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

# Impact and Process Evaluation of the U.S. Department of Energy's Wind Powering America Initiative

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Department of Energy
Office of Energy Efficiency and Renewable Energy

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FINAL REPORT
DOE/EE-0897

May 2013

## Acknowledgements

This study has benefited from the contributions of many individuals. Jeff Dowd of the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) initiated the study. Navigant performed the evaluation under subcontract to Lawrence Berkeley National Laboratories (LBNL). Ed Vine and Yaw Agyeman, LBNL's study managers, provided invaluable oversight and critical guidance that helped keep the project on track.

The Navigant study team comprised Frank Stern, principal investigator; Charlie Bloch, principal analyst for the study; and a diverse team of analysts, researchers, writers and advisors, including Lindsay Battenberg, Mark Bielecki, Rachel Dickenson, Terese Decker, Jennifer Hampton, Jan Harris, Jane Hummer, Julianne Meurice, Bill Provencher, Stuart Smoller, Rebecca Stoecklein, and Dan Violette.

Various industry stakeholders and current and former Wind Powering America (WPA) staff provided valuable guidance and input during the initial evaluation planning and data collections stages, including Jim Ahlgrimm, Dwight Bailey, Ian Baring-Gould, Stan Calvert, Phil Dougherty, Michele DesAutels, Larry Flowers, Randy Manion, Walt Musial, Brian Parsons, Brian Smith, Jennifer States, Amanda Vanega and Ryan Wiser. The team wishes to particularly thank Heather Rhoads-Weaver of eFormative Options for the provision of detailed small-wind capacity installation data and the team at the North Carolina Solar Center, North Carolina State University and the Interstate Renewable Energy Council for maintaining the Database of State Incentives for Renewables and Efficiency (DSIRE) website.

The following reviewers provided valuable input during the study. Those who reviewed the evaluation design and draft report provided advice that greatly helped the study team deal with the challenges of the research subject and evaluation design. The study team is grateful for their comments.

External reviewers:

- Eric Blank, President and Co-Founder, Community Energy
- Edgar DeMeo, President, Renewable Energy Consulting Services, Inc.
- Tom Feiler, Director of Business Development, AMSC
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- Ian Baring-Gould, WPA Technical Lead, National Renewable Energy Laboratory
- Ben Chicoski, Senior Analyst, Energetics Incorporated
- Michele DesAutels, former DOE National Coordinator of WPA (2009-2012), U.S. Coast Guard

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This report is being disseminated by the Department of Energy. As such, this document was prepared in compliance with Section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Public Law 106-554) and information quality guidelines issued by the Department of Energy. [Further, this report could be "influential scientific information" as that term is defined in the Office of Management and Budget's Information Quality Bulletin for Peer Review (Bulletin). This report has been peer reviewed pursuant to section II.2 of the Bulletin.]

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# Executive Summary

This report presents an evaluation of the impacts and processes of the former Wind Powering America (WPA) initiative sponsored by the U.S. Department of Energy (DOE). WPA has an underlying goal of dramatically increasing the use of wind energy in the U.S.

## WPA Initiative Overview

DOE established WPA in 1999 to educate, engage, and enable critical stakeholders to make informed decisions about how wind energy contributes to the U.S. electricity supply. The initiative has an overarching goal of dramatically increasing the use of wind energy in the U.S. The initiative originally focused on utility-scale capacity additions, but several states' interest in small-scale wind led DOE to expand WPA to encompass small and community wind-focused efforts as well.

The overall goal of increasing wind energy deployment in the U.S included three measureable objectives:

1. Five gigawatts (GW) of installed wind capacity by 2005 and 10 GW by 2010.
2. Twelve states with 20 megawatts (MW) of installed capacity by 2005 and 24 states by 2010. WPA later revised this state-level goal to target 30 states achieving greater than 100 MW installed capacity by 2010, with intermediate state targets each year.
3. Five percent of the federal government's electricity supplied by wind energy by 2010.

WPA has worked in several focus areas to accomplish its goal, including the following:

- State-based activities (the focus of this evaluation);
- Rural economic development;
- Public utility partnerships; and
- Federal wind power/Greening Federal Loads.

The last three WPA focus areas were implemented at the national level.

During the initiative's initial 11 years (through 2010), wind capacity in the U.S. grew to 40 GW by the end of 2010. Only 27 states had achieved the 100-MW target for installed wind capacity (three states below WPA's revised goal of 30); however, 14 had reached the 1,000-MW threshold (American Wind Energy Association [AWEA] 2011). At the federal level, DOE spent $27 million during these years to support WPA activities. This study focuses on WPA's influence on wind power capacity additions in the context of these first two capacity-related objectives.

The third objective for federal wind energy usage was supported by national-level activities, and was therefore excluded from the scope of this study. In 2004, WPA transferred leadership for that objective to the Federal Energy Management Program (FEMP). According to the most recent FEMP report on the goal, which was expanded to include all renewable energy sources, "electricity from self-generated renewable energy, purchases and bonuses accounted for 4.89% of federal electricity use in 2007, but declined to 3.38% in 2008, " below the 5% target (FEMP 2010).

