portfolio
- Resource variability
- Limited or no certification of turbines, components, contractors, and installers
- Need for resource assessment that includes site-specific analysis
- Siting issues for large turbines (such as zoning, permitting, radar, and environmental) are assumed to also be relevant for small turbines (e.g., the U.S. Fish and Wildlife Service environmental regulations)
- Concern over possible health impacts from wind turbines
- Confusing misinformation and mal-information in circulation.

2.2.13.2 Potential Solutions

Meeting participants identified the following possible solutions to small and distributed wind barriers.

- Financing and the economics of purchasing a small or distributed wind turbine can be prohibitive. Continued research and development to address small turbine issues is required

so that a wider selection of turbines can enter the market. Competition in the marketplace can then drive the cost down.

- Net metering laws and other incentives can increase demand and the market for small and distributed wind; net metering should be annualized.
- New investment ideas could make turbine acquisition possible for entities like schools; for example, leasing programs that involve a third-party owner who transfers ownership after payback.
- Pursue an effort to change solar set-asides to distributed set-asides so that customers can choose the technology included in their energy portfolio.
- The standard solution to resource variability is storage, but this can be cost prohibitive. To address the reliability and maintenance barriers, the Small Wind Certification Council is working to certify small wind turbines that meet or exceed the requirements of the AWEA Small Wind Turbine Performance and Safety Standard. Other organizations are also working on small wind certifications. Underwriters Laboratories is certifying controls, and the North American Board of Certified Energy Practitioners is certifying small wind installers. Through university-industry partnerships like the Colorado Collaboratory, public agencies, industry partners, and university students are working together to develop renewable energy products and address wind energy issues. These efforts should be supported.
- Resource assessment and access to site-specific data can be difficult to obtain. Often interested parties use airport data, but this may not be adequate to estimate the potential energy generation at a particular site. New site-specific models are needed that combine good wind maps with complex fluid design models to enable micrositing.
- To address the environmental regulations that are required by the U.S. Fish & Wildlife Service, states should work together as a region to gather data and lessons learned and provide information on known issues.
- Education at all levels (including the general public, schools, county commissioners, utilities, decision makers, legislatures) can help combat misinformation and mal-information with facts. Providing information from a credible source through workshops and partnerships with schools can help with education on all levels. Working with schools can get students excited about renewable energy and impacts the rest of the community.

2.2.14 Radar and Restricted Department of Defense Lands

Attendees identified radar as a barrier to wind deployment, especially in the East and West, but the issue did not receive enough votes to be addressed in a breakout session. In general, attendees believed that although the impacts of radar systems are real and prevent project development, the process of determining whether land will have radar issues has been simplified, and projects are not being sited in areas with radar issues. Over time radar could prove to be a large barrier to wind development; however, meeting participants did not identify it as a serious barrier in the near term.

2.2.15 Barriers to Island and Remote Systems

Although in many cases development barriers for island states and remote territories may mirror some of the issues already described, islands also face additional challenges due to their remote locations as compared to the nation's developed energy and transmission system. A concessions process could not be conducted to identify the most pressing barriers facing island states and remote territories, so the following list includes all barriers identified during the discussion:

- Technically complicated systems, including high contributions of wind into conventional thermal power generation and wind-diesel systems
- Integration of high-contribution wind into low-voltage transmission systems
- Limited technical support for communities
- High cost of batteries that can support high-contribution wind
- High construction and transportation costs
- Complicated logistics to implement larger wind projects
- Limited land to utilize for wind development due to private ownership, competing uses, and environmental sensitivity
- Permitting issues (i.e., military land), including radar and controlled airspace
- Concerns over aesthetics of wind turbines, social acceptance issues
- Small economies of scale (difficult for bulk purchasing and to find investors)
- Severe weather, harsh climates (typhoons, icing, cold)
- Endangered species (avian and bat concerns), especially for island areas with limited habitat
- Federal requirements (consultation, wildlife conservation plan)
- Difficulty accessing funds, economic condition of operating utilities, access to federal funds, limited access to tax incentives
- Lack of anemometry/wind data
- Lack of education resources for decision makers in local governments and utilities
- Limited investment/involvement from utilities.

The following discussion addresses some of the most important barriers identified above in greater detail.

2.2.15.1 High Cost of Wind in Remote and Isolated Locations

Power in remote areas is mostly provided by thermal generation units (e.g., diesel or fuel oil) and is therefore expensive (typically with a fuel cost of around $0.20 per kilowatt-hour, or kWh, although it can be much higher). Remote wind projects will, however, be more expensive than conventional large-scale power development which, even when compared to power generation under current conditions, may not be cost competitive. Consideration of long-term power price and price risk should be incorporated in any project development.

2.2.15.2 Need for Specific Wind Technology and Equipment

The wind technology that should be applied in rural and remote areas must be considered carefully as not all wind technology is applicable in all areas. Specific areas will have different requirements, such as typhoon survivability in the Pacific and ability to function in ice and low temperatures in Alaska. Additionally, the installation of wind into small and isolated grids will require turbines that have more active control and grid-conditioning capabilities. These turbines may be harder to obtain, may only be available in specific sizes, and may be more expensive than turbines typically installed in mainland U.S. applications. Requirements for wind turbines should be identified as early in the development process as possible.

2.2.15.3 Financing Issues

Operating remote, isolated power systems is expensive, and the conflicting mandates of providing power to a typically small customer base must be balanced with the cost of power that these communities can afford to pay. The additional complications of the steep rise in the cost of fuel over the past 5 years have resulted in very difficult financial positions for many power cooperatives serving isolated communities.

As an additional complication, many of the power utilities in the island states and remote territories are either government-owned or power cooperatives, which cannot take advantage of federal tax incentives such as the Production Tax Credit or accelerated depreciation. There are several other approaches to obtain lower-cost loans, but typically these are more complex and can be time consuming. The lack of access to typical tax-based financial incentives either increases the cost of projects or forces these organizations to use independent power producer or flip structures, which are not preferred by most utilities.

2.2.15.4 Lack of Available Land

Land availability is a large problem in most remote or island communities. Open land is typically scarce, and often a multitude of issues compete for open available land. Land values are typically high, and transmission infrastructure is limited, which also limit the locations where larger-scale projects could be installed. Island topography can be complex, which again limits the viable locations suitable for wind development.

2.2.15.5 Issues Specific to Remote Locations

Projects on islands and in remote communities are typically smaller in scale than would be found in the continental United States. This leads to higher costs, more complex logistics, and a reluctance of major developers to actively engage in project development. Additionally, the uncertainty of working in isolated communities will also increase the risk for project developers and thus drive up costs as compared to more conventional development. For this reason, local authorities such as utilities or state energy offices will likely want or be required to take a more active role in the development process. This could include collecting long-term site-specific data, conducting initial environmental screening, conducting integration studies, and working to develop a stakeholder engagement strategy. All of these activities will help promote development and reduce the risk for project development.

2.2.15.6 Social Acceptance Issues

Social acceptance of wind technology, especially when a wind installation is among the first in the area, is a concern, and thus public outreach for the project must be carefully managed early in the project scoping and evaluation process. Due to the small size of most island/isolated communities and the generally high population density where wind may be implemented, most development sites will result in a social impact. This impact can be in the form of sound and visual clutter, although flicker (the strobe effect of shadow caused by the wind turbine blades) could also be a concern. Project acceptance is greatly improved when the local community understands and appreciates the clear community benefits of the project. The fact that a wind project provides a means to control and reduce the cost of energy to all utility customers enhances the likelihood of public acceptance of the project; management of this message is critical for eventual project success.

2.2.15.7 Lack of Wind Resource Information

Before any real efforts can be made to determine whether wind technology is appropriate, a wind resource assessment must be conducted. In most cases, all of the long-term wind information has been collected for general weather forecasting or condition monitoring at local airports. Because these sites are often located at low elevations and in generally sheltered locations, they are not appropriate for assessing the potential for wind generation and, in many cases, they may provide inaccurate indications that there is no viable wind resource. To better assess sites, an initial screening should be followed by a wind resource assessment directed at power generation. As an example, in the U.S. Virgin Islands, the Virgin Islands Energy Office solicited bids to install meteorological towers at sites. Installing meteorological towers and collecting site-specific wind speed data for a period of 1 to 2 years will provide the energy office with the ability to better quantify the value of adding wind at those project sites and may help encourage interest from project developers.

2.2.15.8 Lack of Understanding of Wind Technologies and Development Structure

As discussed previously, due to the small scale of most local projects, it is usually difficult to entice large development firms with extensive experience in the wind development process. This typically results in projects being developed by smaller local developers or, in some cases, the local power utility or cooperative. In these instances, the local power cooperative or state energy office must become much more involved in the development process. In many cases, the local utility or energy office will be the project developer, which is quite a complex undertaking. In most cases, the local power cooperative and/or state energy office does not have the experience to develop projects. In the best cases, an extended project timeline can allow staff to develop the expertise, but in the worst cases, inexperience can lead to projects that are poorly regulated and do not deliver expected output, which affects future wind development. As discussed previously, it is also difficult for local decision makers to invest the time to come up to speed on a new energy option. Without this understanding of the benefits and impacts of wind development, it is difficult for decision makers to make educated decisions.

2.2.15.9 Environmental Sensitivity Due to Rare and Threatened Avian Species

As discussed in the section on land availability, there is concern that wind development may impact threatened or endangered species. Detailed studies may be needed to ensure that the potential development may not disturb a specific habitat. Additionally, the isolated nature of

island communities typically means that there may be a small number of species, so there may be elevated concerns of species impact from even small numbers of potential fatalities. Although there are typically no moratoriums on wind development in most communities, the expanded restrictions make development more difficult.

Although there is likely very little that can be done to directly address potential environmental impacts, conducting initial assessments of threatened or endangered species is the first step in any development process. This will help identify areas where development should not be considered. Once appropriate sites have been identified, detailed assessments can be conducted in collaboration with local environmental regulators and organizations. Some technology-based mitigation strategies, such as curtailment of the turbines under specific conditions or at specific times, may also be appropriate. Alternative methods of species conservation could also be conducted to help support any impacted species.

2.2.15.10 Condition of the Local Grid Infrastructure

The implementation of high-contribution renewables on to remote grids is a difficult process that requires an understanding of how current generation technology will accept variations in the load, the design and power flow on the existing transmission infrastructure, and mitigation measures that will limit the variability of the wind generation. Most of this analysis can be completed following the identification of specific sites, but the analysis is not trivial and will require considering potential expansion of the transmission infrastructure, the installation of mitigation technologies, and the selection of the turbines.

As an example, the Islands Water and Power Authority of the U.S. Virgin Islands in collaboration with NREL is conducting an analysis on grid stability and interconnection issues, both as an isolated power system and then with the islands interconnected to other Caribbean islands (i.e., Puerto Rico) through an undersea cable. The initial study examined a worst-case scenario of integrating a high contribution of wind and solar up toward a 60% renewable plan. A near-term assessment examining near-term installations to only the two isolated grids is planned.

3 Regional Summaries

The following section provides an overview of the regional discussions and findings. During each regional meeting, representatives from each state were asked to provide a state summary and identify the barriers that impede expanded wind development. The barriers were tabulated and then, as part of an effort to determine the top issues, each participant cast four votes, with two designated to represent the importance of the issue from a regional perspective. Participants then moved to breakout sessions to address the top issues in detail (some of the other issues were discussed with the entire group). Attendees also discussed the potential impact of WPA's move to a regional-based framework. Related comments are summarized below.

3.1 Great Lakes Region

For the purpose of this report, the Great Lakes region is defined as encompassing Illinois, Indiana, Michigan, Minnesota, New York, Ohio, and Wisconsin. In terms of U.S. markets, states in the Great Lakes region could be considered to be part of a mature market with significant project deployment experience. The Great Lakes region has a strong history of skilled manufacturing. The region also includes major load centers and is a critical crossroads for logistics transportation and transmission. The Great Lakes region is also a promising area for offshore wind development.

Participants at the Great Lakes regional meeting identified several deployment barriers (Table 1). Although the attendees initially recognized *legislative issues* as its own barrier, they later combined it with *lack of appropriate permitting and zoning* for small group discussions. Attendees also identified low natural gas prices as affecting the limited availability of markets for wind.

Table 1. Wind Deployment Barriers in the Great Lakes Region

Barriers	Votes	Weighted	Regional Votes
Permitting and zoning/legislative issues	18	23%	13
Weak state wind power markets	15	19%	4
Lack of appropriate permitting and zoning	*14*	*18%*	*12*
Social acceptance issues	13	16%	3
Transmission issues	13	16%	13
Few financing options for small and community wind	11	14%	2
Poor understanding of wind energy's economic impacts	7	9%	2
Legislative issues	*3*	*4%*	*1*
Limited understanding of and support for manufacturing	3	4%	2

A continuing and functioning network in the Great Lakes region requires continued stakeholder education to address public acceptance issues. A functioning regional network must also include state-specific capabilities, incorporating local knowledge of events and impacts. Therefore, WWGs will have a continued important role as WPA transitions to a regional approach.

3.2 Great Plains Region

Colorado, Kansas, Nebraska, Oklahoma, and South Dakota are included in the Great Plains region. In terms of U.S. markets, states in the Great Plains region could be considered maturing, with significant potential but several markets without sufficient momentum to transition to full-scale deployment.

Based on updates provided by state representatives, workshop participants identified the major barriers to the wind industry in the region (Table 2). Workshop participants divided into three groups to discuss transmission issues, the need for education and engagement of rural populations, and small and distributed wind issues. They worked to identify the aspects of each issue and potential solutions, especially solutions appropriate to the region. The topics of state and regional competition, limited state and regional markets, and funding sources were discussed as a larger group.

Table 2. Wind Deployment Barriers in the Great Plains Region

Barriers	Votes	Weighted	Regional Votes
Transmission issues	14	22%	14
State and regional competition	10	16%	1
Limited state and regional markets	9	14%	9
Need for education and engagement of rural populations	7	11%	2
Limited understanding/uptake of small wind	6	10%	
Change of state leadership	5	8%	5
Limited financing and funding for small/community/distributed wind	4	6%	1
Lack of funding for state-based wind stakeholder engagement activities	4	6%	
Public acceptance and siting Issues	2	3%	
Development issues on Native lands	2	3%	
Environmental issues and limitations	0	0%	

The general consensus was that there are huge barriers that need to be addressed in the Great Plains, but there is also great opportunity for wind development. State organizations and NGOs with a pro-wind focus need funding to help address these barriers, whether provided by WPA or other sources. Organizations will need to address state and federal decision makers so they understand that support for wind development is important for the region.

3.3 Mid-Atlantic and Southeast Regions

The Mid-Atlantic and Southeast regional meeting included representatives from Delaware, Georgia, Kentucky, Maryland, New Jersey, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, Virginia, and West Virginia. In terms of U.S. markets, states in the Mid-Atlantic region could be considered developing, with significant potential but still contained, with several markets that do not have enough momentum to transition to full-scale deployment. States in the Southeast are still developing; however, the deployment of new Class 3 wind turbines are allowing expanded development in markets that previously were not considered. Markets in this area are also strongly influenced by the potential development of the offshore wind market.

Based on updates provided by state representatives, workshop participants identified major wind industry barriers in the region to be lack of funding for state activities, the lack of state mandates, social acceptance issues, and transmission issues. The entire list of barriers is provided in Table 3. Workshop participants divided into four small groups focused on the lack of state mandates, social acceptance issues, transmission issues, and poor understanding of wind resource and potential, identifying the aspects of each issue and potential solutions. The topics of funding for state activities and the opportunity cost of offshore wind as barriers to land-based wind were discussed by the entire group at the end of the breakout sessions.

Table 3. Wind Deployment Barriers in the Mid-Atlantic and Southeast Regions

Barriers	Votes	Weighted	Regional Votes
Lack of funding for state activities	13	16%	5
Lack of state mandates	12	15%	7
Social acceptance issues	11	14%	6
Transmission issues	10	12%	9
Poor understanding of wind resource and potential	7	9%	3
Lack of general public understanding of wind technologies	6	7%	5
Weak/limited RPS	5	6%	
Opportunity cost of offshore wind focus	4	5%	3
Short-term federal wind policies (Production Tax Credit/Investment Tax Credit)	4	5%	2
Federal guidelines for environmental impacts (birds/bats)	3	4%	3
Lead time for licensing of offshore wind	3	4%	1
Interconnection issues for small wind	2	2%	
Local ordinances	1	1%	1
Radar issues and technology	0	0%	

Although some of the states in the region have developing wind markets, many other states are just beginning to develop active wind markets. State representatives voiced concerns that

although there are viable reasons to move to a regional network approach, reduced state-based funding just as states are starting to develop markets could be potentially catastrophic. Participants pointed to the closing of DOE's regional offices as an example of how efforts to gain efficiencies had not resulted in stronger outcomes.

Meeting attendees, including contractors, expressed that with the multitude of compounding changes in the WPA initiative, many are confused about expectations and/or are losing confidence in the future of the program. Although this meeting helped to address some of these issues and the participants collectively felt that the meeting was beneficial, attendees expressed a desire to continue and expand opportunities for collaboration and information sharing.

A continuing and functioning network in the Mid-Atlantic region requires continuing stakeholder education to address public acceptance issues. This is especially true with the limited availability of developable land-based resources and the likely long lead time to large-scale development of offshore wind resources. A functioning regional network will also need to include state-specific capabilities to incorporate local knowledge of events and impacts. Therefore, state WWGs will have a continued important role as WPA transitions to a regional approach.

3.4 Northeast Region

For the purpose of the regional meeting, the Northeast region includes Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. In terms of U.S. markets, states in the Northeast region could be considered mature with significant potential, but the region includes several markets that do not have enough momentum to transition to full-scale deployment. The Northeast region also faces strong organized opposition to wind deployment, leading to increased sensitivities to proper siting guidelines, social acceptance issues, and a need for general education regarding wind deployment impacts.

Although some of the states in the region have relatively strong markets for wind technologies, these states are generally small players on the national front; most states in this region are just beginning to develop active wind markets. Participants expressed that social acceptance issues, fueled by a lack of accepted guidelines for wind installations and regionally active wind opponents, make development in the Northeast especially difficult without large investments in education and outreach. Based on updates provided by state representatives, workshop participants identified the following major barriers to the wind industry: lack of credible guidelines, social acceptance issues, lack of markets for wind, permitting and siting issues, and financing issues. Participants broke into five small groups focused on these barriers to identify the aspects of each issue and potential solutions, especially solutions appropriate to the region. *Permitting and siting issues* was combined with *lack of credible guidelines*. Table 4 lists all identified barriers. Federal policy stability was also identified as an industry barrier, but because this was not a focus of DOE activities, it was not included in the list of regional barriers.

Table 4. Wind Deployment Barriers in the Northeast Region

Barriers	Votes	Weighted	Regional Votes
Lack of credible guidelines	18	22%	10
Social acceptance issues	17	20%	12
Lack of markets for wind	12	14%	10
Permitting and siting issues	10	12%	
Lack of public education (general)	8	10%	4
Net metering	7	8%	1
Financing	4	5%	2
Environmental impacts	3	4%	2
Integration	2	2%	
Customer demand	1	1%	1
Poor understanding of the wind resource	1	1%	1
Historic preservation	0	0%	
Issues transporting large equipment	0	0%	

Although WPA funding for the Northeast has historically been moderate, many state representatives voiced concerns that although there are viable reasons to move to a regional network approach, the severe lack of funding in many states to conduct studies and pursue outreach activities makes it difficult to support ongoing efforts in the regional wind market. Participants again pointed to the closing of the DOE's regional offices as examples of how efforts to gain efficiencies had resulted in a complete loss of effective stakeholder networks. Attendees also pointed out that in general, a poor understanding of what needs to happen on a state or regional level to advance wind deployment is not an issue; identifying funds to allow that work to commence or continue is an issue. For example, research to assess the physical and social impacts of turbine noise in places like Vinalhaven and Falmouth has been difficult to obtain. Opposition stemming from alleged health impacts of wind deployment is a known issue, but developing a consistent and scientific response to these claims and defending attacks from wind opponents have not been undertaken. Attendees stated that a process must be developed that would allow people to work on current issues.

A continuing and functioning network in the Northeast region requires continued stakeholder education and the development of a consistent and scientifically justifiable set of rules or guidelines for wind deployment to address public acceptance issues. A functioning regional network will also need to include state-specific capabilities, incorporating local knowledge of events and impacts. Therefore state WWGs and other organizations that actively work to promote appropriate wind energy deployment will have a continued important role.

3.5 Northwest Region

The Northwest regional meeting included representatives from California, Montana, Oregon, and Washington. Alaska, Hawaii, and Nevada were not represented. Representatives from Idaho could not attend. State experience with wind energy ranged from little (Nevada, Hawaii, and

Alaska) to extensive (California). Twenty-four representatives attended this regional meeting, including developers, wind manufactures, government officials, WWG members, university staff, and other individuals interested in the deployment of wind technologies. Although Washington, Oregon, and California have strong wind energy markets for commercial-scale projects, other states in the region face many more challenges. Barriers for the implementation of small and community wind development can be seen across the region.

Participants in the Northwest region identified 15 barriers (Table 5). Workshop participants broke into three groups focused on the barriers of transmission and wind integration issues, lack of financing for small and community wind, and lack of standards and certifications for small wind. Attendees originally identified *transmission issues* and *wind integration issues* as two separate barriers, but they were combined for the breakout session. The groups worked to identify the aspects of each issue and potential solutions, especially solutions appropriate to the region. Social acceptance issues were discussed in the larger group.

Coordination among Northwest states will be essential to develop regional solutions to transmission, integration, and balancing issues. In the Northwest, continued stakeholder education is needed to address public acceptance issues. A functioning regional network will also need to include state-specific capabilities that can incorporate local knowledge of events and impacts. Therefore, WWGs and regional organizations will have a continued important role as WPA transitions to a regional approach.

Table 5. Wind Deployment Barriers in the Northwest Region

Barriers	Votes	Weighted	Regional Votes
Transmission issues	11	20%	10
Wind integration issues	10	18%	9
Lack of financing for small and community wind	8	15%	2
Lack of standards and certification for small wind	7	13%	
Social acceptance issues	5	9%	4
Environmental impacts of wind in the region	4	7%	
Siting, ordinances, and permitting issues	2	4%	1
Limited and inexperienced workforce	2	4%	
Working with federal entities	4	4%	2
Lack of funding for outreach activities	2	4%	
Lack of public information/education for small and utility-scale wind	1	2%	
Radar issues/Federal Aviation Administration	1	2%	
Lack of understanding of wind energy's positive impacts	0	0%	
Lack of markets for wind energy	0	0%	
Permitting of large wind	0	0%	

3.6 Southwest Region

The Southwest meeting included representatives from Arizona, California, Colorado, Nevada, New Mexico, and Utah. In terms of U.S. markets, states in the Southwest region could be considered maturing with significant potential, but the area also contains several markets that have not gained enough momentum to transition to full-scale deployment. California and Colorado have strong markets for wind technologies, other states are just starting to develop active wind markets, and some states (such as Nevada) have not been able to widely implement large-scale projects, despite documented wind potential. Table 6 lists barriers identified by participants in the Southwest region. *Need to educate environmental organizations* was initially categorized as a separate barrier but was later combined with *need to educate public*.

Table 6. Wind Deployment Barriers in the Southwest Region

Barriers	Votes	Weighted	Regional Votes
Lack of funding for outreach and education	11	17%	1
Need to educate public and environmental organizations	10	16%	8
Difficulties with permitting and access on federal lands (Bureau of Land Management, Fish and Wildlife Service)	9	14%	9
Need for education on utility integration issues	9	14%	2
Transmission issues	8	13%	8
No articulated market case for utilities (investor-owned, co-ops, munis) to desire wind	5	8%	3
Local planning, permitting, and ordinances issues	5	8%	1
Complex jurisdictions (federal, state, tribal, local, and private lands)	3	5%	
Need for better assessment of local wind resource	1	2%	
Disconnect between developers and community engagement	1	2%	
Lack of framework for tribal lands development	1	2%	
No market justification for community wind	1	2%	
Lack of justification/understanding impacts between local vs. remote development	0	0%	
Lack of understanding regarding competitive procurement	0	0%	
Need for certified equipment	0	0%	

Workshop participants divided into four groups focused on the barriers of a lack of funding for outreach and education, a need to educate the public and environmental organizations, difficulties regarding development on federal lands, and a need for education on utility integration issues. Transmission was discussed in the larger group with other identified barriers.

A continuing and functioning network in the Southwest region requires continued stakeholder education to address public acceptance issues. A functioning regional network will also need to include state-specific capabilities that can incorporate local knowledge of events and impacts.

Therefore, state WWGs will have a continued important role as WPA transitions to a regional approach.

Many state representatives indicated that although there are viable reasons to move to a regional network approach, the possibility of reduced state-based funding just as states are starting to develop markets could be catastrophic. Participants pointed to the closing of the DOE's regional offices and a centralization of GeoPowering the West programs as examples of how efforts to gain efficiencies resulted in a complete loss of effective stakeholder networks.

3.7 Island States, Territories, and Remote Communities

Island states and remote communities have similar deployment barriers and motivations to expand the use of wind and other renewable energy technologies. Because a meeting of this diverse network would have been difficult, a teleconference was offered to bring together U.S. states and territories with isolated power grids. The teleconference included representatives from Hawaii and Alaska and the U.S. Territories of Guam, the Commonwealth of the Northern Mariana Islands, and the U.S. Virgin Islands. The Territory of American Samoa was not represented at the meeting.

In terms of U.S. markets, the island states and territories represent a small potential for wind generation in terms of megawatts, but they share the highest cost of energy in the nation, largely driven by their reliance on imported fossil fuels. Due to the high cost of energy in these isolated areas, the long-term economic viability of the communities in these states and territories will largely be dependent on the incorporation of stable and low-cost energy sources, in all likelihood incorporating a large contribution of renewable energy technologies.

The use of wind energy across these states and territories varies greatly. The oil price shocks of 2008 led to an increased consideration of renewable energy sources as the cost of power in almost all cases rose to more than $0.50/kWh, more than five times the average rate for the continental United States.

Hawaii and Alaska have active and developing wind markets, with Hawaii reaching a development plateau as larger technical issues are addressed. Alaska has experienced wind development in rural areas for the past 15 years, but the installation of two larger wind plants on the main grid in 2012 demonstrated viable development opportunities along the state's main transmission infrastructure. The U.S. Territories are just beginning to understand their potential wind markets and have varying degrees of development, from the U.S. Virgin Islands (actively working on issues) to the Commonwealth of the Northern Mariana Islands (initiating work).

Although the meeting format did not allow for a ranking of the barriers faced by island communities, the following barriers were identified:

- Technically complicated systems, including high contributions of wind into conventional thermal power generation and wind-diesel systems
- Integration of high-contribution wind into low-voltage transmission systems
- Limited technical support for communities

- High cost of batteries and other known grid-stabilizing technologies that can support development of higher-contribution wind applications
- High construction and transportation costs
- Complicated logistics, including limited development seasons
- Limited land to utilize for wind development due to private ownership, competing uses, and environmental sensitivity
- Limited land to utilize due to military (federal) ownership, location of airports, population density, and private land holdings
- Concerns over aesthetics, noise, flicker, and other social acceptance impacts of wind turbines
- Small economies of scale (difficult for bulk purchasing and to find investors)
- Severe weather, harsh climates (typhoons, icing, cold)
- Endangered species (avian and bat concerns), especially for island areas with limited habitat; potentially unique species; and limited data on populations
- Federal requirements (consultation, wildlife conservation plan)
- Difficulty accessing funds (including federal), economic condition of operating utilities, limited access to tax incentives
- Lack of anemometry/wind data that can be used in assessments
- Lack of education/knowledge of decision makers in local governments and utilities, making it harder to assess and understand the impacts of wind development
- Limited investment/involvement from utilities
- Limited and or weak grid infrastructure combined with concerns over the potential impact of high wind contribution due to wind resource variation.

Solutions to address the barriers were identified during the regional discussion. These include:

- Explore the possibility of developing regional projects, which would help reduce costs/complexities and could allow bulk purchasing of equipment. Exact savings would be determined.
- Create a forum to share experiences, building off development in communities with lessons (positive or negative) to share.
- Host a regional wind-diesel workshop to address social acceptance issues, work with government agencies, and share information on development strategies and technologies.
- Conduct studies on grid integration and share experiences, such as a best-practices guide for high-contribution renewable technologies.
- Invite people to attend an existing workshop (i.e., Alaska Rural Energy Conference, Asia Pacific Economic Council, Clean Energy Conference) hosted by island and remote communities, addressing island and remote issues.

- Work with international island nations such as Japan and Iceland (which have developed advanced technology and experience in integrating renewables in grids) or Australia (which has many rural communities supplied by renewable power).

In a discussion regarding how the region could expand collaboration and address some of the communal development barriers, the following activities were identified:

- Develop improved documentation on the challenges of wind energy deployment in island communities so that organizations can address these challenges. Documentation would include a detailed list of challenges. The challenges and/or their impacts may change based on factors such as size, energy costs, and potential environmental impacts, so the discussion may need to be expanded.
- Develop and implement new communications tools to allow better collaboration across the wide geographic and time zones represented by these entities. Options could include a WPA-sponsored or WPA-managed SharePoint site, Google Documents repository, Web-based conference calls, etc.
- Conduct studies and analyses to provide more general lessons learned, even if specific analysis must be performed on a state-by-state basis. It's important to leverage information.
- Build on the strength of the region. Complete regional studies that will demonstrate the expanded impacts of addressing issues on island communities.
- Collaborate among organizations with similar goals across technologies, market areas, and organizational structures.
- Build on other regional activities and events, such as the wind-diesel conference or other regional meetings that many stakeholders already attend. Alternative forms of attendance and information-sharing should be explored given the high cost associated with travel from these communities and the many time zones. Identify related national or international meetings that people may already attend, such as the WINDPOWER Conference and Exhibition in the United States. Host side events at these meetings focused on island and remote communities.
- Fund projects in the early stages of project development (e.g., the DOE provided Hawaii and the U.S. Virgin Islands with funding for the early stages of project development). Financial support at this stage allows improved discussions with local leaders, more complete impact assessments, and a better understanding of project costs, and it allows potential private investors to enter the project later when the risk has been reduced.
- Improve and/or maintain the credibility of organizations that advocate for responsible wind development. Examples of bad projects and/or poor stakeholder engagement can taint the entire industry. Although in most cases renewable energy and wind energy are well accepted in island communities, providing accurate information about potential projects and their likely impacts is critical. This will help buttress any potential projects from false claims about impacts, allowing expanded use of motivated and educated volunteers to help insure that the good projects are developed.
- Distribute contact information of interested parties. Expand the participant list to include all interested parties; potentially include representatives from states or territories with large

island and remote communities, such as Maine. Include international communities that are facing similar challenges.

One discussion topic was whether any meeting focused on island energy issues should include a discussion of other renewable energy resources. Many of the integration issues would apply to any high-contribution renewable system; however, some wind-specific issues would be better addressed by a more focused approach.

There was general agreement that the initial conference call did not include all of the potential organizations that may be interested in participating in an expanded discussion of wind development in island states and isolated grids. Meeting participants agreed that for the greatest impact, participants from the utilities and state/territorial governments should be included in the discussion. Also, representatives from American Samoa should be identified. There was additional discussion of trying to incorporate other international participants or potentially other organizations that represent island and remote communities.

4 Regional Strategy Development

After identifying wind deployment barriers, the meeting attendees discussed regional strategy development.

4.1 Existing Regional Networks

They first identified examples of functioning regional networks already in existence. In most cases, these organizations are seen as either completely impartial or interested in supplying a stakeholder-driven approach to wind development. A subset is listed here.

- Appalachian Regional Commission
- Great Lakes Wind Collaborative
- Mid-Atlantic Renewable Energy Coalition
- New England Wind Energy Education Project
- Northwest Energy Coalition
- Southern Alliance for Clean Energy
- Bonneville, Western, Tennessee Valley, and other Power Administrations.

Attendees also discussed larger organizations with big networks that cover multiple regions or those with a national focus on wind markets or technology niches, such as the following:

- Clean Energy States Alliance
- U.S. Offshore Wind Collaborative
- Heartland Alliance for Regional Transmission
- Wind on the Wires
- Industry associations, including the American Wind Energy Association and the Distributed Wind Energy Association.

4.2 The Role of the States in the Regional Approach

Attendees noted that maintaining and expanding wind development in the states is important for achieving the 20% by 2030 scenario. They stated that without strong support and healthy markets in individual states, addressing barriers and furthering wind development on a regional basis will be difficult to accomplish. Meeting participants expressed concern that without funding for states, the programs created to move wind forward will end.