A significant portion of WPA's efforts toward impacting these objectives lies in state-based activities. These activities focused on enhancing target state stakeholders' understanding of the barriers and benefits of wind, most often through state wind working groups that were initially funded by WPA.

These WPA state-based activities included, but were not limited to, the following key elements:

- Formation of and support of state wind working groups;
- Anemometer loan programs;
- State-level wind resource maps;
- Wind for Schools programs;
- Annual workshops and conferences; and

- State-specific material development (e.g., small-wind development guides).

## Evaluation Overview

The evaluation of DOE's Wind Powering America initiative combined an impact and process evaluation to achieve key objectives. The impact evaluation assessed the following three key outcomes achieved through WPA's state-based activities:

1. How many MW of the wind capacity added from 1999 to 2011 were influenced by those efforts.[1]
2. The degree to which wind working groups were able to leverage other organizations' funds to support their DOE-provided budgets.[2]
3. The degree to which partner and third-party organizations have replicated WPA activities and outputs.

The process evaluation sought to provide greater understanding of the particular processes that proved most effective in achieving those outcomes. These findings were analyzed in the context of overall progress toward the DOE's three measurable wind deployment objectives listed above. The prioritized research objectives focused on the following researchable questions:

- What elements of WPA's state-based activities have been most successful and why?
- Which wind working groups have been most successful and why? What are the characteristics of the successful working groups that fostered their effectiveness?
- What, if any, common conditions were present for states where the wind working groups were less effective? What could be done to minimize these conditions in the future?
- What are the lessons learned and best practices from this evaluation for use by DOE in light of its future plans for expansion of wind development across the U.S.?

In addition to the focus on state-based activities, the evaluation provided for limited inquiry into the initiative's secondary influence on states not directly targeted by WPA (i.e., if those states' landowners traveled to WPA conferences in neighboring states) as well as perceived impacts from the three WPA initiatives that were implemented at the national level.

[1] While this evaluation covers WPA initiative years 1999-2010, respondents acknowledged that the indirect nature of many activities' influence requires several months or years before capacity is installed that was subject to that influence. In addition, initiative outputs and outcomes may continue to impact capacity installed after WPA funding or organized activities have ceased in a particular state. As such, the evaluation uses the capacity installed in each state through the end of 2011 (the latest date for which capacity data was available) as the baseline end date for capacity exposed to WPA activities. Prior to this report's publication, installed capacity data for 2012 utility-scale wind became available. An estimate of the additional 2012 capacity that was influenced by WPA (under this report's methodology) appears in Section 4.

[2] This evaluation defines leveraged funds using an established DOE methodology (see Wolf 2008). In summary, for an organization's resources or funds to be considered leveraged by the WPA initiative, those funds must have been 1) provided by another party for a primary or related activity in WPA's logic model, 2) secured concurrent with or following a wind working group's receipt of federal funding, and 3) been of a character and amount sufficient to impact the associated activities' impact or effectiveness.

## Methodology

Unlike utility resource acquisition programs, the WPA initiative was not designed to directly incentivize wind power installations. Instead, its activities aim to transform the market for wind power by removing or reducing the barriers to its adoption. This means that the initiative's impact on installed wind capacity is better characterized as indirect rather than direct. For example, initiative outcomes like increased awareness of wind energy or knowledge sharing among stakeholders lead to outcomes such as more supportive state and local policies. It is these supportive policies, however, that directly impact wind power capacity additions. This evaluation acknowledges this market transformation approach and the indirect nature of WPA's impact on the market. The initiative's historical focus on capacity-based objectives, however, obscures the intermediary outcomes, indicators, and metrics that can help link specific WPA activities with capacity additions.

To help overcome these challenges, this study employed an investigative approach that combined historical tracing and expert judging methods to achieve its evaluation objectives. The analysis primarily relied upon a set of in-depth interviews with a sample of key market actors in target states (i.e., those with wind working groups) and non-target states (those without a working group). A single set of interviews addressed both impact and process-related questions, with additional follow-on questioning conducted (via a Delphi process approach) for key impact questions.[3]

**Note on the Use of a Non-Experimental Research Design to Evaluate Program Impacts**

Due to several program design and statistical considerations discussed in this section, this evaluation could not utilize an experimental or quasi-experimental approach to estimating WPA's capacity-based impacts. Instead, the study relied on a combination of historical tracing and expert judging approaches, including a modified Delphi process, to quantify and characterize the overall share of capacity additions that could be allocated to the WPA initiative. The approach builds upon methodologies found in impact evaluation and attribution analysis literature (Violette and Cooney 2003, TecMarket Works Team 2006, Vine 2012, New York State Department of Public Service and the Evaluation Advisory Group 2012, Siebold et al. 2001); however, the evaluation's design does not provide for the same degree of rigor associated with an experimental or quasi-experimental approach. Readers are cautioned that implied causal linkages and attributions of market impacts cannot be supported by direct statistical analysis. As such, this report makes judicial use of impact- and attribution-related terminology, opting in most cases instead to describe WPA's allocation or share of influence on wind capacity additions rather than its "attributable impact."