Attendees felt that although a regional framework would be beneficial for wind deployment, it could not replace state work and that continuing support of WWGs is critical in maintaining state-specific knowledge. Participants also expressed that when transitioning to a regional model, WPA should keep the focus on state policy decisions. They pointed out that many regional needs require state-specific knowledge of approach and timing. Also, many permitting and regulatory decisions, as well as outreach efforts, must be performed at the state level.

Participants also expressed concern that progress to date and the capacity to allow for wind development will be lost and overshadowed by adversarial organizations without continued focus at the state level. They acknowledged the tendency of states to compete with one another in a region and noted that overcoming this collaboration barrier will be challenging. The group also noted that, while regional collaborating entities such as the Great Lakes Wind Collaborative provide important functions, these groups cannot replace the role of states in reaching out and responding to the public.

Attendees stated that key links to state organizations must be maintained, as well as historical relationships, infrastructure, and funding. Attendees recommended that the regional entity remain small, with the majority of resources going to the states.

4.3 Benefits of a Regional Approach

Participants also discussed the possible benefits of transitioning to a regional model. They identified one immediate beneficial role of regional collaborating entities: to promote efficiency gains from sharing information generation and dissemination roles. Another benefit identified was the diversity that a regional organization could provide. With a regional model, state representatives would be exposed to other models and ideas that they could incorporate into their state's operation. States could avoid duplicating efforts and, with an overload of activities, some needs could be met at the regional level. Attendees suggested developing a coordinated communications plan that would make members aware of state activities and help people prioritize items that they need to pay attention to at the state and regional levels. Part of the communication plan could include presentations on best practices (e.g., an RPS).

Attendees agreed that a collection of regional-specific data, including costs, resources, and good federal data on the impacts of wind development, would be helpful to support, justify, and build a case for expanded land-based and offshore wind development.

4.4 Recommendations

Participants noted the following critical aspects that must be recognized and addressed if a regional approach is to be successful:

- In-person participation in a region is difficult because people have to travel. Web-based participation works, but it's not the same.
- Polarizing issues could fracture regional cooperation/competition among states (e.g., interstate transmission).
- Spreading funding too thin means everybody misses out. Moving to a regional approach may seem to allow reduced funding, but organizations must guard against spreading the money so thin that it is not effective anywhere.
- States could be left out if they do not fit nicely into regional models (e.g., Alaska and Hawaii).
- A danger exists of over-generalizing and "lumping together" issues, positions, and resources.
- Utility structures differ across states (e.g., public power ownership is really important in Washington but not in other areas).

- Differences in utilities and markets vary by state, not by clearly defined regions. For example, operations of the Southeast Electric Reliability Council are very different from the Pennsylvania New Jersey Maryland Interconnection (e.g., price structures, the energy markets, and the regulatory environment).
- It would be difficult for a regional entity to be based at a state government group or to grow out of a group currently working in only one state.
- Legal structures (501(c)3 vs. 501(c)4) need to be investigated.
- Open discussions may not happen if a regional organization has public openness.
- There are not enough state activities to make regional approaches valid.
- To encourage regional cooperation and barrier resolution, future regional entities should be given multi-year funding to give them the opportunity to fully grasp the issues of the region and time to develop and enact a strategy. Annual regional meetings would be helpful to make connections and continue the conversations started at these meetings.
- Progress to date and the capacity to allow for wind development is being overwhelmed by a constant onslaught of negative and, in many cases, deceptive anti-wind information. Without strong support by impartial and independent organizations with the ability to provide honest and credible wind deployment information, addressing barriers and furthering wind development will be difficult.
- Manufacturing and Watt generation are not necessarily synonymous. The level of knowledge and expertise on these issues must increase. The generalized tools used in the past need to transition to tools that will be useful for supporting decisions at the county or sub-region levels.

Attendees also suggested several strategies to improve state and regional activities.

- Leverage information. Conduct studies and analysis with a regional focus, even if specific analysis is performed on a state-by-state basis, instead of multiple times for each state.
- Build on the strength of the region. Complete regional studies that will demonstrate the expanded impacts of the region. Due to their size and wind resource, individual states may find it difficult to compete for limited external resources and markets.
- Encourage organizations with similar goals to collaborate across technologies, market areas, and organizational structures.
- Build on other regional activities and events (e.g., the New England Wind Energy Education Project Conference or other regional meetings that many stakeholders already attend).
- Provide funding for projects in the earlier stages of project development, such as for feasibility projects. Most funding is for near-complete projects. In smaller markets with smaller project sizes, the early stages of project development are typically the most difficult and include the most risk. Financial support at this stage allows improved discussions with local leaders, more complete impact assessments, and a better understanding of project costs. It also allows potential private investors to enter later when the risk has been reduced.

- Improve and maintain the credibility of organizations that advocate for responsible wind development, as even a few bad projects and examples of poor stakeholder engagement can taint the entire industry.
- Develop a grassroots support base that feels as strongly about the need for wind energy as the groups that oppose its development. This will allow expanded use of motivated and educated volunteers to help ensure that the good projects are developed.

Attendees repeatedly discussed the issues of funding and credibility, looking at different models through which funding could be obtained for state or regional outreach activities, under the assumption that a reduction in federal, state, and local funding is expected to continue. Ideas associated with this question and potential solutions (provided in Section 2.2.6, Lack of Funding for Stakeholder Engagement) highlight the need to address issues of perceived or real bias based on potential funding mechanisms.

5 State Reports

As stated in the introduction to this report, the principal technology acceptance goals of the Energy Department's Wind Energy Program are 30 states achieving at least 100 MW of installed capacity by 2010 and 15 states achieving at least 1 GW of installed capacity by 2018. For FY2011, the annual target was 30 states with at least 100 MW and six states with 1 GW of installed capacity (see Figure 1).

At the end of FY11, 29 states achieved 100 MW of installed capacity: Arizona, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, Nebraska, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Utah, Washington, West Virginia, Wisconsin, and Wyoming.

Fourteen states have more than 1 GW of wind installed, far exceeding the Energy Department's goal: California, Colorado, Illinois, Indiana, Iowa, Kansas, Minnesota, New York, North Dakota, Oklahoma, Oregon, Texas, Washington, and Wyoming. No new states crossed this threshold in 2011.

It is interesting to note that a review of the current deployment data revealed that the increasing barriers to wind deployment are reflected in the installations currently implemented across the country. With some notable exceptions, wind development is for the most part implemented in states with a strong track record of existing wind operations. In the first half of 2011, more than 70% of the 2.25 GW of added capacity reported by the American Wind Energy Association resulted from installations in just five states, each with more than 1 GW of current wind capacity. In states with less mature markets (defined as those with less than 500 MW of installed capacity), less than 350 MW have been installed, primarily in six states. This distribution of development demonstrates an observed trend: in the current "tight" wind market, developers are focusing on expanding capacity in states that are already known to support wind development, leaving states that are still working through the process or states with strong fear-induced public opposition under-represented. This result supports the WPA adage that helping a state develop its first 100 MW of installed wind capacity and then continuing to help these states to reach 1 GW of installed capacity is a key step to developing a vibrant wind market.

The following sections provide summaries of the wind energy market in each state.

5.1 Alaska

Alaska has two distinct markets for wind development: main central communities connected by a small, isolated transmission system and rural communities that are isolated from the state's grid. At the end of 2011, 11 MW of installed wind capacity and an additional 2 MW under construction were installed in rural communities. None were connected to a wider transmission system.[9] More and larger projects are likely to be developed in rural areas of the state and, although very important, they are unlikely to provide large capacity increases.

[9] By the end of 2012, Alaska had installed 59 MW.

Expanded wind development is underway along the Railbelt, the main grid in Alaska that runs along the old Alaska Railroad and through many of the largest cities in the state (Anchorage, Fairbanks, Homer, and Seward) and the Matanuska Valley.

The state does not have a formal RPS, although it generates a large amount of its energy through a proven hydro resource. The state-sponsored Alaska Renewable Energy Fund has provided more than $125 million in grants to support wind energy deployment in an effort to stabilize energy prices, primarily in isolated communities that currently rely on diesel fuel for all power, transportation, and in many cases, heating needs.

As of December 2011, Alaska had 26 operating wind systems in rural communities, all interconnected with diesel power generation and, in a few cases, hydro. Projects ranged in size from 24 kW to 9 MW and cover the technical spectrum. According to initial Alaska Energy Authority studies, there are approximately 300 rural communities in the state, of which more than 100 have a viable wind resource. In most cases, the wind projects are implemented by local power cooperatives, with the Alaska Village Electric Cooperative the most active.

The state has an active anemometer loan program through (or in collaboration with) the Alaska Energy Authority, which provides technical support to communities interested in implementing wind. Alaska has an active WWG built around the Renewable Energy Alaska Project, a state non-governmental organization. The University of Alaska, in collaboration with NREL and Sandia National Laboratory, have developed the Wind-Diesel Application Center, which works to support and provide education on isolated wind systems. Based on the state's involvement with integrating wind and other renewable technologies into power systems, Alaska has developed a strong public- and private-sector understanding of high-contribution renewable energy power systems, including integrated smart grid, transient analysis, and control design.

Barriers to wind development in Alaska include the fact that high-contribution wind systems are technically complicated. Other barriers include limited technical support for remote communities, limited financing, complicated foundation technology (due to permafrost), high construction and logistics costs, increased project costs due to scheduling in remote areas, and a lack of understanding on the use and applicability of wind technology to reduce usage of imported fuel options.

5.2 Arizona

Arizona is a high-priority state for the WPA initiative. As of the end of 2011, the state had 138 MW of wind installed or under construction.[10] The installed capacity consists of a variety of projects, including distributed, community, and utility-scale installations as well as a municipal-owned wind project.

As reported by Northern Arizona University representatives at the Southwest regional meeting, one of the major barriers to wind energy development in Arizona is the popular idea that "Arizona has no wind" and that wind energy isn't competitive or cost effective. Because these ideas are so widespread, the state does not support wind energy development. The legislature has no interest in funding the Arizona WWG or other programs that educate people about wind

[10] By the end of 2012, Arizona had installed 238 MW.

energy, assist with wind installations, or provide incentives for installing wind turbines. The only state assistance that Northern Arizona University received was a small portion of tax-funded education money used to develop a renewable energy center.

In spite of these legislative conditions, Northern Arizona University provides unbiased, technical information on wind energy, and staff members are reaching out to citizens with many educational opportunities. The Arizona WWG is based at Northern Arizona University, as is the state's Wind for Schools program. The group provides valuable information to schools, ranchers, tribes, developers, county officials, and others interested in learning more about renewable energy. In fact, the university's role as a source for wind energy information contributed to the first utility-scale wind project in Arizona. A Navajo County rancher first started working with Northern Arizona University to collect wind data on his property. His research led him to contact Iberdrola Renewables, which later resulted in the development of the Dry Lake Wind Project. The project, which consists of 30 turbines located across a combination of private, state, and Bureau of Land Management properties, came online in 2009.

Another challenge to wind development in the state is finding ways to help interested tribes implement alternative energy sources on their land. Five of Arizona's 22 tribal nations are interested in learning how they can develop their own energy and foster economic development. They want to educate and train their members so that they don't have to hire consultants and can increase the number of jobs available to their people. In response to this need, Northern Arizona University launched a project in the Four Corners region comprised of tribal members, the university, and consortiums and plans to tie renewable energy to economic development options based on Navajo and Hopi tribal needs.

The lack of regulatory guidance for county officials is another barrier in the state. In Navajo County, Northern Arizona University and the Arizona WWG helped educate officials so that they could develop a wind ordinance. Although the effort was a success and Phase 2 of the Dry Lake Wind Project came online in 2010, this is a county-by-county process. Other counties can use Navajo County's ordinance as an example but will require education and information to develop their own ordinances.

Other obstacles in Arizona include interconnection, transmission, and jurisdictional barriers. There are many parties involved in these issues, and there is a lack of consistency among them. In addition, recent interactions among developers, ranchers, and tribes have almost stopped projects.

One barrier that was successfully addressed is an aspect of the viewshed. People who live near installations don't want to see the lights on top of turbines, which are required by the Federal Aviation Administration. Developers at the Perrin Ranch Wind Energy Center are installing radar-activated lighting on top of the turbine towers, which will only light up when aircraft are detected in the area.

5.3 California

As of the end of 2011, California's installed capacity was 3,927 MW.[11] California adopted a 33% by 2020 RPS and is working to build the necessary transmission to achieve it. A major effort by the Renewable Energy Transmission Initiative resulted in several new transmission lines planned throughout California and support for fast-tracking development.

California developers are primarily considering distributed and utility-scale wind installations. To achieve the state's Clean Energy Jobs Plan of 20,000 MW by 2020, 12,000 MW must come from distributed wind projects. The state's governor wants to explore distributed wind as much as utility wind and is looking for a variety of installation opportunities, including state properties, schools, rooftops, and parking lots.

Meeting these goals requires additional and integrated transmission. California Independent System Operators has a new Federal Energy Regulatory Commission transmission planning process and a feed-in tariff program that would allow public policy goals to be included in the planning and would pay for transmission investments. Projects can be built without commission approval. A board of directors will review plans, which will include a transmission plan to obtain more than 33% of energy from renewable energy sources using in-state, out-of-state, and distributed generation (using a wide definition).

The California Wind Energy Association is working on a project to develop guidelines for standardized statistical procedures to account for avian and bat mortality. These procedures could, among other things, provide guidance on how to determine the impact to populations when dead birds or bats are found at a project site.

In addition to transmission constraints, deployment barriers in the state include:

- The reluctance of utilities to enter into long-term power agreements. Utilities prefer ownership structures because they perceive more benefit, but experience contradicts this assumption
- Public concerns about wildlife and health
- A complex permitting regime with multiple authorities
- A general knowledge disconnect between the energy experts who are not wildlife experts and the wildlife experts who are not usually energy experts.

Renewables are being built in locations that are removed from the load center. Stakeholders identified a need to better characterize challenges and to move quickly on solutions.

5.4 Colorado

At the end of 2011, Colorado had 1,800 MW installed, comprised primarily of distributed and utility-scale wind projects.[12] Colorado seems to foster a favorable environment for wind development. Amendment 37, passed by Colorado voters, requires that 30% of their energy

[11] By the end of 2012, California had installed 5,549 MW.
[12] By the end of 2012, Colorado had installed 2,301 MW.

should come from renewable sources by 2020. Xcel Energy and Tri-State Generation and Transmission have released RFPs for wind. Also, 41,000 Windsource participants voluntarily pay a premium for renewable energy via Xcel Energy and Public Service Company of Colorado. The state's previous governor talked about his vision of a "New Energy Economy" for Colorado. Vestas operates manufacturing plants in the state.

Barriers to developing wind in Colorado depend on the size of the wind turbine. Barriers to distributed wind include a lack of familiarity and visible examples, a lack of incentives, zoning and height restrictions, and rural utility apathy or resistance toward wind. Barriers to community wind include a poor economic climate and a utility rate structure that discourages the kind of mid-scale buy-back that would encourage development in this area.

Utility-scale wind development faces a different set of barriers. Investor-owned utilities have satisfied their renewable energy credits requirements and are selling them to California. Xcel Energy wants to "be in the wind business," but without new requirements or an increase in the value of renewable energy credits, the company may not continue to install wind turbines. Other utilities that are not investor-owned remain resistant to installing wind by purchasing renewable energy credits from other entities or investing in other renewable energies. They desire a strong public demand, regulatory authority, and direct economic opportunity. Other barriers to utility-scale wind investment and development include pancaking rates,[13] availability of transmission capacity to load, the poor economy, and unreliable federal incentives.

Some of these barriers have been successfully addressed. Good examples of small wind turbines exist throughout the state, especially where Wind for Schools project turbines have been installed. These projects included community involvement in the development process. In northeastern Colorado, more than 200 people attended a series of five workshops, which helped to raise consciousness and support for wind development. Other ways to address barriers to distributed wind are to proactively address zoning with templates and local champions; to develop informational wind energy publications that can be distributed at wind events; and to use the Wind for Schools project and other methods to install wind turbines in many locations, providing positive examples of wind turbines.

Supporting utility-scale wind development would require a rigorous analysis of benefits and the documentation of citizen intent. Utilities should receive improved information addressing their business concerns and templates showing the benefits they would receive from installing wind turbines. Document models of what has worked in other places could reduce the impedance of pancaking rates. Additionally, developing and disseminating benefits stories could result in increased support for wind energy.

5.5 Connecticut

Connecticut is working to install the state's first commercial wind project. Unlike many states, Connecticut has given one entity — the Connecticut Siting Council — authority to approve new energy projects. The council's decisions on whether a project moves forward are final. Wind projects must meet a 1-MW threshold, and most wind turbine projects receive an expedited process.

[13] "Pancaking" refers to layering charges as power is transferred across multiple control areas.

In June 2011, the Connecticut legislature passed SB 1243, a major energy policy reform package to reduce energy costs and promote renewable energy. The bill combined two agencies to create the Department of Energy and Environmental Protection, which will be responsible for creating a comprehensive energy plan and completing the legislation's mandates. A new law requires the Siting Council to refrain from making decisions on new wind projects until regulations covering various topics such as setbacks, flicker, decommissioning, etc. are adopted. The state is trying to develop a strong renewable market by moving forward with these reforms.

Connecticut is working on the implementation of both large and small wind turbines. Largely due to topography and tree cover, deploying small wind projects is difficult, and few sites can be used for small turbines. Despite this, the state is testing small wind turbines to develop deployment criteria for small wind.

A barrier that was identified specifically for Connecticut is the lack of good transportation infrastructure, especially for large wind turbines. The narrow, winding country roads in rural Connecticut will pose an additional challenge for the development of large, multi-megawatt turbines.

5.6 Delaware

Although Delaware only has 2 MW of wind capacity installed (at the University of Delaware's Lewes campus), there is much support for wind power in the state. Delaware has implemented an aggressive RPS that requires all retail electricity suppliers to purchase 25% of the electricity sold in the state from renewable sources by the end of the 2026 state fiscal year.

Delaware is considering land-based and offshore wind projects, with the primary focus and support for offshore wind. Utility-scale, land-based resources are scarce in Delaware. Some of the public support necessary for wind farms to be chosen over other energy sources has been the direct result of advocacy groups' outreach efforts.

5.7 Georgia

Although Georgia currently has less than 1 MW of installed wind capacity, the Georgia WWG is working to move forward with both small and utility-scale wind projects in the state. Small-scale wind is primarily being considered in mountain communities, while small- and utility-scale wind (as offshore wind) are being considered in coastal communities.

WWG activities include arranging community leader meetings and educational forums, providing technical assistance, and coordinating and disseminating information to a wide audience. The group has a draft model resolution for local governments to use to appropriately site wind development and manufacturing. Additional resources that are being developed and collaborations such as the webinar on Georgia's offshore renewable energy potential are helping to open the door for wind opportunities in the state. The WWG's work led to the installation of an affiliate Wind for Schools project turbine at the Towns County Schools campus.

In addition to the meetings, education, information, and technical assistance provided, the WWG is supporting the Southern Company's plans to deploy an offshore met tower, which will test feasibility for a wind farm off the Georgia coast. They are providing mapping tools for decision makers and stakeholders to make informed decisions and participating with neighboring state

energy offices and the Southern Alliance for Clean Energy to study regional transmission needs for ocean-based renewable energy. In support of the new manufacturing facility being built by the German ZF Group to build wind turbine gearboxes, the WWG is preparing to form a manufacturing committee.

Georgia is making progress toward installing wind capacity, but to effectively contribute to the national 20% by 2030 vision, barriers must be addressed. These include a lack of local knowledge and experience with wind energy; policy-related barriers for offshore wind farms that are subject to federal and state regulation; siting and permitting issues for offshore and land-based wind projects; inadequate financial incentives; and lack of an appropriate permitting process.

State-level funding for wind is comparable with funding for other renewable energy technologies in Georgia; however, it is not clear whether this funding level is sufficient to support ongoing wind deployment informational outreach.

5.8 Hawaii

Hawaii had 93 MW of installed wind capacity at the end of 2011.[14] Current limitations for wind development in Hawaii are largely due to grid stability and island load issues, which make the implementation of large quantities of wind problematic. In addition, the Interisland Wind project proposes to connect up to 200 MW from a wind farm on Lanai and 200 MW from a wind farm on Molokai via undersea cable to Oahu. This project will likely take many years to complete. The development of the Lanai and Molokai projects hinges on many issues, but primarily on the cost of an undersea cable and local project acceptance. Although WPA has some activities underway in Hawaii, such as providing technical support to the WWG, most renewable energy development support from DOE and NREL has been provided through the Hawaii Clean Energy Initiative.

There is a 25% to 60% capacity factor for wind in most of Hawaii. There is interest in using wind to pump water as well as expanding the small- and medium-size wind market.

Barriers in the state include the following:

- It is difficult to access federal funds due to a high number of endangered bird species in project areas.
- The Environmental Protection Agency requires a consultation and wildlife conservation plan, which:
  - Is cost prohibitive
  - Is overly burdensome on applicants
  - Causes projects to shut down
  - Means that issues must be mitigated prior to initiating projects.
- The utility is a monopoly (with the exception of Kauai).

[14] By the end of 2012, Hawaii had installed 206 MW.

- It has limited investment in wind energy.
- It cannot handle wind intermittency.

- Although Oahu has a 30-MW wind farm with a battery system, batteries are prohibitively expensive for small- to mid-scale projects.

Activities identified to address barriers in the state include finding a more holistic approach to addressing bird issues (which requires a programmatic plan and flexibility from the federal government).

5.9 Illinois

As of the end of 2011, Illinois had 2,743 MW of installed capacity.[15] Most installed capacity in Illinois is utility scale, although some community wind projects are installed. The state is still struggling to develop small wind. The chronic lack of funding from the state rebate program means that the program accepts applications typically for only 1 month and even then cannot fund all eligible applicants. Illinois metering laws help to make the state more attractive for wind development, and Illinois is a restructured state with competitive energy generation. The legislation implementing the Illinois RPS created the Illinois Power Agency, which has procured renewable-based power on behalf of Illinois utilities to meet their graduated RPS requirements. The Illinois Power Agency has awarded some new contracts for in-state wind.

Three major barriers affect wind development in Illinois.

- Wind opponents in Illinois are well organized. For example, at the WWG's taxation workshop, picketers handed out flyers to officials and staff attending the workshop and drew some media attention. Although well organized, opponents are relatively few in numbers, making it easy to get to know them and their concerns. Their position is anti-wind, mostly focused on perceived health issues such as headaches. Their activities resulted in the state considering 1.5-mile setbacks from wind turbines to adjacent property owners, which would effectively zone wind out of the state. The vast majority of the concern is associated with one poorly sited project.
- Economic barriers include the state deficit and current economic challenges.
- Property value impacts are a concern. Illinois is home to a property value guarantee in only one county, which is highly coveted by other counties. Developers claim wind energy installations have no impact on property values but are generally unwilling to sign a guarantee. This property value guarantee was implemented late during negotiations between a developer and the community and is not well defined. This guarantee has been problematic for wind proponents in Illinois.

[15] By the end of 2012, Illinois had installed 3,568 MW.

5.10 Indiana

No Indiana representatives attended a regional meeting or provided a state update. As of the end of 2011, Indiana had 1,340 MW of installed wind capacity.[16]

5.11 Kansas

At the end of 2011, Kansas had 1,274 MW[17] of installed wind capacity from utility and distributed wind projects, including wind development from projects at the Post Rock Wind Farm and Ironwood sites. Installations through the Kansas Wind for Schools project included 13 installed turbines with additional schools working through the application and development processes.[18]

Kansas has an RPS that requires 20% of generation by 2020 to be obtained from renewable energy sources, including wind. This policy is encouraging utilities to develop wind energy to meet the 20% requirement. Kansas also offers net metering for customers of investor-owned utilities, but municipality-owned utilities need assistance with setting up a system that could include net metering. Although Kansas has some beneficial wind policies, further wind development will likely be hindered by the state energy office's lack of emphasis on wind energy and policy instability at the federal level. An easy-to-understand national message on the value of wind to the nation and its potential for economic development would be of value.

The Kansas WWG is not meeting currently, but the group worked hard to implement the first 1,000 MW of wind development, educating landowners and county commissioners on the economic potential of wind and highlighting the differences between coal and wind. Kansas has also successfully switched from strictly project development to supplying wind development support. In one town, more than 400 jobs were created to support the wind industry.

Despite the incentive provided by the RPS requirement, a number of barriers are inhibiting wind development in Kansas. According to a survey conducted by Kansas State University in 2010, environmental concerns rated the highest. People are very concerned about potential development in the Flint Hills; the proximity of wind turbines to the great wetlands of Cheyenne Bottoms and Quivera Wildlife Refuge, an extremely popular stopover point for waterfowl and cranes; and the impact on prairie chicken species that are under threat in Kansas. There is a study underway at Kansas State University to investigate the decline of prairie chickens in the state, and one of the study's goals is to establish whether wind turbines affect prairie chickens in the Midwest. Positive results from this study could help wind development in Kansas.

Other concerns about developing wind power in Kansas include health impacts and property rights. Education about these topics — as well as costs, transmission, and economic development value — was identified as a way to address these barriers. Through organizations such as the Renewable Energy Demonstration Initiative and Resourceful Kansas, some of these education needs are being addressed. The Renewable Energy Demonstration Initiative is developing an alternative-energy demonstration site where people can see what a wind turbine looks and sounds like, as well as a demonstration of energy usage and savings. Resourceful Kansas is

[16] By the end of 2012, Indiana had installed 1,543 MW.
[17] By the end of 2012, Kansas had installed 2,712 MW.
[18] By the end of 2012, 21 Kansas schools were participating in the Wind for Schools project.

engaging communities throughout the state and increasing awareness of renewable energy options through seminars, energy assessments, and technical assistance. These organizations and others like them are helping to inform citizens and decision makers about the costs and benefits of wind.

Another barrier to wind development in the state is a lack of transmission from the wind-rich west to load centers in the eastern part of the state. There is also a lack of understanding of the general wind resource, which is limiting the development of community wind projects. The 100-meter measurements from Kansas State University are taken at a height that is insufficient to procure good data and attract attention from developers interested in implementing a turbine at the university.

Regarding the Wind for Schools project, having a champion at the schools is extremely beneficial. This level of support encourages strong community involvement and companies wanting to get involved in the project. This support is a great grassroots effort to promote wind development but could also be harnessed to support expanded development.

Working with rural power cooperatives will also allow expanded wind development. In general, co-ops are not interested in substituting kilowatt-hours (coal for wind, for example) but rather in maintaining a low power cost for their members. There is also a strong local desire to own any new infrastructure, so the independent power producer model is of little interest. Working with co-ops as a group will also likely allow further development, a requirement if Kansas is going to meet its wind development potential.

5.12 Kentucky

Kentucky has no large-scale commercial wind installations. Although the state does not have an RPS, it does have a net metering law for projects up to 12 kW and a state income tax incentive for development. Unfortunately, these aren't strong incentives for wind development in the state. An additional challenge to wind development for Kentucky is resource mapping. Because the maps focus on larger blocks of resource areas, there is a disparity between what the maps show and what might actually be available.

Despite little incentive to develop wind in Kentucky, in 2011 the Tennessee Valley and Eastern Kentucky WWG worked to prepare these states for the growth necessary to contribute to the 20% Wind Energy by 2030 wind vision in a manner beneficial to utility, state, and local stakeholders. The group provided analytical and reference tools to regional utilities, facilitated state and regional collaboration through the regional WWG, conducted market research on wind energy markets with the result of a report on regional market opportunities, provided technical assistance to states on policy options, identified and analyzed best practices for wind energy within the eastern Kentucky region, and provided outreach and education to electric utilities.

5.13 Maine

As of the end of 2011, Maine had 397 MW of installed wind capacity with more than 300 MW under construction.[19] Projects in Maine consist of large, medium, and small turbines. Community

[19] By the end of 2012, Maine had installed 431 MW.

projects are also underway, with 150 MW of community wind in the pipeline. The University of Maine received funding to research deepwater offshore wind.

Maine has a binding state goal of 2,000 MW of installed wind generation by 2015, which expands to include offshore wind development by 2020. Reaching the wind-specific goal requires a supportive policy environment. Maine has an RPS that includes wind and a generally predictable siting and permitting development process for large wind projects. Small, medium, and community wind projects have good legislative support that includes a small wind rebate, net metering, feed-in tariffs, a renewable energy credit premium, and a green standard. There is also a requirement for tangible local benefits (i.e., the community receives a development fee).

Although there is some policy support for wind energy, barriers to moving wind energy forward in Maine exist. Energy markets are difficult to enter due to the inability to obtain a power purchase agreement. Policies regarding wind energy can also be unstable due to the frequent administration changes and the learning curve this imposes for developers and project supporters. Transmission and limited funding for small and community wind are also barriers for wind energy. Finally, multiple state agencies must review proposed projects, making development difficult, especially for small wind projects.

5.14 Maryland

Maryland has 120 MW of installed capacity. With an RPS of 20% by 2022, Maryland has many additional opportunities for land-based and offshore projects, although most of the attention is focused on offshore wind. The WWG is working to pass a bill that would require long-term contracts for offshore wind power and support the installation of 1 GW of offshore wind.

Deployment is increasing at the residential level due to increased grant opportunities, and deployment is also taking place at universities. The anemometer loan program is ongoing but is dependent on WPA funding.

A major barrier to further wind development in Maryland is the ecological impacts of potential offshore development. Because so much research is being conducted on this topic, concerns may be mitigated, and this barrier to offshore development may be removed. Like many areas of the country, another barrier to wind development in Maryland is the uncertainty of the investment tax credit and the Production Tax Credit. Without these stable policies, wind developers are unlikely to pursue development in Maryland.

5.15 Massachusetts

As of the end of 2011, Massachusetts had 46 MW of installed wind capacity (primarily from community wind projects).[20] The state made major progress by installing just under 20 MW in the first half of 2011, anchored by the 15-MW Berkshire Wind Power Project on Brodie Mountain in Hancock. The ~420-MW Cape Wind project in Nantucket Sound may be the first U.S. offshore wind project. This project has been fully permitted and is expected to move into the construction phase, although it continues to face legal challenges at every step.

[20] By the end of 2012, Massachusetts had installed 100 MW.

The state has several active programs to promote distributed and community-scale wind projects, primarily administered by the Massachusetts Technology Collaborative. Massachusetts has been a WPA priority state with an active WWG and with active participation in the New England Wind Forum. The Massachusetts Technology Collaborative is a strong state partner to promote the use of wind technology. Massachusetts has a very active anti-wind community in the state, with most projects litigated to the full extent possible. Some of the most contentious public hearings and organized misinformation outreach events have occurred in the state.

Massachusetts is moving forward with some legislative issues that would bring reform to portions of the wind development processes. One of these is the Wind Siting Reform Act, which will encourage wind development by establishing clear siting standards, one-stop permitting at the local and state levels, and streamlined appeals of permits. Massachusetts is also working on reports and programs that will inform future changes and reforms. Documents such as the Massachusetts Clean Energy Leadership report are helping Massachusetts identify strengths and areas for improvement that would move the state forward in developing renewable energy. Programs like the Commonwealth Wind Incentive Program assist wind projects of all sizes and move Massachusetts toward the governor's goal of 2,000 MW by 2020.

The Cape Cod Commission is trying to oversee regional siting for wind systems in the Cape Cod area. Through this effort, the commission would sequence its review and the community-level review. This would likely streamline the process, but depending on the commission's standards, it may greatly limit wind development on Cape Cod.

To better facilitate the development process, the state is working with the Massachusetts Historical Society to identify regions with issues that might restrict development. This will make it easier for developers to know which areas to avoid.

The Massachusetts Department of Environmental Protection hosted a panel on noise and health impacts. The department develops and enforces the noise ordinance for the state. This could be seen as a model to help address this issue in other states or it could be expanded as a topic to consider on a regional basis.

Although historically most large turbines in the state have been part of community projects, the implementation of these smaller-scale projects is slowing due to poor economics brought on by the recession and increasing organized (and typically external to the community) opposition to project development.

State barriers in Massachusetts include:

- Social acceptance issues
- Permitting and siting issues
- Issues with integration of wind development. Although state programs are working well, many projects larger than 100 kW "get stuck" in the review process because of changing permitting requirements
- Historic preservation issues, for buildings and areas

- A lack of long-term contracts for power purchase or renewable energy credits for larger projects.