The iterative judging process provided evaluation participants the opportunity to consider several (potentially competing) points of view while re-assessing their initial estimates of WPA's influence. For process-related issues, responses from each state were reviewed in the context of the initiative's perceived share of influence to identify commonalities among more (or less) successful state wind working groups.

Notably, WPA's activities in some states focused on promoting large (utility-scale) development while others focused on small-wind additions. This evaluation defines "utility-scale wind" as installed projects greater than 1 MW and "small-wind" as projects of 1 MW or less. It includes research on the various market factors (including WPA state-based activities) that influenced both large and small-wind capacity. However, to prioritize evaluation resources, the approach focused primarily on utility-scale wind in states that added significant capacity in that category.

[3] As an example, a Delphi process approach may involve asking respondents to estimate a range within which a sought value is likely to fall. The evaluator then seeks to determine where in that self-reported range the respondent believes the true value most likely falls (e.g., by dividing the range into quartiles or asking for a point estimate). This iterative process may include sharing other respondents' estimates (or an average) with the individual. Due to the nature of this evaluation, however, it employed a modified Delphi process wherein uncertainty ranges were developed *after* each respondent had settled on a point estimate of the WPA initiative's share of market influence. See Section 3.2.3 for details.

## Impact Evaluation Key Findings

This section summarizes the key impact-related findings, including wind industry stakeholders' perceptions of various market factors' influence on wind capacity additions, the capacity-based share of influence from WPA state-based activities and other national initiatives, and the role and importance of leveraged funds and replication of initiative activities and tactics.

### Influence of Various Market Factors on Wind Capacity Additions

After an open-ended discussion of the market factors that may have influenced wind capacity additions in a sampled state, wind working group members and industry stakeholders were asked whether they perceived WPA and its state-based activities (e.g., the wind working group) to have had an influence on either the timing or rate of wind capacity additions in their state. A majority (71%) of respondents affirmed that the program's state-based activities had at least some influence in their state. Another 20% said the activities had little to no influence, while 9% were unsure.

Respondents were then asked to allocate shares of influence on a state's wind capacity additions among each of ten market factor categories; the total shares allocated across all factors had to total 100%. The goal of the exercise was to have respondents quantify the share of influence they would allocate to WPA state-based and other national activities in the context of the other market factors that also influenced capacity additions in each state. Based on these stakeholder assessments of each market factor category's share of influence on wind capacity additions, the following key findings emerged for the sampled target states.

*Utility-Scale Market*

- Stakeholders perceived that federal policies (particularly the production tax credit [PTC]) have had the greatest overall share of influence (26% on average) on utility-scale wind capacity additions in sampled target states.
- State and local policies had the second greatest perceived share of influence (19% on average). This influence primarily arose from states' renewable portfolio standards (RPS); however, state-level tax incentives or specific regulatory decisions by a state's utility commission have also been important. In some sampled target states, the perceived influence of RPS requirements in neighboring states has also played a role (up to a 20% share; 8% on average), particularly for those states that did not have their own RPS at the time.
- In most sampled states, respondents allocated a significant, but lesser, share of market influence to economic and technical factors (12% and 11% on average, respectively). Primary economic factors included electric load growth and the cost of competing power sources like natural gas. Technical factors generally included wind resource quality or access to transmission.
- WPA state-based activities received a 10% or greater average share of the perceived market influence on utility-scale wind additions in six of the thirteen states sampled.

*Small-Wind Market*

- The allocations of market influence were more diverse for small-scale wind than for utility-scale. However, federal policies (particularly the Investment Tax Credit [ITC] cash grant option) and state and local policies (e.g., utility or state rebates and net metering) were again among those factors receiving the greatest shares of perceived influence (17% and 21% on average, respectively).
- WPA state-based activities were perceived to have had a greater share of the influence on small-wind capacity additions than with utility-scale wind, with a capacity-weighted average of 18% of the overall market influence. WPA state-based activities received a 10% or greater average share of the perceived market influence in eleven of the fourteen states sampled.
- Sociocultural factors have also had a greater perceived influence (9% on average) on the small-wind market, with respondents citing issues related to individuals' environmental awareness or a desire for increased self-reliance (or less reliance on a utility) as key drivers.

### Estimate of WPA's Influence on Wind Capacity Additions

Respondents' estimates of WPA's share of influence on the market (including the uncertainty of those estimates) were aggregated to determine an overall percentage-based range of the initiative's share of influence on wind capacity additions across the 14 sampled target states. Using the wind power capacity added in each targeted state following the formation of its wind working group (through the end of 2011) and extrapolating the range to account for non-sampled target states, the evaluation team calculated an overall capacity-equivalent influence of approximately 2,300 MW for WPA state-based activities in the 36 WPA-targeted states. Other WPA activities (e.g., rural economic development and public utility partnerships) were allocated another 1,050 MW, for a combined total of approximately 3,375 MW, or nearly 15% of capacity additions in those states targeted by the initiative. In terms of WPA's objective that 10 GW be installed in the U.S. by 2010, this estimated influence represents nearly 34% of that capacity. Table ES-1 summarizes the calculated capacity-equivalent influence for each wind market and category of WPA activities.