5.16 Michigan

Michigan had 377 MW of installed capacity as of the end of 2011.[21] Michigan's RPS has a cost standard based on the cost of a new coal power plant and, because wind energy is cheaper than originally estimated, the cost standard will need to be adjusted. Because the cost of wind electricity is lower than expected, the Michigan WWG considers that the state has the first wind "rebate" in the country; approximately $55 million will be returned to customers.

Northern Power is producing a new utility-scale turbine, and several have been installed on the Upper Peninsula. Investment continues in small-scale turbines. Michigan State University's anemometer loan program continues and is in its fifth cycle. There is interest in upgrading Michigan's storage capacity, including investigating using electric car batteries for grid storage once they've been removed from the electric vehicle.

Michigan has invested in studies to understand the misinformation about wind and asked several experts to help separate fact from fiction. This effort will result in a report and a public meeting. Polling on wind attitudes is also supported.

Zoning and siting remain major barriers to wind development in Michigan, and transmission is an ongoing issue. The Great Lakes Wind Council developed wind energy permitting language, but progress has stalled in the current budget climate.

The Michigan WWG is covering all issues related to wind energy, and WPA's state wind outreach team continues to provide education and outreach. The team focuses mainly on zoning and siting issues, and there is an ongoing need to educate the "middle ground" (i.e., those neither opposed nor for wind energy) as issues and concerns arise. Michigan also recently started a Wind and Health Technical Group, which is considering whether the current noise standard for wind projects (55 dBA at the property line) should be changed.

In recent years, progress has been made addressing transmission issues. Michigan now has a Wind Energy Resource Zone Board, which has identified two zones for expedited siting for transmission: the "thumb" area of Michigan and Allegan County on Lake Michigan. Also, the Public Service Commission granted expedited permitting for transmission service that would bring wind energy into load centers.

Wind energy-related manufacturing is perceived as a great opportunity. Michigan is home to more than 100 companies involved in the wind industry and has had some success using American Recovery and Reinvestment Act funding to make Michigan companies competitive in manufacturing wind energy components. This work supports the development of Centers of Energy Excellence in Michigan for various manufacturing products (machining hubs, low-cost carbon fiber for blades, etc.).

[21] By the end of 2012, Michigan had installed 988 MW.

5.17 Minnesota

As of the end of 2011,[22] Minnesota had 2,733 MW of installed capacity. Minnesota had a WWG in the early 1990s, but the group disintegrated with competition from early development activities. The void was filled by two not-for-profit organizations, Wind on the Wires and Windustry.

In Minnesota, the Community-Based Wind Development law continues to promote community-owned wind. However, this law has been updated annually, making the program a moving target. House Bill 805 promotes projects 25 MW and smaller through incentives to buy locally generated and owned wind. Like green pricing, the bill allows ratepayers to opt in and elect to pay more so that a utility buys locally owned power. A major new transmission line is also being developed from Fargo, North Dakota to the Twin Cities, which will affect wind development along the new transmission corridor.

Wind development in Minnesota first occurred in areas away from homes and is now happening closer to homes, which is generating new permitting and siting concerns. In Minnesota, transmission is at capacity for remote projects on agricultural lands. One project has been particularly problematic and has generated tremendous animosity among neighbors. As a result of opposition to wind energy, the county passed an ordinance requiring the equivalent of 10 rotor diameters from any property line belonging to someone not invested in the project. The ordinance, which is more stringent than the state's setback requirements, was contested and was recently granted a hearing to determine whether the setback is warranted and whether there is sufficient evidence to support the stray voltage requirements.

5.18 Montana

Montana had an installed capacity of 386 MW from 2005 to 2011.[23] The state has a large wind resource, but the lack of transmission capacity inhibits Montana from capturing it. The governor is a wind energy supporter, but further development will require transmission upgrades. Old arguments such as wind variability and the notion that exporting wind won't benefit Montanans are being used against wind. Montana exports approximately 60% of the energy it produces, mostly in the eastern part of the state. There is a need to transfer more benefit from wind development to landowners. The majority of people in the state support wind energy, but the viewpoint of the vocal minority is heard.

Opponents to new transmission are targeting commercial wind, and as a result, the issue has grown in the past 2 years. Major transmission projects are under development in Montana, but a district court recently ruled that the private company developing one of the transmission lines (an entirely merchant, non-utility line) lacked eminent domain rights as a merchant company. The judge also said that the company was not adequately compensating the landowners for their property losses. The implication of this decision is that other investor-owned utilities are unable to use eminent domain for transmission. This decision has great impacts on the future of wind in Montana. The transmission line developer is working to change the law in the legislature, and it's hotly debated. Eminent domain questions affect all of the transmission projects.

[22] By the end of 2012, Minnesota had installed 2,986 MW.
[23] By the end of 2012, Montana had installed 645 MW.

A different model for landowner compensation for transmission lines is needed, and Montana is on the leading edge of developing a solution. The law being considered by the legislature will clarify that the developer can use eminent domain, but it won't address the compensation issue, which will be needed to unlock the state's wind resource. It is very important to make sure that the process gives landowners an opportunity to bargain and secure fair compensation. Some ideas include paying pole rental fees or providing royalties for power transmitted through the lines to landowners. Another suggestion was to give landowners a property tax break for a one-quarter-mile swath underneath the poles in addition to the upfront costs to acquire the easement, but this idea has been met with opposition from landowners who say this is inadequate compensation.

The second most significant barrier is restriction on export to nearby markets. For example, Washington won't allow power generated from east of the Continental Divide, where most of Montana's wind resources are located, to enter Washington. Because of this, Montana is unable to contribute to meeting Washington's RPS. This is especially disadvantageous since Montana's wind blows in the fall and winter and complements the Columbia River Gorge wind perfectly, which blows in the spring and summer. This can be characterized as a limited state market for wind and also a lack of ability to export, which is important because Montana's demand is low.

Northwestern Energy is the largest energy developer in the state. The company is very interested in using its coal plants to firm up wind energy. Sixty percent of the state's energy currently comes from coal, followed by hydropower and then small contributions from wind. Montana has a 15% by 2015 RPS, and Northwestern Energy uses approximately 10% renewable energy.

5.19 Nebraska

Nebraska installed its first utility-scale wind turbine in 1998 and has 337 MW of installed capacity at the end of 2011.[24] The projects are primarily comprised of utility-scale turbines but also include more than 20 schools with small-scale turbines that are involved in WPA's Wind for Schools project.

The Wind for Schools project has been very active and is a successful way to educate teachers, students, and their families about wind energy. Currently 25 schools are involved in the program. Many teachers have attended wind energy curriculum training. Funding for the schools comes from various sources: the U.S. Department of Agriculture, Nebraska Public Power District, the Attorney General's office, private donations, community foundations, and local efforts. With many schools focusing on energy, including community colleges, Wind for Schools is an educational steppingstone that creates enthusiasm and an understanding of how energy works, as well as how wind fits into the greater energy picture.

Wind energy education and outreach have been important in Nebraska not only to schools but also to landowners, developers, and utilities. The Nebraska Farmers' Union has performed a lot of public outreach to communities and found that customers and landowners are very supportive of wind energy. For landowners with installed turbines on their property, approximately 90% want to move forward with more wind energy. Continued outreach and education to public co-op customers, owners, and managers are needed. One way the Nebraska WWG has helped address

[24] By the end of 2012, Nebraska had installed 459 MW.

this need is by hosting outreach meetings and Wind Power Nebraska conferences. These events have helped facilitate communication, networking, and dialogue between wind energy stakeholders and Nebraska residents.

Another barrier that has been successfully addressed was the inability of Nebraska's Public Power District to utilize federal wind development incentives that were designed for the private sector. In 2007, LB629 was passed unanimously to create an opportunity for a public-private partnership between public power entities and privately owned community-based energy development (C-BED). This legislation also allowed for sales tax abatement for C-BED projects.

Recent legislation has helped Nebraska to address additional barriers. LB436 addressed the lack of a statewide net metering policy in 2009. With both public and utility support, LB436 provided for a statewide process to reimburse small wind users under 25 kW. This legislation wouldn't have moved forward without public education and outreach.

In 2010, LB1048 passed and addressed barriers to the wind export market. It clarified the roles of various stakeholders in Nebraska's export market, including private-sector wind developers, public power utilities, and the Power Review Board for export markets. LB1048 also changed the federal treatment of wind projects so that they utilize a nameplate capacity formula. This brings in a more dependable cash flow to communities.

Although Nebraska has successfully addressed some major barriers, challenges to wind development remain. The Nebraska WWG has identified the following barriers that need to be addressed:

- A need for a higher kW net metering law
- A need to more clearly define and incent community ownership's role in state wind development
- Identification of unused transmission capacity in the state for smaller projects
- A need for large grid transmission infrastructure to more efficiently utilize domestic and export wind energy
- A need for continuing education of decision makers, landowners, public utilities, and the general public about the benefits of wind energy development.

One of the keys to addressing these barriers is education, and Nebraska will continue working to educate and raise awareness about wind energy, although the source of funding to continue this work is unknown.

The vision of the two major Nebraska utilities is changing, with the boards of directors of these institutions understanding the benefits of wind development and moving the utilities to consider expanded wind development. The owners/members of the rural electric associations are interested in expanding wind development (as demonstrated by a deliberative polling process conducted in the state) but are not interested in forcing the generally well-run rural electric associations into expanding wind deployment. The associations' directors are generally resistant to any legislative mandates to support wind, such as a state RPS, as they want to make their own decisions regarding power infrastructure. More education of rural electric association members

and an increase in the cost of power relative to wind will lead to expanded wind development in the rural electric associations' territories.

5.20 Nevada

At the end of 2011 the state had less than 1 MW of installed wind capacity and no projects under construction.[25] A small 5-MW distributed wind interconnection demonstration program has been oversubscribed with more than 11 MW of applications, demonstrating the high level of interest in the state for the expanded use of distributed power.

The implementation of an aggressive RPS (25% renewables/efficiency by 2025) is a prime driver for the expanded wind development. Another factor driving the wind energy market in Nevada is the successful resolution of major barriers such as market access, siting, and permitting based on active engagement with the codes and ordinance in Carson City and Washoe County (these are now serving as a model for other cities and counties to adopt). Several large-scale projects have been proposed and/or have submitted applications to the Bureau of Land Management, such as the 194-MW Great Basin Wind Project.

Nevada has enacted some good wind deployment policies. The development of the Governor's Renewable Energy Transmission Access Advisory Committee report, the establishment of the tax abatement and wind incentive programs, and the increase of net metering from 1% to 5% have helped wind development. Other policies, such as the authorization of cities and counties to include location and appearance as "reasonable restrictions" and the end of a wind incentive program, are hindering wind development in Nevada. Remaining challenges to development in the state include ordinances, land management and environmental issues, transmission, the need for more research and development, workforce training, infrastructure, public policy, wildlife, and air space and military mission training.

WPA has an active WWG in the state that has worked to address the remaining large barriers to wind development. To date, DOE and WPA have funded outreach efforts in Nevada, and there are no plans or capacity for the state to financially support continuing WWG activities.

Barriers to deployment in the state include:

- Ordinances, codes, and siting related to small wind turbines
- Land management issues
- Environmental issues
- Transmission issues
- Lack of workforce training
- Air space and radar issues (87% of the land in Nevada is government owned, 40% by the Department of Defense, resulting in many no-fly zones)
- Difficulty accessing federal lands for wind development

[25] By the end of 2012, Nevada had installed 152 MW.

- A need to increase net metering from 1% to 5% to help small community projects
- Lack of funding for outreach and education activities (currently these activities are funded by WPA and, with the state's deficit, continuing these activities will be difficult).

5.21 New Hampshire

New Hampshire had 25.5 MW of wind capacity installed at the end of 2011, mostly from the 24-MW Lempster Wind Farm in Sullivan Country. The 99-MW Granite Reliable Power Windpark in Coos County, providing power to Green Mountain Power and Central Vermont Public Service, pushed the state above the 100-MW threshold in FY2012.[26] The state has an RPS of 24.8% by 2025. The state does have a simplified one-stop permitting process for projects larger than 30 MW. WPA is not active in the state, although work with the New England Wind Forum and the New England Wind Education Project directly supports addressing siting challenges in New Hampshire.

5.22 New Jersey

New Jersey had 7.8 MW of installed wind capacity at the end of 2011, consisting of 29 small wind projects, with no net increase over the past year.[27] The Energy Master Plan released in October 2008 calls for 200 MW of onshore wind by 2020, 1,000 MW of offshore wind by 2012, and 3,000 MW by 2020, but it is widely accepted that the dates associated with these targets are no longer valid. The 2011 Draft Energy Master Plan upholds the offshore targets but states that the dates are not realistic. In August 2010, the state passed the Offshore Wind Economic Development Act, which supports and subsidizes offshore wind development. Even with the delays in this market, support is evident for expanded use of offshore wind technologies. Three offshore wind developers in New Jersey have each proposed 350-MW wind farms and are actively working with appropriate state and federal agencies on necessary studies and permitting approvals. None of these projects will be built in the immediate future.

New Jersey will probably reach the 100-MW target when one of the offshore projects comes online. One developer has also submitted plans for a 20-MW pilot project offshore. WPA has an active WWG in the state, and the Office of Clean Energy funds an anemometer loan program, focusing mostly on university and college school sites. Over the past year, WPA provided technical support to the state regulatory board to assess standards for small and distributed wind technology implementation in front of a challenge to this program due to the lack of performance from several early projects.

There is strong support from the governor and incentive to reach the RPS of 20.38% by 2021. There has also been strong support for distributed generation, but that seems to be diminishing. No major barriers to land-based or offshore wind were identified.

5.23 New Mexico

No representative from New Mexico attended a regional meeting. As of the end of 2011, the state had 750 MW of installed capacity (778 at the end of 2012).

[26] By the end of 2012, New Hampshire had installed 171 MW.
[27] By the end of 2012, New Jersey had installed 9 MW.

5.24 New York

The RPS in New York is 29% renewable power by 2015, and as of the end of 2011, the state had 1,403 MW installed. The state has also developed protocols for development, including survey protocols for birds and bats. New York has a strong interest in offshore wind. In 2009, the New York Power Authority issued an RFP for offshore wind projects in the Great Lakes. At the same time, there is local opposition: Three towns and one county have moved to pass ordinances or resolutions opposing offshore wind.

5.25 North Carolina

North Carolina has a few kilowatts of distributed wind capacity installed, some through the Wind for Schools project. Although there are currently no utility-scale wind projects in North Carolina, a few projects have been proposed. Most of North Carolina's resources are found along the coast and in the mountains, in addition to a strong estimated offshore resource. According to some documents, the offshore resource is estimated to be the best offshore resource of any eastern state. Local universities have conducted studies that support offshore wind, and the University of North Carolina at Chapel Hill is planning to mount anemometers and sensors on offshore platforms near the northern Outer Banks to collect real-time wind data. A governor's offshore advisory panel is considering all offshore opportunities and plans to publish a report. In the meantime, the North Carolina Planning commission is preparing transmission utilities for an increase of offshore wind, and there have been discussions regarding a legislative bill that would enable the state to take advantage of manufacturing opportunities.

Despite these possibilities, barriers to developing wind in North Carolina remain. For land-based utility-scale wind, the ambiguity in the 1983 Mountain Ridge Protection Act (or "Ridge Law") over the legality of placing wind turbines on mountain ridges makes it difficult to proceed with projects in the mountains. Other barriers include a weak RPS of 12.5% by 2021, NIMBY opposition, and viewshed issues.

5.26 Ohio

Ohio was one of the states that crossed the 100-MW threshold in 2011, ending the year with 112 MW of installed capacity.[28] WPA has an active WWG in this state and is providing regional collaboration through the Great Lakes Wind Collaborative. When combined with the updated 80-m wind assessments and the 2010 annual meeting of the collaborative in Cleveland, these activities demonstrate that if all of the other Great Lakes region states have been able to take advantage of their wind resource, Ohio should as well. Recent efforts by the WWG, active developers, and concerned stakeholders working with the Governor and General Assembly led to the implementation of Senate Bill 232, which reverses a non-competitive tax structure seen as a major barrier to wind development. In a recent decision, the Ohio WWG will be funded by the state energy office for the next few years.

5.27 Oklahoma

By the end of 2011, Oklahoma had an installed capacity of 2,007 MW, with more than 713 MW installed in 2011 alone.[29] The majority of wind in Oklahoma consists of utility-scale wind

[28] By the end of 2012, Ohio had installed 426 MW.
[29] By the end of 2012, Oklahoma had installed 3,134 MW.

projects. There are no community wind projects. One school has a 50-kW turbine, and a few other small turbine projects exist. Oklahoma has primarily focused on utility-scale projects.

These utility-scale projects have been installed due to successfully addressing some barriers to wind in Oklahoma. Oklahoma has traditionally been rooted in oil and gas, so it has been difficult to generate interest in wind energy. With the work of the Oklahoma Wind Initiative, wind advocates were able to facilitate getting utility-scale interests involved in their state.

Another issue that has been successfully addressed in Oklahoma is wildlife. The Nature Conservancy, the U.S. Fish and Wildlife Service, and the Oklahoma Wind Initiative were able to develop a map that highlighted areas well suited for wind installations. The map was tailored to take into account the locations of bat caves, prairie chickens, and other endangered species, mitigating the impact on local wildlife.

Wind advocates in Oklahoma have found that one of the main ways to address wind barriers is education. They have provided education opportunities through landowner meetings, legislator workshops, and more. A main message has been economic development. Although rural groups seem to understand the impact wind can have on the economic development in a region, it seems that the message of economic development is not resonating with other groups. During a recent session of the legislature, the production tax credit was scheduled to be eliminated, but thanks to estimations from the Jobs and Economic Development Impacts model, a 2-year moratorium was established.

Even with these successes and recruitment efforts, it has been difficult for Oklahoma to attract manufacturing development and facilitate wind turbine installations. An effort by Clean Line Energy to build and connect transmission lines in Texas, Oklahoma, and Kansas to Tennessee encountered opposition from anti-wind groups and local citizens who are concerned with property rights, wildlife, and siting issues.

The ever-changing political environment affects wind turbine installations across the country. With a potential complete administration change every couple of years, it is difficult for beneficial legislation to be adopted and upheld over time. Current policy in Oklahoma is negative partially due to a strong natural gas industry and a belief that wind may compete directly with this technology. Currently there are no state funding opportunities for continued WWG activities.

5.28 Oregon

As of the end of 2011, the state had 2,513 MW of installed capacity.[30] In Oregon, policy plays an important role. Oregon's RPS is 25% by 2025, and the state offers $2 per KWh at the residential level as a tax credit. The Energy Trust of Oregon and the Oregon Department of Energy leverage their resources to promote wind and solar. Although Horizon Wind Energy has developed utility-scale wind in Oregon, most installed capacity is mid-scale, 5- to 22-MW applications.

Oregon is leading the way in small wind turbine certification requirements. Only eligible turbines qualify for Energy Trust incentives. A wind turbine certification program provides

[30] By the end of 2012, Oregon had installed 3,153 MW.

assurances that the turbines will live up to advertised promises. It is hard to promote small wind when the capacities that are typically achieved by small turbines are not consistent with typical projections. This is especially the case since the capacity factors for distributed wind technology are well below common large-scale wind applications. An unbiased federal program to evaluate turbines would benefit the industry. Preliminary certification work (grading) isn't working.

Acceptance and understanding remain important issues. Transmission issues also exist in some areas. The same communities that want wind are also questioning the need for large transmission lines. Interconnection issues are one of the biggest challenges. An assessment of need that is compelling and based on well-defined requirements and value is needed. Pacific Northwest National Laboratory has developed some tools to quantify benefits, but the need isn't translating into local, community-level impacts. Other barriers include siting issues, technology evaluation issues (e.g., resolving the debate about horizontal- versus vertical-axis turbines), and developing more community-level feasibility assessments to jumpstart projects.

5.29 Pennsylvania

At the end of 2011, Pennsylvania had 789 MW of installed wind capacity, primarily in utility-scale projects with some distributed wind installations.[31] Strong drivers for utility-scale projects exist, including the involvement of large institutions such as Penn State and the adoption of the Advanced Energy Portfolio Standard in 2004. Other opportunities for increasing installed wind capacity could come from the Wind for Schools project and a few offshore wind plans that are moving forward.

Although projects are moving forward, there has been some local opposition. The Clean Air Council has responded with local outreach efforts to better understand the communities' concerns and to educate them on the benefits of wind. The council is preparing a larger outreach effort to additional communities where turbines might be installed, including handouts and arranging site visits. Barriers to wind energy include ordinances, net metering, and wildlife issues. A model wind ordinance was developed in 2006 and has been adopted in many areas, but not everywhere. There has been some success supporting net metering, but many questions remain.

Efforts to support and promote the development of wind energy in Pennsylvania have generally been supported by state policy. Former state administrations have been proponents of wind, although the current one is focused on other energy technologies. Because of this shift in focus, support from the state is not expected.

5.30 Rhode Island

At the end of 2011, Rhode Island had 2 MW of installed wind capacity.[32] Additional projects are advancing through the development process, but several projects have experienced opposition. A few community projects are moving forward. Rhode Island may have other opportunities for developing wind energy offshore. The state is working with Blue Water Wind to look into the possibility of an offshore wind zone.

[31] By the end of 2012, Pennsylvania had installed 1,340 MW.
[32] By the end of 2012, Rhode Island had installed 9 MW.

To better facilitate the development process, the state planning office is developing standards for land-based wind. The state is also investigating a feed-in tariff for small wind. Rhode Island already has a systems benefit charge fund and feed-in tariff established for renewables. Rhode Island offers net metering for systems up to 5 MW and 3% of the peak load. The increase in system size and capacity limit were effective as of July 2011. Some net metering issues need to be addressed, including legal issues surrounding large projects on small loads (Public Utility Regulatory Policies Act rates vs. wholesale rates) and aggregating virtual net metering on the national grid.

5.31 South Carolina

South Carolina's wind market is young with only a few kilowatts of wind power capacity installed as a result of three Wind for Schools projects. A few studies are being conducted to identify offshore wind possibilities off the coast of South Carolina near Georgetown and North Myrtle Beach. In addition to these studies, the South Carolina wind stakeholders' group is working to educate local officials and their constituents through community forums. They are providing analytical tools, references, and technical assistance to utilities and other stakeholder groups. These forums and tools are being met with support and enthusiasm for developing wind.

There is a good testing and manufacturing presence in South Carolina. Clemson University Restoration Institute is constructing a large-scale wind turbine drivetrain testing facility through a DOE grant. IMO Group, GE Energy, Tindall Corp., Timken Co., Prysmian, and Okonite are among the manufacturers that are producing wind industry components in South Carolina.

To effectively contribute to the national 20% by 2030 wind vision, the South Carolina wind stakeholders group identified the following barriers to wind energy:

- Lack of local knowledge and experience with wind energy
- A need to understand and address siting and permitting for offshore wind projects
- Inadequate incentives to build wind projects (no RPS)
- Lack of funds for baseline environmental studies
- Utility-wind integration issues
- Concerns voiced at public and community leader forums, which include project costs and avian impacts.

5.32 South Dakota

At the end of 2011, South Dakota had 784 MW of installed capacity, with no new wind projects under construction.[33]

Ten years ago, South Dakota only had 44 MW of installed wind capacity. The current installations are comprised mostly of utility-scale and distributed wind turbines, including 11

[33] By the end of 2012, South Dakota had installed 784 MW.

Wind for Schools project turbines.[34] The South Dakota Wind Partners and other cooperatives have developed some community wind installations.

Funding is often a major barrier to wind projects. With the recent economic downturn, many projects were put on hold. South Dakota Wind Partners successfully addressed this barrier through an innovative investment model. The group led an effort to raise funds for a community wind project that is owned by South Dakota investors. South Dakota Wind Partners sold shares to more than 600 people in increments starting as low as $750 to raise more than $16 million. As a result, South Dakota Wind Partners now owns and operates a seven-turbine wind farm with a 10-MW capacity. The expected rate of return on investment is approximately 7%.

Wind integration issues are another barrier to wind development. South Dakota has successfully integrated wind near Pierre by alternating the use of wind and hydropower, depending on load demand and availability of the resource.

A major barrier that is difficult to address is population decline in rural areas. In rural areas, small communities are disappearing. When a school, a gas station, or a grocery store closes, it is often followed by the loss of the town. With few services in the middle of the state, the population is becoming centralized near Sioux Falls, the Black Hills, and on tribal lands. Economic development from the wind industry in the form of jobs and royalty payments can be a solution to depopulation.

Another aspect of population decline that poses a challenge to wind power is that the demand for energy is not in the same location as the source of power. Having used up the "easy" transmission, South Dakota must develop additional ways to move power from where it is generated to the load demand.

Working on federal and native lands poses special difficulties for developing wind. Because of these difficulties, many developers are looking for unencumbered property. In the past, dealing with properties that have U.S. Fish & Wildlife easements has caused major delays, some around 180 days. As a result, developers will walk away when they find out that a property has an easement on it. To avoid these situations, a map has been developed that shows the locations of federal land easements.

Similarly, difficulties and delays may ensue when pursuing a project on a reservation. Extra effort is required to perform a full environmental review. With no uniform commercial code in South Dakota, issues must be resolved in tribal court. But because of tribal court issues and costs, most companies won't go to tribal court. An additional challenge is the difficulty of working with the Bureau of Indian Affairs, which is required to review and approve all projects on tribal land. Bureau involvement generally results in redundancy, extra costs, and additional time. Additionally, inconsistencies among Bureau offices can mean that projects can be approved in one region, but a similar project by the same company must start from the beginning to be approved in another.

South Dakota's wind development policy is generally good and supportive. The state has an RPS requirement of 10% by 2015, but in 2010 it modified the contract excise tax that requires

[34] 13 by the end of 2012

contractors to pay 2% on gross receipts for the project in addition to the 4% sales tax they must pay. There is an option to apply to the state for a rebate, but there is no guarantee for reimbursement. This policy could deter a developer. South Dakota Senate Bill 194, which passed both the House and Senate in 2011, calls for the assembly of a Wind Energy Competitive Advisory Task Force that would review South Dakota wind energy taxation and incentives. The task force would then make recommendations to the Governor and Legislature on how to tax wind energy and yet remain competitive with surrounding states.

The best supporters of wind are rural county commissioners and school district officials who recognize the economic development benefits for their communities. Resistance is generally low, but resentment from locals who do not recognize direct benefits persists. There is a need to talk directly to potential supporters and make the community benefits clear to all locals, even those not directing benefiting from the project. Communication lines should be open during the development and construction process to limit potential sources of conflicts.

The South Dakota WWG and wind energy association have worked extensively to provide information about wind development across the state, holding 84 workshops on landowner and landowner rights in 2010. The unofficial goal is to develop 1,000 MW of new wind generation in the state.

The state currently has no financing opportunities to continue WWG activities in South Dakota. South Dakota has no state income tax, and there is little or no opportunity for help from the state government.

5.33 Tennessee

At the end of 2011, Tennessee had 29 MW of installed wind capacity, but there is little incentive for further development. Tennessee doesn't have an RPS, and the wind purchase goal has already been fulfilled. There are tax incentives for manufacturing.

Despite little incentive to develop wind in Tennessee, the Tennessee Valley and Eastern Kentucky WWG worked to prepare these states for the growth necessary to contribute to the 20% Wind Energy by 2030 wind vision in a manner that is beneficial to utility, state, and local stakeholders. To this end, they provided analytical and reference tools to regional utilities, facilitating state and regional collaboration through the regional WWG, conducting market research on wind energy markets with the result of a report on regional market opportunities, providing technical assistance to states on policy options, identifying and analyzing best practices for wind energy within the Tennessee Valley, and providing outreach and education to electric utilities.

5.34 Utah

Since 2007, Utah has progressed from 1 MW to 325 MW of installed wind capacity. More distributed and utility-scale wind projects, including those planned across state lines, are in the queue. There has been no interest in developing community wind projects.

The Utah Wind Power Campaign is facilitated by Utah Clean Energy and the Utah State Energy Program in coordination with the state wind outreach team and members of the Utah WWG with support from WPA. The campaign has worked to successfully address a number of barriers by

providing information, outreach, and education to keep the community of citizens, businesses, developers, and governments informed and up to date on critical wind energy events, activities, and action items. Outreach and education have also played an important role in the adoption of wind-friendly policies such as a production tax credit for large wind, an investment tax credit for small wind, net metering and interconnection standards and policies, and the development of a renewable energy ordinance.

The Utah Wind Power Campaign consulted with experts and the national labs and finalized a model wind ordinance in early 2010. The model is a tool for local governments to use when adopting wind ordinances. Many counties have adopted this model, but others are choosing bad wind ordinances that impede wind development. National labs have also been useful in providing technical assistance and expert testimony on core wind energy issues to utility regulators. The coordination of information for wind developers and stakeholders and the changes made in net metering and interconnection have earned Utah an "A" in the 2011 edition of "Freeing the Grid."[35]

Other programs such as the Wind for Schools project and the Utah anemometer loan program have helped to advance wind energy development in Utah. With the installation of two Wind for Schools turbines, wind energy curriculum and education are being incorporated throughout the school districts. The anemometer loan program has provided valuable information to interested parties and helped to further define Utah's wind resources.

Although Utah has made great progress in increasing wind development, barriers remain. One of the major barriers is wind energy myths. There is a great need for education of Utah's local governments, utilities, regulatory officials, governor, legislature, elected officials, citizens, businesses, and communities to dispel these misconceptions. Other barriers that pose a challenge to wind development in Utah include transmission, the inadequacy of the Utah renewable energy goal, restrictive wind ordinances, and environmental groups.

With the facilitation of conversations and education provided by Utah Clean Energy to landowners, utilities, and decision makers, policy is being developed. Additional outreach and education to the state could provide more favorable policies supporting wind development in Utah. Utah does not currently have financing opportunities to continue WWG activities. Without dedicated funding, Utah's education and outreach efforts will not continue.

5.35 Vermont

Vermont had just over 46 MW of wind development at the end of 2011, most of this from the Searsburg Wind Energy facility that was installed in southern Vermont in 1997 and a wind farm constructed in Sheffield Country in 2011.[36] Vermont has a very contentious development market with several active groups opposing any wind development in the region due to concerns over visual impacts. A Sustainably Priced Energy Enterprise Development Goal (similar to an RPS) calls for generating 20% of Vermont's load with renewable resources by 2017. This represents a

[35] A report published by the Network for New Energy Choices that describes best practices in state net metering policies and interconnection procedures; the 2011 report is available at www.newenergychoices.org/uploads/FreeingTheGrid2011.pdf

[36] By the end of 2012, Vermont had installed 119 MW.

non-binding objective because there are no penalties associated with a failure to reach this goal. The state does have a feed-in tariff for renewable sources that is capped at 2.2 MW. Vermont is viewed as a difficult wind market, and a future wind implementation scenario is unclear.

Vermont has no state wind siting guidelines or a streamlined process for permitting facilities. The Public Service Board has exclusive jurisdiction over all wind projects. Vermont has no state policies that support wind. However, Governor Shumlin is very supportive of wind and is developing a new energy plan that should identify an important role for wind development.

Major hurdles to wind development in Vermont include:

- Onerous guidelines by the state wildlife agency that require significant pre-construction studies for potential impacts on birds and Indiana bats
- Strong NIMBY opposition from host towns
- A slow Public Service Board review process
- A rigorous requirement in the review process stating that projects will not cause undue visual impacts and will conform with any provisions in an affected town that specifically require protection of important visual features in the town or region.
- Although Vermont enacted a feed-in tariff in 2010, it primarily benefited distributed solar photovoltaics, not distributed wind. There were only six small wind applications for the feed-in tariff. Out of 240 projects seeking the standard offer contract, wind projects constituted only 9,000 kW.
- Vermont's two major utilities are purchasing power from two wind farms in New Hampshire.
- Vermont has a state clean energy fund that is funded with revenue received from a tax on the Vermont Yankee nuclear plant for dry cask storage. The fund provides grants and loans to renewable energy projects, including two multi-turbine wind projects at the Bolton Ski Area and in Georgia that serve as demonstration projects to gain public support for utility-scale wind. Both locations are near the greater Burlington population area.

5.36 Virginia

Virginia has no installed wind capacity. Several projects are being considered along the Virginia/West Virginia border, and Dominion Power purchased more than 2,500 acres in Tazewell County for potential wind development. Most of the future projects are currently undergoing wind resource characterization, so it is unclear when the state will reach the 100-MW mark.