**Table ES-1. Capacity-Based Estimates of WPA's Share of Market Influence: Extrapolated to All WPA-Targeted States**

| Market / Activity Category | WPA-Influenced Capacity Range (MW) | | |
|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound |
| ***Utility-Scale Market*** | ***2,966*** | ***3,350*** | ***3,752*** |
| State-Based Activities | 2,074 | 2,306 | 2,546 |
| Other WPA Activities | 891 | 1,044 | 1,206 |
| ***Small-Wind Market*** | ***22.8*** | ***24.6*** | ***26.5*** |
| State-Based Activities | 17.0 | 18.1 | 19.4 |
| Other WPA Activities | 5.8 | 6.5 | 7.1 |
| **Total: All Markets and WPA Activities** | **2,988** | **3,375** | **3,779** |

Note: The "Expected Value" reflects the capacity-weighted average of the estimates that respondents provided for WPA activities' perceived share of influence in each state. The lower and upper bounds represent the respondents' aggregated, self-reported estimates of a 90% uncertainty interval around their original point (i.e., expected value) estimates.
Source: Navigant analysis

Among the sampled WPA-target states, approximately 70% of respondents also indicated that the capacity installed in a particular state by the end of 2010 would have been lower without WPA's intervention, while 69% felt that capacity additions would have been delayed in the initiative's absence. In the context of the objective that 30 states achieve 20 MW of installed capacity by 2010, WPA's influence on increasing the amount and timing of capacity installed in the states it targeted can be considered a success.

For states that were not directly targeted by WPA (i.e., those that did not have a wind working group), the interviews provided some evidence of market effects and influence from the initiative's national and state-based activities in adjacent states. Combining both state-based and other WPA activities, the initiative's perceived influence on wind capacity additions would equate to approximately 1,100 MW of capacity additions in the three non-targeted states sampled (Iowa, New York and Texas). This represents approximately 7.7% of the capacity added in those three non-targeted states since the founding of wind working groups in neighboring states.

### Extent and Importance of Leveraged Funds

According to respondents in sampled states, federal funds served as important seed money for the wind working groups, but were often insufficient on their own for running a productive group or organization. In most cases, interviewees familiar with working group administration perceived third-party funding as critical to a working groups' ability to succeed in their efforts. Such outside funding (and in-kind

contributions) for WPA state-based activities has come from a wide range of sources, including state energy offices, other federal and state agencies, universities, private foundations, and corporate sponsorships or donations. As participation in the wind working group was voluntary, much of the time spent by attendees and committee members was on their own behalf or that of their employers and was itself a form of in-kind support.

The majority (67%) of those familiar with the working groups' administration in sampled states considered these third-party funds to have been "very important" in terms of affecting the wind working group's ability to influence wind capacity additions. However, the estimated share of working group funds represented by outside resources varied from 20% to 95% of the total budgets in sampled target states (based on interviewee approximations). In some cases, third-party funding sources were cited as representing an increasingly greater share of the group's budget over time as the group attracted more participants and sources of support.

Based on the interview responses, working groups associated with universities and non-governmental organizations (NGOs) in sampled target states were more likely to cite higher levels of third-party funding than those based within a state agency. Notably, both types of organizations (universities and NGOs) tend to require some level of fundraising from external sources (e.g., grants, corporate partnerships, donations), and their staff may be more accustomed to seeking out such funding.

#### Extent and Importance of Replication of WPA Activities

This evaluation also sought to characterize the extent of secondary impacts that may have arisen from other organizations' replication of WPA state-based activities. The objective of this inquiry was not to quantify the MW-impact of any replication, but to identify which, if any, of WPA's activities or tactics were perceived as effective enough to be implemented by other organizations. Most interview respondents were unable to provide evidence of or extensive details about such replication; however, several of these stakeholders did offer the following examples:

- In four states, respondents discussed how knowledge and best practices (and the wind working group approach) was shared across state lines, with members and coordinators of one working group helping to inform the establishment and practices of those in other states.
- In two states, individuals involved in wind working groups reported that they had applied the working group approach to other markets, issues or technologies (e.g., solar, biomass, or other renewables); however, in the few cases where such replication was discussed, resulting efforts appear to have been short-lived or had limited impact.
- In at least six states, respondents listed numerous organizations that have contributed to carrying forward the efforts and activities of states' wind working groups after their federal funding ended. For example, members of the various organizations that had participated in wind working groups carried forward the knowledge, momentum, and relationships formed through the working group to continue influencing the market.

- Examples of replication can also be found in states not targeted by WPA (e.g., Texas sponsored its own Wind for Schools project), though the impact of those activities appears to be have been limited.