Despite legislation that passed a few years ago streamlining the permitting process for projects larger than 100 MW and recent state government support for all aspects of wind, there are still some major barriers to wind development in Virginia.

For utility-scale projects, a major barrier is local opposition to project development. Wind advocates have developed some tools and performed some outreach, but this is an ongoing challenge for wind projects. For community and distributed wind projects, state grants have

supported some school and residential efforts. However, the 35-foot height ordinance makes it difficult to move forward with Wind for Schools projects.

Offshore wind has seen some recent support in Virginia: reports from Virginia Tech, support from the Minerals Management Service, and the creation of a trade organization in support of offshore wind. Additionally, the General Assembly has signaled support for offshore wind and for the development of an offshore technology center that would perform certification and testing.

Although there has been some recent support for offshore wind and some success in streamlining the permitting process for utility-scale projects, the RPS in Virginia is not strong enough to drive new introduction of wind energy generation. Most utilities are already integrating all the renewable energy that they need to meet the requirements.

WPA has an active WWG in this state and in FY10 implemented a Wind for Schools project at James Madison University. The updated land-based and offshore wind resource maps may lead to expanded project proposals in the future. The state's 15% by 2025 RPS is not expected to drive the market since the language allows most technologies and is largely already met by existing generation and imports. An expanded focus on offshore wind technology deployment should allow WPA to provide additional support to the state. There is little state support available for WWG activities.

5.37 Washington

Washington often ranks third in the country for most installed wind capacity, following California and Texas. At the end of 2011, Washington had 2,573 MW of installed capacity with an estimated 800 MW under construction and 1,400 MW in the permitting process.[37]

Washington policy is supportive of renewable energy, and the state is focused on promoting small and community scale wind to avoid some of the major transmission issues that accompany utility-scale wind. California is an important renewable energy market for Washington. The state is also exploring markets in Montana, Alberta, and British Columbia.

The wind resource is better in eastern Washington, but major population loads are in western Washington, making transmission an issue. In many cases, wind resource and existing transmission coincide with sparsely populated areas. However, new wind projects are starting to encroach on populated areas or scenic areas (for example, new projects in the Columbia River Gorge).

The Washington Department of Commerce is focused on how to meet the increasing demand of a growing population. The state population is expected to double in 50 years, which works out to an additional 275 people per day. The state is examining several options to meet expected energy needs, including small and community wind. The Northwest was involved in wind technology development early on, but when funding for this effort declined, interest also waned.

[37] By the end of 2012, Washington had installed 2,808 MW.

Washington has effective policies in place (net metering, production incentives, standards), but siting and financing remain major issues. Production incentives have worked well and have been a boon for the smaller installers. Incentives are limited. Learning from others, Washington has been able to avoid some problems with large rebate programs. However, one problem is that small wind above a certain size doesn't qualify for incentive programs, so utilities are only interested in small wind up to that size. A smooth incentive taper would make more sense. Washington has 62 utilities ranging from small to large, which complicates the development of effective incentive programs.

Washington successfully resolved some concerns of the Washington Department of Fish and Wildlife related to wind project siting and wildlife impacts by developing wind siting guidelines. These guidelines have resulted in in-depth siting surveys and have worked well for all parties involved. Washington County conducted a county-wide siting environmental impact study to determine where to site turbines. This upfront effort has been rewarded by no siting issues since the study's conclusion. This was a very effective model and would work well in other counties.

Washington is focused on the following activities:

- Allocating transmission, including the identification of key players and implementing agreements
- Developing state-wide siting standards for urban, suburban, and rural areas while addressing differing state and county level prosperities
- Developing model siting ordinances through legislation
- Integrating wind at high contribution levels (including priority dispatch)
- Developing a supply chain for wind power systems, including manufacturing incentives and innovation-focused activities
- Training programs for wind energy
- Addressing issues with the RPS and how this will impact the state's renewable energy market
- Promoting utility-scale installations
- Net metering
- Community-scale project development
- Addressing sitting issues of small wind systems through expanding the availability of experienced wind installers
- Wind mapping.

Deployment barriers include:

- The state RPS is ripening, reducing the drive for continued wind development.
- There is a lack of understanding about long-term energy needs and how renewables (wind) can help support future energy needs.

- Utilities are risk-averse.
- Expertise in the industry is not local (i.e., it comes from out of the state or country).
- Technology is also not local (i.e., it comes from out of the state or country).
- The workforce is inexperienced, and there is a lack of training programs at all levels.
- The supply chain is not clear, and local suppliers are not certified. Washington is trying to develop more local manufacturing but is late to the industry.
- The state has low-cost hydropower.
- Big companies lack interest in small wind and diversification.
- The taxing approach is ineffective (local economic benefits are not well distributed among school districts, fire departments, and residents whose viewshed is impacted).
- Issues exist with wind power integration into the grid.
- Storage is limited and expensive but must be developed because increased generation is anticipated to clog transmission lines in the future. Storage will enable power to be distributed most efficiently.
- Coordination in the state is fractured (ad hoc partners).
- "Pay-to-play" for new transmission makes it more difficult to develop transmission than if costs were shared.
- Uncertainty exists about backup needs.

Specific challenges for community wind are:

- Finding ways to take advantage of the U.S. Department of Agriculture loan program
- Aggregating funds for modeling, assessment, and forecasting
- Packaging competitive financing, technical assistance, operations and maintenance training
- Simplifying the processes of grants, loans, and power sales.

5.38 West Virginia

At the end of 2011, West Virginia had 564 MW of installed wind capacity.[38] Most projects that are operating, under construction, or working through the permitting process are utility-scale projects. There is some interest in community-based wind, and a few projects are advancing through the process. Overall West Virginia is very receptive to wind development, and there is continued interest to develop at new sites throughout the state.

The West Virginia WWG is fully supported by DOE funding. It is uncertain whether state financing opportunities exist that could support continued WWG activities.

[38] By the end of 2012, West Virginia had installed 583 MW.

5.39 Wisconsin

Wisconsin had an installed capacity of 631 MW at the end of 2011, which includes an increase of 162 MW from several projects (utility-scale, community, and small-scale) completed in 2011.[39] Most of the wind resource is in the southeast part of the state in Fond du Lac and Dodge Counties. These counties are also near the largest load centers, so transmission is not a primary concern.

Wisconsin's RPS allows developers to build projects out of state as long as the power is brought into the state. As a result, they have additional capacity outside of the state. Proponents of wind development have tried unsuccessfully to increase the low RPS (10% by 2015; it also varies by utility).

Wisconsin projects 100 MW or greater are approved through the Public Service Commission, but projects smaller than 100 MW must be approved by local government. This can be very difficult depending on how local residents and officials view wind energy.

Several counties have passed ordinances that overstep their authority and go far beyond state law, limiting counties to regulation of wind development for the protection of health and safety. Legislation to reform siting has been developed, and even though it has bipartisan support, the legislature isn't considering it. On the other hand, the governor introduced a bill on behalf of the real estate lobby that would require 1,800-foot setbacks. In the Wisconsin debate, utilities have been conspicuously silent. Important advocates are Renew Wisconsin and Clean Wisconsin.

A third barrier is significant excess generating capacity (base load and intermediate).

5.40 Territory of Guam

With the exception of a few small renewable energy projects, Guam is 100% dependent on fossil fuels for meeting its energy supply needs.[40] The primary sectors that consume fossil fuels in Guam are:

- Electricity production
- Transportation
- Water heating and self-generation by the commercial sector (primarily hotels)
- Home cooking and small commercial operations (propane).

In 2010, the Guam Power Authority consumed nearly 2.9 million barrels of fossil fuel (~121 million gallons) for power generation.[41] In 2010, 109 million gallons of motor fuel were sold, including gasoline, diesel, and jet fuel. Note that the motor fuel data compiled by the Guam Energy Office do not include shipping to Guam. In 2010, Guam used 230 million gallons of

[39] By the end of 2012, Wisconsin had installed 649 MW.
[40] Jennifer Sablan of the Guam Power Authority provided this update. Additional information was extracted from Baring-Gould, I.; Conrad, M.; Haase, S.; Hotchkiss, E.; McNutt, P. (2011). Guam Initial Technical Assessment Report. 89 pp.; NREL Report No. TP-7A40-50580. Available at www.nrel.gov/docs/fy11osti/50580.pdf
[41] Internal data provided to the National Renewable Energy Laboratory by Guam Power Authority.

fossil fuel, or more than 1,270 gallons per year for every man, woman, and child living on the island.

Guam Power Authority is a full-service electric utility serving about 46,000 customers. It owns and manages 663 miles of transmission and distribution lines and 29 substations throughout the island. Electricity is delivered through a transmission and distribution grid consisting of a combination of 115-kV, 34.5-kV, and 13.8-kV lines. Its generation capacity is 552 MW with total energy production of 1,854 gigawatt-hours (FY 2009).

Although there is no wind development on the island, the Navy and Guam Power Authority have conducted wind resource mapping and assessments.

Barriers to wind deployment on Guam include limited land, potential windy sites on privately owned land, concerns over aesthetics of wind turbines, a large amount of military land that may create issues with zoning variances, no local tax incentive, typhoons, little accessible land, no prior experience with permitting a wind project, avian concerns, and other potential environmental impacts.

5.41 Commonwealth of the Northern Mariana Islands

With the exception of a few small renewable energy projects, the Commonwealth of the Northern Mariana Islands (CNMI) is 100% dependent on imported fossil fuels for its energy supply needs.[42] The primary sectors that consume fossil fuels in the CNMI are:

- Electricity production
- Transportation
- Space cooling, water heating, and self-generation by the commercial sector (primarily hotels)
- Schools and hotels.

The Commonwealth Utilities Corporation is the CNMI's publically owned utility, providing power, water, and wastewater services. The Corporation operates and maintains power generation and distribution services on all three main islands of Saipan, Tinian, and Rota; however, the power plant on Tinian is owned and operated through a power purchase agreement with a private power provider.

As part of an effort to consider the development of alternative energy options for CNMI, the Division of Energy and Department of Public Works oversaw the development of Alternative Energy Development Program in the CNMI,[43] which documents most of the key elements of the existing power system on the three islands.

All electricity power plants in the CNMI are powered by diesel fuel. The Commonwealth Utilities Corporation currently uses 22 million to 24 million gallons of diesel fuel per year, at a cost of more than $60 million. In 2010, total fuel imported for power generation was 554,811

[42] Abe Malae of Commonwealth Utilities Corporation provided this update. Additional information was extracted from Baring-Gould, I.; Hunsberger, R.; Visser, C.; Voss, P. (2011). Commonwealth of Northern Mariana Islands Initial Technical Assessment. 95 pp.; NREL Report No. TP-7A40-50906

[43] http://gov.mp/wp-content/uploads/2011/05/QUESTIONNAIRE-RENEWABLE-ENERGY5-FAQs.pdf

barrels (~23 million U.S. gallons) of diesel fuel. The local cost of diesel fuel is between $3.45 to $4.04 per gallon.

Due to the temperate climate, there is minimal seasonal load variation. The power system collapsed in 2008, so the utility spent most of the resources rebuilding the power plant and could not focus on other power sources.

During the past few years, work has progressed to implement several small wind projects in Saipan. Most of these projects consist of small Skystream turbine installations at schools; however, a planned project at the Southern Saipan High School consists of installing six Jacobs 20-kW turbines. Although several efforts have been made to support expanded renewable energy development within the Commonwealth and several public tender requests have been offered, there is no formal mandate or overriding policy to spur the expansion of alternative energy development.

The three inhabited islands of CNMI face many of the same barriers as Guam, including a lack of available land and a lack of local understanding of wind technologies and development structure. Differences include a much reduced military presence on the islands and a higher degree of environmental sensitivity due to several rare and threatened avian species (e.g., the Mariana swiftlet and the Nightingale reed-warbler). A U.S. Fish and Wildlife Service consultation states that although the current small wind projects are likely to result in impacts, they are not likely to jeopardize either species. Post-installation environmental impact studies of all of these projects are expected to provide useful data that could be applied to additional wind projects across the CNMI.

Another obvious difference is the lack of available wind development-class resource data and local ability to easily perform the required data collection. Another consideration is the condition of the local grid infrastructure, which is primarily low- and medium-voltage and is generally limited on all three islands. The integration of larger amounts of variable renewable technology will develop into a problem as larger contributions of wind are realized and the absence of any studies makes uncertain the real potential impact. Lastly, funding for project development and near-term deployment is limited, and the Commonwealth Utilities Corporation will experience difficulty assembling the financing package for large-scale wind deployment, likely requiring a higher reliance on long-term independent power producer models for project development.

5.42 U.S. Virgin Islands

The U.S. Virgin Islands (USVI) consists of three primary islands—St. Thomas, St. Croix, and St. John—and a handful of surrounding islands in the Caribbean Sea approximately 50 miles east of Puerto Rico.

Similar to many island communities, the USVI is 100% dependent on imported fuel oil for electricity.[44] Retail electricity rates in 2011 ranged from $0.33/kWh to as high as $0.49/kWh and were as high as $0.52/kWh following the oil price spikes of 2008. The electricity generation and

[44] Carl Joseph of the U.S. Virgin Islands Energy Office provided this update. Additional information was extracted from Lantz, E.; Olis, D.; Warren, A. (2011). U.S. Virgin Islands Energy Road Map: Analysis. 121 pp.; NREL Report No. TP-6A20-52360. Available at www.edinenergy.org/pdfs/52360.pdf

distribution systems in the USVI are owned, operated, and maintained by the Virgin Islands Water and Power Authority (WAPA). Created in 1964, WAPA operates as an independent public utility and is regulated by the USVI Public Service Commission.

WAPA generation assets are primarily located on St. Thomas and St. Croix and consist of steam turbines operating on No. 6 fuel oil, combustion turbines operating on No. 2 fuel oil, and a limited amount of internal combustion (diesel) generation. Capacity is derived primarily from combustion turbines (72%) and steam turbines (28%). Total installed capacity is 191 MW on St. Thomas and 117 MW on St. Croix.

Developable wind resources have been identified on many of the exposed ridges and in coastal areas of the USVI. Specifically, the southern shore of St. Croix and Bolvoni Point on St. Thomas have each been identified as potentially viable sites for utility-scale wind energy production. Other sites with sufficient exposure to the prevailing easterly tradewinds may also provide wind development opportunities.

The government of the USVI has a policy goal to reduce the state's dependence on imported fuels by 60% by 2025, and although this is not a mandated process, it provides a major driver for many actions ranging from energy efficiency to the expanded use of renewable energy technologies. Through the U.S. Department of Energy's Energy Development in Island Nations initiative, the USVI is receiving a great deal of technical and financial support as it works to reach its 60% fuel import reduction.

In one of the initial steps to reaching a 60% reduction in imported fuel use, WAPA completed a public solicitation for the delivery of solar energy through a PPA model, resulting in nearly 20 MW of awarded contracts. It is likely that a similar approach will be used for wind development over the next few years. The USVI also has a vibrant small wind market, supported by very high energy costs and supportive net metering policies.

Through the DOE's Energy Development in Island Nations initiative, WAPA and the Virgin Islands Energy Office receive technical and financial support to reach the 60% fuel import reduction. Through this effort, wind-specific studies have included screening assessments of potential wind sites, support for the implementation of a wind resource measurement activity, and regulatory review assistance.

Apart from costs that sometimes exceed conventional generation resources and its variable output nature, barriers to wind energy projects are potential wildlife impacts, land use issues, aesthetics, and nuisance impacts (on individuals living in close proximity to projects). There is also a lack of knowledge about wind technologies by the decision makers, the public, and people in the power sector, including contractors who provide technical services to WAPA. System integration, including the lack of understanding of wind technology from a grid stability perspective, is also a challenge. The final major challenge is a lack of local detailed wind resource data needed for near-term project development. Wind maps have been completed for the islands, but this is not sufficient to conduct detailed feasibility assessments, let alone project development.

To better assess specific sites in the USVI, the Virgin Islands Energy Office has initiated an activity to install meteorological towers and SODAR units at sites on the islands. Installing meteorological towers and collecting site-specific wind speed data for a period of 1 to 2 years will provide the Energy Office with the ability to better quantify the value of adding wind at those project sites and may help encourage interest from project developers. High-quality wind resource data collection to conduct power system assessments will also help by defining a good source of reference data for each of the main islands, supporting potential development at additional sites.