While such anecdotal evidence of replication exists, the most oft-cited forms appear to relate to the positive network effects that stem from WPA's approach to its state-based activities. Specifically, WPA's influence appears to grow as the network of individuals and organizations connected to the initiative expands.

## Process Evaluation Key Findings

This section summarizes the key process-related findings, including identification of the initiative's key pathways to influencing wind capacity additions, stakeholder perceptions of which state-based activities

have been most influential, common characteristics of successful state wind working groups, and characteristics of those states where wind working groups have had less success.

### Pathways for WPA's Influence on Wind Capacity Additions

During the in-depth interviews, respondents were asked to estimate the share of influence that WPA and their state's wind working group had on each of the other primary market factors that directly impacted capacity additions in their state. Respondent perceptions revealed that WPA influences wind capacity additions in targeted states through multiple indirect pathways. Specifically, the initiative's effects on sociocultural factors, other groups' activities, and state and local policies each contributes to a positive collective influence on the market.

### Most Influential State-Based Activities

Evaluators read through a list of WPA's state-based activities and outcomes and asked interview respondents to rate each activity category's level of importance in terms of contributing to the initiative's influence on the wind power market in their respective state. Two activities, described below, stand out as having played the greatest role in the success of WPA's state-based activities in sampled WPA-target states.

*Increasing Public Support and Building Networks that Improve Information Sharing among Stakeholders*
Both utility-scale and small-wind interview respondents considered activities aimed at either increasing public support or building networks to facilitate information sharing among stakeholders as the most important.

*Developing and Disseminating Targeted Technical Information*
WPA's role as a repository and provider of technical information was seen as another key driver for successful state-based activities. At least one respondent in each state indicated that these public resources, particularly reports and webinars associated with national labs or universities, were viewed as a credible, non-biased source of information.

### Characteristics of Successful State Wind Working Groups

In general, the success of state wind working groups has been influenced by each one's ability to establish itself as a credible contributor in helping to address the important issues and barriers to wind power development in a particular state. Findings suggest that successful groups tended to establish a niche role in the wind advocacy space wherein the working group could engage a diverse set of stakeholders (who might not otherwise converge) and provide a forum for constructive dialogue. The characteristics described below provide specific examples of wind working group attributes considered to be effective by interview respondents.

*Information Sharing among Diverse Stakeholder Networks*
Market actors indicated information sharing and the ability to bring together a *diverse* set of stakeholders as a key characteristic contributing to the effectiveness of the wind working group. Policymakers, landowners, wind developers, utility companies, and other stakeholders could each contribute a unique perspective on the industry, and the neutral forum created by successful working groups was a good place to do so.

*Finding a Useful (and Unoccupied) Niche*
The capacity of a wind working group to fill a niche as the driver of network building and information sharing in a particular state's wind market depended to some degree on minimizing duplication of efforts or even competition with other wind- or renewable energy-oriented groups.

*Wind Energy Champions*
Interview respondents from at least six states made a point of identifying by name a small number of individuals in those states whose dedication to promoting and pushing forward the market for wind development were a vital part of the wind working group's success. Some considered these individuals to be champions for the wind industry because of their ability to expand the sphere of influence and make connections among key stakeholders.

*Partnerships*
Another factor mentioned by respondents as contributing to the effectiveness of some wind working groups was their ability to partner with entities like universities that helped foster the group's credibility and objectivity. Respondents in other states noted that wind working groups that formed partnerships with (or were coordinated by) the state's energy office benefitted from the government-based support structure and offered better opportunities to interact with policymakers.

### Characteristics of Challenging States

Each respondent was asked if any characteristics of the state's working group, or of the state itself, contributed to the WPA state-based activities having had any less of an influence on wind capacity additions. The following recurring themes were cited by respondents in the six states where WPA was perceived to have had a less-than-average share of influence.

*Existing Markets and Other Action Groups*
Wind working groups were perceived as less effective in states where the market for wind power had already established some momentum before the groups were fully active. This trend was sometimes tied to the presence of other pro-wind groups in the area (e.g., in Washington and Oregon).

*Lack of Involvement or Engagement of Some Stakeholder Groups*
In four of the sampled target states, interview respondents indicated that their wind working group could have been more effective if they had done a better job engaging and forming positive relationships with utility companies. In some instances, respondents indicated that the wind working groups formed "adversarial" relationships with utilities that were seen as "anti-wind" instead of confronting the issue in a positive way.

*Inability to Secure Additional Funding*
In at least five of the sampled states, respondents indicated that limited funding prevented wind working groups from being more effective. While some made reference to federal funding levels, respondents in two states indicated that an inability to secure additional or matching funds from state agencies inhibited working group effectiveness.

*Poor or Inconsistent Leadership*
There was an apparent connection between the perceived objectivity and stability of wind working group leadership and the perceived effectiveness of some groups.

*Political Barriers*
Despite their best efforts, some wind working groups felt that they faced insurmountable political opposition either at the state or federal level.

## Recommendations

Recommendations based on the above key findings and in the context of strategic decisions currently facing the DOE Wind Energy Program are provided below.

- Recommendation 1: Leverage WPA's reputation as a provider of objective and credible technical information to address current and emerging barriers to the continued large-scale deployment of wind capacity in states where the market is already developed.
- Recommendation 2: Continue to utilize the initiative's ability to influence the market through stakeholder engagement and expand partnerships with universities and organizations perceived to contribute to WPA's objectivity and credibility.
- Recommendation 3: Use the Program Theory and Logic Model approach to define objectives and progress indicators that better align with WPA's role as a market transformation initiative.
- Recommendation 4: More frequently evaluate the initiative's impact and progress against goals and objectives and require better tracking and reporting of associated metrics.

# 1. Introduction

This report presents an evaluation of the impacts and processes of the Wind Powering America (WPA) initiative sponsored by the U.S. Department of Energy (DOE). WPA has an underlying goal of dramatically increasing the use of wind energy in the U.S. This introductory chapter is organized as follows:

- Section 1.1 describes the initiative and its objectives.
- Section 1.2 summarizes the objectives of this evaluation.
- Section 1.3 provides an overview of the structure of this report.

## 1.1 WPA Initiative and Objectives

This section provides details on the overall design and approach of the WPA initiative, its goals and objectives, the specific state-based activities that are the focus of this evaluation, and the initiative's timeline and funding.

### 1.1.1 WPA Design and Approach

The DOE established WPA in 1999 to educate, engage, and enable critical stakeholders to make informed decisions about how wind energy contributes to the U.S. electricity supply. The initiative has an overarching goal of dramatically increasing the use of wind energy in the U.S. The initiative originally focused on utility-scale capacity additions but, by 2003, several states' interest in small-scale wind led DOE to grow WPA to encompass small and community wind-focused efforts as well. WPA has worked in several focus areas to accomplish its goal, including the following:

- State-Based Activities (the focus of this evaluation) – These activities focused on the formation of state wind working groups that disseminated objective technical information about wind power and provided a forum for stakeholder discussion on key issues.
- Rural Economic Development– These efforts sought to promote the positive economic impacts that wind development and equipment manufacturing and installation could have in rural areas through jobs, property taxes, and landowner revenues.
- Public Utility Partnerships – WPA worked with cooperative and municipal utilities and organizations, like the American Public Power Administration (APPA), to address technical and economic barriers to wind power development.
- Federal Wind Power/Greening Federal Loads – This comprised efforts to aggregate the energy load of federal facilities and purchase renewable energy or green tags to serve that load.

Efforts toward the last three WPA focus areas were implemented at the national level.

DOE assigned the National Renewable Energy Laboratory (NREL) to assume the initiative's technical leadership responsibility. Because WPA was conceived as a nationwide public-private partnership, an initial core team of industry and government representatives worked with national and regional wind stakeholders to formulate the initiative's key strategic approach to achieving the above objectives on a limited budget (DesAutels et al. 2010).

WPA established the following 12 "operating principles" to guide its investment decisions (LBNL 2011):

1. Work at market margins
2. Leverage existing institutional relationships
3. Create new partnerships
4. Pursue strategic opportunities
5. Develop innovative pilot projects
6. Replicate success
7. Educate, equip, and support state wind working groups (WWGs)

8. Select and address strategic challenges
9. Develop and disseminate targeted information, analyses, and tools
10. Document activities and resources
11. Utilize existing national, regional, and local expertise
12. Coordinate with established wind institutional resources

For WPA's state-based activities, this strategic approach manifested in an effort to enhance target state stakeholders' understanding of the barriers and benefits of wind, most often through each state's wind working group.

### 1.1.2 Initiative Objectives

The overall goal of increasing wind energy deployment in the U.S included three measureable objectives set by WPA in 1999:

1. Five gigawatts (GWs) of installed wind capacity by 2005 and 10 GW by 2010.
2. Twelve states with 20 MW of installed capacity by 2005 and 24 states by 2010. By 2005, WPA had revised this state-level goal to target 30 states achieving greater than 100 MW installed capacity by 2010, with intermediate state targets each year.
3. Five percent of the federal government's electricity supplied by wind energy by 2010.

During the initiative's initial 11 years (through 2010), wind capacity in the U.S. grew to 40 GW. Only 27 states had achieved the 100-MW target for installed wind capacity (three states below WPA's revised goal of 30); however, 14 had reached the 1,000-MW threshold (AWEA 2011). At the federal level, DOE spent $38 million (adjusted to US $2010) during these years to support WPA activities. This study focuses on WPA's influence on wind power capacity additions in the context of these first two capacity-related objectives.

The third objective for federal wind energy usage was supported by national-level activities, and was therefore excluded from the scope of this study. In 2004, WPA transferred leadership for that objective to DOE's Federal Energy Management Program Office (FEMP). According to the most recent FEMP report on the goal, which was expanded to include all renewable energy sources, "electricity from self-generated renewable energy, purchases and bonuses accounted for 4.89% of Federal electricity use in 2007, but declined to 3.38% in 2008," below the 5% target (FEMP 2010).