In collaboration with NREL, WAPA is also conducting analysis on grid stability and interconnection issues, both as an isolated power system and then with the USVI interconnected to other Caribbean islands (e.g., Puerto Rico) through an undersea cable. One of the initial studies examined a worst-case scenario of integrating a high contribution of wind and solar, indicating that at high contribution system impacts would be major without the implementation of some power regulation. In 2012, an assessment is planned that will examine near-term installations to just the two isolated grids while incorporating power smoothing and regulation technologies such as batteries or flywheels.

5.43 Territory of American Samoa

American Samoa, an unincorporated territory of the United States, is a group of five islands about halfway between Hawaii and New Zealand in the South Pacific Ocean. The American Samoa Power Authority (ASPA), the monopoly utility for the territory, provides about 9,900 customers with electric power and water services.[45] In 2010, generation capacity was 49 MW with total energy production of ~159 million kWh. The highest peak system demand was 28.4 MW in 2005.

More than half of the island's generation capacity (the Satala plant, producing 23 MW of 45 MW) was destroyed during an earthquake and tsunami on September 29, 2009. With Federal Emergency Management Agency (FEMA) assistance, ASPA installed 18 1-MW temporary generators. All temporary generators will be replaced for $16 million. Because the temporary generators are inefficient and ASPA is responsible for the fuel, ASPA is spending more than originally budgeted due to the increased fuel consumption.

FEMA and ASPA developed a three-tier plan for power following the tsunami. Tier 1 was based on the use of 56 FEMA-supplied and five ASPA-supplied temporary generators (unpacked grid) immediately following the disaster. Tier 2 (beginning approximately December 2009) involves the use of a temporary power generation system (Aggreko). Tier 3 (approximately 2 to 4 years after the disaster) is the permanent, improved project with 20-MW diesel generators, 2-MW Waste to Energy, 1-MW wind turbine, along with at least 1 MW of photovoltaics. An RFP was issued in December 2010 for a ground-mounted grid-tied, photovoltaic system for a total cost of $8.5 million, to be located on 3.75 acres adjacent to the airport runway. As part of the generation

[45] Extracted from Busche, S.; Conrad, M.; Funk, K.; Kandt, A.; McNutt, P. (2011). American Samoa Initial Technical Assessment Report. 61 pp.; NREL Report No. TP-7A40-50905. Available at www.nrel.gov/docs/fy11osti/50905.pdf

expansion and replacement, improvements in the transmission and distribution system are also being conducted.

American Samoa has the same fuel issue as all Pacific Island countries. The price of electricity in American Samoa is mainly a function of the volatile world price of diesel fuel. Fuel surcharges are used to recover the cost of fuel. Fuel prices more than doubled from 2006 to 2008. The world price of diesel decreased in 2009 after a worldwide recession. In 2010, the world price of fuel began increasing again.

Although there is currently no installed wind capacity on any of the islands, wind energy has the potential to play a significant role in supplying electrical energy to American Samoa. Combining the available wind resource with a high level of existing infrastructure and high energy costs make wind technology an attractive potential addition to the current generation portfolio. Currently, the Territorial Energy Office received a grant through the American Reinvestment and Recovery Act for the installation of several anemometers. ASPA is managing this project and is installing anemometers at various heights on existing power poles and communication towers.

6 Conclusion

Many barriers to expanded wind energy development face the nation. These barriers impact regions and states differently, although there are also obvious national-level barriers that affect multiple areas of the country. As the survey results indicated, key barriers to the development of wind technologies include a lack of forward-looking, viable markets spurring expanded wind development and a combination of siting, permitting, education, technology acceptance, and transmission issues.

Although stakeholders understood and generally agreed with a model of moving to a regional approach for WPA activities, they also pointed out that many wind energy development decisions are conducted at the state level. Stakeholders also stated that although progress has been made in opening markets to wind development, without continued funding and outreach support, many ongoing activities would be curtailed. Additionally, although attendees identified several organizations as potential funding sources, the current condition of the economy makes it unlikely that these sources will be able to support activities that the Energy Department once funded. No strong candidate was identified as a potential source of replacement funding.

There is a strong belief that the work of WPA and other stakeholder engagement organizations has been very successful and is critical to moving the market forward. Even though recent changes in the initiative's approach have been implemented, many felt that WPA's work is just beginning and that many of the states will require WPA's help to keep markets open and moving forward.

Appendix A: Great Lakes Regional Meeting Participants

Name	Affiliation	State
Jennifer Alvarado	Great Lakes Renewable Energy Association	Michigan
Julie Baldwin	Michigan Public Service Commission	Michigan
Ian Baring-Gould	National Renewable Energy Laboratory - Wind Powering America	Colorado
Liesl Clark	5 Lakes Energy	Michigan
Mark H. Clevey	State Energy Office (BES)	Michigan
Lisa Daniels	Windustry	Minnesota
Alex DePillis	RENEW Wisconsin	Wisconsin
Jess Fernandes	U.S. Department of Energy	District of Columbia
Steve Harsh	Michigan State University	Michigan
Bennie Hayden	Marketing for Green LLC	Michigan
Fred Iutzi	Illinois Institute for Rural Affairs	Illinois
Douglas Jester	5 Lakes Energy	Michigan
Tim Kumbier	Shepherd Advisors	Michigan
Dave Loomis	Illinois State University / Center for Renewable Energy	Illinois
Charles McKeown	Michigan State University	Michigan
Michael Murray	National Wildlife Federation	Michigan
Golam Newaz	Wayne State University	Michigan
Allan O'Shea	Gail Wind Project	Michigan
Victoria Pebbles	Great Lakes Wind Collaborative / Great Lakes Commission	New York
Steve Rice	JFNew	Michigan
John Sarver	Michigan Wind Working Group	Michigan
Mike Schutz	Metro Consulting Associates	Michigan
Nathan Steggel	Windlab	Ohio
Frank Szollosi	National Wildlife Federation	Michigan
Richard VanderVeen	Mackinaw Power	Michigan
Cliff Williams	Orisol Energy	Michigan

Appendix B: Great Plains Regional Meeting Participants

Name	Affiliation	State
Ian Baring-Gould	National Renewable Energy Laboratory - Wind Powering America	Colorado
Dot Barnett	Climate and Energy Project	Kansas
Rod Blaue	Malloy	South Dakota
Corrie Christol	National Renewable Energy Laboratory - Wind Powering America	Colorado
Chad	Lincoln Electric System	Nebraska
Thomas Davlin	Lincoln Electric System	Nebraska
Larry Flowers	American Wind Energy Association	Colorado
John Hansen	Nebraska Wind Working Group	Nebraska
Adam Herink	Bluestem LLC	Nebraska
Jerry Hudgins	University of Nebraska - Lincoln	Nebraska
Trent Johnson	U.S. Department of Energy grant awardee 2007	Nebraska
Dan McGuire	Nebraska Wind Working Group	Nebraska
Kylah McNabb	Oklahoma Department of Commerce	Oklahoma
Russell Raymond	U.S. Department of Energy / Energetics	District of Columbia
Britton Rife	Oklahoma Wind Power Initiative	Oklahoma
Zachary Roth	Platte Renewable Energy LLC	Nebraska
Ann Selzer	Nebraska Center for Energy Sciences Research – University of Nebraska-Lincoln	Nebraska
Pedram Sotoodeh	Kansas State University	Kansas
Kurt Stradley	Lincoln Electric System	Nebraska
Colin Tareila	Kansas Wind for Schools	Kansas
Dulan	Kansas State University	Kansas
Steven Wegman	South Dakota Wind Energy Association	South Dakota
Paul	Lincoln Electric System	Nebraska
Ginger Willson	Nebraska Energy Office	Nebraska

Appendix C: Mid-Atlantic and Southern Regional Meeting Participants

Name	Affiliation	State
Jim Ahlgrimm	U.S. Department of Energy	District of Columbia
Dan Ancona	Princeton Energy Resources International	Maryland
Mike Bahleda	Halcrow	Virginia
W. Dwight Bailey	U.S. Department of Energy – National Energy Technology Laboratory	Pennsylvania
Dick Ball	Sierra Club	Virginia
Jen Banks	North Carolina Solar Center	North Carolina
Ian Baring-Gould	National Renewable Energy Laboratory - Wind Powering America	Colorado
Layton Bedsole	Dial Cordy & Associates	North Carolina
Thurman Brendlinger	Clean Air Council	Pennsylvania
Bruce Buckheit	environmental consultant	Virginia
Bruce Burcat	Mid-Atlantic Renewable Energy Coalition	Pennsylvania
Ray Daffner	Appalachian Regional Commission	District of Columbia
Michele DesAutels	U.S. Department of Energy	District of Columbia
Jess Fernandes	U.S. Department of Energy	District of Columbia
Steve Foren	Naval District Washington	District of Columbia
Chris Fry	U.S. Department of Energy	District of Columbia
Alex Fuller-Young	PennFuture	Pennsylvania
Travis Giese	Cape Hatteras Wind Energy	North Carolina
Andrew Gohn	Maryland Energy Administration	Maryland
Kenny Howell	James Madison University	Virginia
Debra Jacobson	George Washington Law School / DJ Consulting LLC	Virginia
Rita Kilpatrick	Southern Alliance for Clean Energy / Georgia Wind Working Group	Georgia
Elana Kimbrell	Kearns & West	District of Columbia
Mitch King	Old Mill Power Company	Virginia
Bob Leker	State Energy Office – North Carolina Department of Commerce	North Carolina
Simon Mahan	Southern Alliance for Clean Energy	Maryland
Ivy Main	Sierra Club Virginia	Virginia
Jonathan Miles	James Madison University	Virginia
Eric Miller	Invenergy	North Carolina

Larry Raithel	CGE Consulting	Virginia
Cliff Scher	Clean Energy Management Solutions	Ohio
Katie Stokes	Southern Alliance for Clean Energy	Tennessee
Ted Vogel	12 South LLC	North Carolina
Jeff Whiting	Highland Industries	North Carolina

Appendix D: Northeast Regional Meeting Participants

Name	Affiliation	State
Megan Amsler	Self-Reliance	Massachusetts
Buddy Andrade	Old Bedford Village	Massachusetts
Liz Argo	Argo Consulting - Cape and Islands Wind Information Network	Massachusetts
Ian Baring-Gould	National Renewable Energy Laboratory - Wind Powering America	Colorado
Stephen Barrett	Harris Miller Miller & Hanson Inc.	Massachusetts
Glen Berkowitz	Beaufort Windpower	Massachusetts
Gerry Bingham	Massachusetts Department of Energy Resources	Massachusetts
James Blount	Blount Inc.	Pennsylvania
Catherine Bowes	National Wildlife Federation	Massachusetts
Daniel Charette	Pioneer Wind Energy Systems Inc.	Massachusetts
Bob Chew	Alteris Renewables	Rhode Island
Michele DesAutels	U.S. Department of Energy	District of Columbia
Deborah Donovan	Sustainable Energy Advantage	Massachusetts
Charles Eisenberg	Windstream Renewable Energy LLC	Massachusetts
Julie Falkner	Defenders of Wildlife	District of Columbia
Jess Fernandes	U.S. Department of Energy	District of Columbia
Alain Goubau	Altaeros Energies	Massachusetts
Bob Grace	Sustainable Energy Advantage, New England Wind Energy Education Program, New England Wind Forum	Massachusetts
Raphael Herz	Johnson Controls	Massachusetts
John Howe	FloDesign Wind Turbine	Massachusetts
Eric Hwang	Doosan Heavy Industries	New Jersey
Sue Jones	Maine Wind Working Group	Maine
Jonathan Klavens	Klavens Law Group, P.C.	Massachusetts
Brian Kuhn	Aeronautica Windpower	Massachusetts
Jody Lally	UMass Wind Energy Center	Massachusetts
Peter McPhee	Massachusetts Clean Energy Center	Massachusetts
Gerry Palano	Massachusetts Department of Agricultural Resources	Massachusetts
Mark Pappa	CSE	Connecticut

Name	Affiliation	State
Francis Pullaro	Renewable Energy New England, Inc.	Connecticut
Pat Quinlan	Consultant	Massachusetts
Shawn Shaw	The Cadmus Group	Massachusetts
Mark Sinclair	Clean Energy States Alliance	Vermont
Anne A. Stout	Wm. E. Tatro Construction	Massachusetts
Jasmine Tanguay	CLF Ventures Inc., an affiliate of the Conservation Law Foundation	Massachusetts
Billy Tatro	Wm. E. Tatro Construction	Massachusetts
Kurt Tramposch	SuAsCo Watershed Council	Massachusetts
Peter Vicars	Heavy Lift Systems	Massachusetts
Dick Vietor	Harvard Business School	Massachusetts

Appendix E: Northwest Regional Meeting Participants

Name	Affiliation	State
Dana D. Abney	Wind Powering America - Nevada	Nevada
Ian Baring-Gould	National Renewable Energy Laboratory - Wind Powering America	Colorado
Chuck Collins	Cascade Power Group / Washington Local Energy Alliance	Washington
David Domansky	Bracewell & Giuliani LLP	Washington
Kyle Frankiewich	Evans School of Public Affairs - University of Washington	Washington
David Grote		Washington
Jim Holbery	GridMobility	Washington
Tom Kaiserski	Montana Department of Commerce	Montana
Phil Lou	Washington State University Energy Program	Washington
Sid Mais	Casey Creek Studio	Washington
Josh Mathis	Horizon Wind Energy	Oregon
Terry Meyer	Cascade Community Wind / American Wind Energy Association	Washington
Larry Miles	The Wind Turbine Company	Washington
Alice Orrell	Pacific Northwest National Laboratory	Washington
Greg Price	Northern Power Systems	Oregon
Heather Rhoads-Weaver	eFormative Options / Washington Local Energy Alliance	Washington
Linda Rotmark	Clallam Economic Development Council	Washington
Kurt Sahl	eFormative Options	Washington
Vijay Satyal	Oregon Department of Energy	Oregon
Doug Sellon	Jamestown S'Klallam Tribe Economic Development Authority	Washington
Jennifer States	Pacific Northwest National Laboratory	Washington
Tim Stearns	Washington Department of Commerce	Washington
Brie Van Cleve	Pacific Northwest National Laboratory	Washington
Tong Zhou	Aubridge Partners LLC	Washington

Appendix F: Southwest Regional Meeting Participants

Name	Affiliation	State
Jim Ahlgrimm	U.S. Department of Energy	District of Columbia
Bob Anderson	Western Grid Group	Nevada
Grace Anderson	California Energy Commission and Western Electricity Coordinating Council's Transmission Expansion Planning Policy Committee	California
Bill Auberle	Northern Arizona University	Arizona
Sara Baldwin	Utah Clean Energy	Utah
Ian Baring-Gould	National Renewable Energy Laboratory - Wind Powering America	Colorado
Robert Buntjer	Electrical Apprenticeship of Southern Nevada	Nevada
Larry Burton	Burton Consulting LLC	Nevada
Chris Caluya	Burton Consulting LLC	Nevada
Bonnie Christiansen	Utah Clean Energy	Utah
Corrie Christol	National Renewable Energy Laboratory - Wind Powering America	Colorado
Karen English	Northern Arizona University	Arizona
James Halsey	International Brotherhood of Electrical Workers 357	Nevada
Rich Hamilton	Nevada Wind Working Group	Nevada
Jeneane Harter	HiTech Communications	Nevada
Pete Konesky	Nevada State Energy Office	Nevada
Randy Manion	Western Area Power Administration	Colorado
Amanda Ormond	Arizona Wind Working Group	Arizona
Tom Potter	All American Energy	Colorado
Sean Sever	Nevada State Office of Energy	Nevada
Chris Tallackson	Utah State Energy Program	Utah

Appendix G: Island States, Territories, and Remote Communities Conference Call Participants

Name	Affiliation	State
Ian Baring-Gould	National Renewable Energy Laboratory - Wind Powering America	Colorado
Hannah Gustafson	Renewable Energy Alaska Project	Alaska
Brian Hirsch	National Renewable Energy Laboratory	Colorado
Carl Joseph	U.S. Virgin Islands Energy Office	USVI
Katherine Keith	WiDAC, University of Alaska	Alaska
Abe Malae	Commonwealth of Northern Mariana Islands Utility	CNMI
Malama Minn	State of Hawaii	Hawaii
Ivan Quinata	Guam EPA and Guam Energy Task Force	Guam
Rich Stromberg	Alaska Energy Authority	Alaska
Adam Warren	National Renewable Energy Laboratory	Colorado

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

DOE/GO-102013-3768 • June 2013