### 1.1.3 WPA State-Based Activities

The evaluation scope was limited to WPA's state-based activities, which included, but were not limited to, the following key elements: the formation and support of state wind working groups, anemometer loan programs, state-level wind resource maps, a Wind for Schools program, annual workshops and conferences, and state-specific material development (e.g., small-wind development guides).

Over the course of the initiative, WPA staff periodically prioritized funding for states that appeared "stuck" in terms of progress toward achievable wind capacity additions or those they considered to have under-supported markets.[4] Staff identified priority states using a state maturity index that was reviewed annually. Conversely, the initiative specifically excluded states that had already shown evidence of rapid growth or self-developed markets. Table 1-1 lists the founding year of each state's wind working group (WWG) and indicates those that have received some level of priority funding for WPA state-based activities.

[4] Priority states generally included those states that had significant wind resources but less than 100 MW installed capacity and/or did not have a nurturing wind policy environment.

**Table 1-1. States Targeted by WPA and Those with WWGs**

| State | WPA Priority State | Year WWG Formed | State | WPA Priority State | Year WWG Formed |
|---|---|---|---|---|---|
| Alabama | | | Montana | | 2001 |
| Alaska | ● | 2003 | Nebraska | ● | 2007 |
| Arizona | ● | 2001 | Nevada | ● | 2002 |
| Arkansas | | 2008 | New Hampshire | | |
| California | | | New Jersey | | 2006 |
| Colorado | | 2003 | New Mexico | | 2001 |
| Connecticut | | 2007 | New York | | |
| Delaware | | | North Carolina | ● | 2002 |
| Florida | | | North Dakota | | 2000 |
| Georgia | | 2005 | Ohio | ● | 2003 |
| Hawaii | | 2002 | Oklahoma | | 2001 |
| Idaho | | 2001 | Oregon | | 2002 |
| Illinois | | 2006 | Pennsylvania | | 2004 |
| Indiana | ● | 2005 | Rhode Island | | |
| Iowa | | | South Carolina | | |
| Kansas | | 2008 | South Dakota | | 2003 |
| Kentucky | | 2004 | Tennessee | | 2004 |
| Louisiana | | | Texas | | |
| Maine | | 2008 | Utah | ● | 2001 |
| Maryland | ● | 2005 | Vermont | | |
| Massachusetts | ● | 2005 | Virginia | ● | 2002 |
| Michigan | ● | 2002 | Washington | | 2002 |
| Minnesota | | | West Virginia | | 2005 |
| Mississippi | | | Wisconsin | | 2007 |
| Missouri | | 2007 | Wyoming | | 2007 |

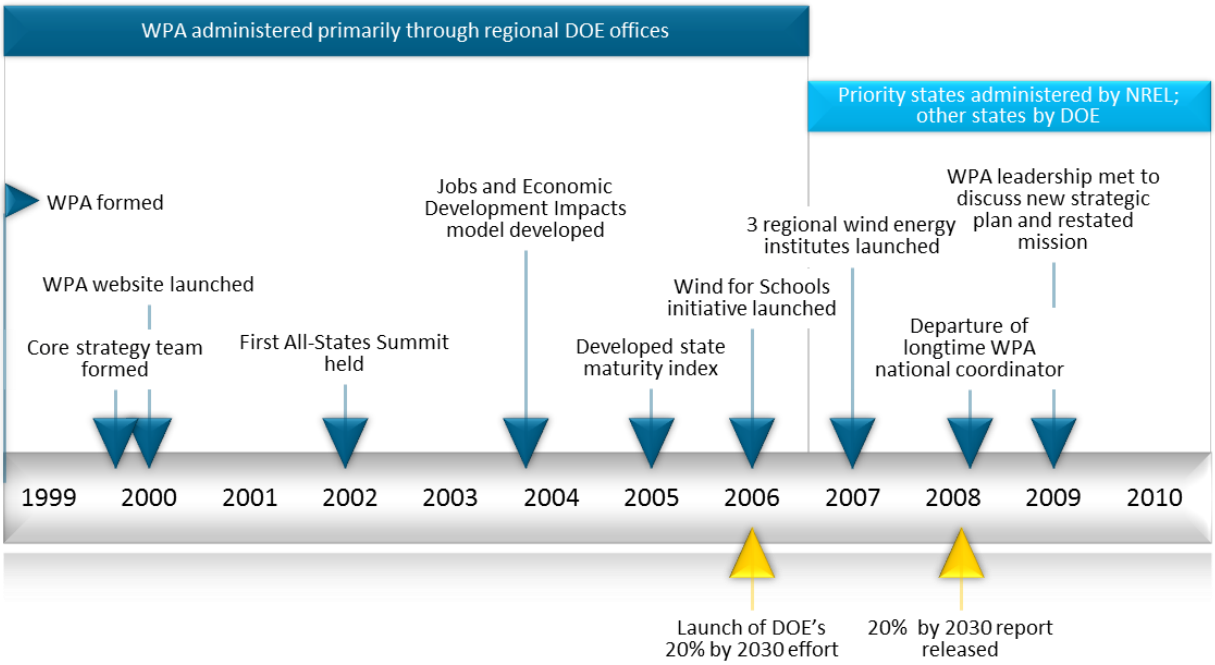
Source: Navigant analysis of WPA records

The intended outcomes of the WPA state-based activities are discussed in greater detail in Section 2.

### 1.1.4 WPA Timeline and Funding

The WPA initiative was launched in 1999, and the first state wind working group formed in North Dakota in 2000. Figure 1-1 illustrates the timing of some of the key events in the history of WPA's implementation.

**Figure 1-1. WPA Timeline**

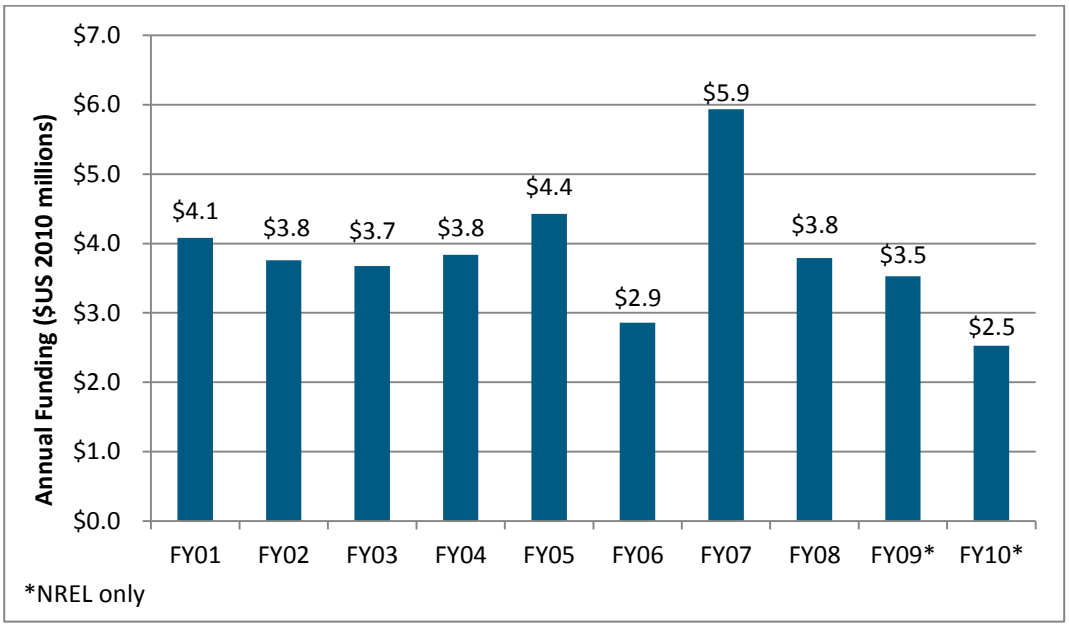



Note: The Jobs and Economic Development Impacts (JEDI) model was developed by NREL to estimate the economic impacts of constructing and operating power generation at the local and state levels.
Source: Internal WPA documents and interviews with current and former WPA staff

In 2002, WPA hosted its first all-states summit to facilitate the sharing of best practices and knowledge among wind working group representatives from multiple states. By the end of that year, 14 such wind working groups existed across the country. As WPA grew, NREL and DOE sought to adapt the initiative accordingly and, in 2006, developed a state wind market maturity index to help organize and better understand the barriers and opportunities across each state. Also in 2006, the DOE launched its 20% Wind Energy by 2030 effort, which has helped inform the subsequent goals and efforts of the WPA initiative. This effort led to a "20% Wind Energy by 2030" report, published in 2008, that explores one scenario for the U.S. receiving 20% of its electricity from wind power by 2030. It contrasts that scenario to one in which no new U.S. wind power capacity is installed, focusing on the benefits and challenges of increasing wind power penetration (U.S. DOE 2008).

As shown in the timeline, portions of funding for state-based activities have been administered by different DOE organizations. For much of the early part of the initiative (through 2006), state funding was provided through each of the six regional DOE field offices. After DOE closed those regional offices, state-based funding was administered separately by NREL (for priority states) and by DOE's remaining field office in Golden, Colorado (for low- and medium-priority states). Figure 1-2 summarizes the annual funding levels for the WPA initiative from 2001 to 2010. On average, DOE designated an average of $3.8 million in annual funding (in $US 2010) over that time period. WPA funding peaked at $5.9M in 2007 (in $US 2010).

**Figure 1-2. WPA Annual Funding Levels, 2001 - 2010 ($US 2010 millions)**




Source: DesAutels 2010. Adjusted to $US 2010 against Consumer Price Index.

Annual budgets for individual states and their working groups varied among states and over time. Interviewed WPA staff estimated DOE's funding for seven states designated as high-priority in 2007 was approximately $237,000 (in $US 2010) per state for a four-year contract (approximately $59,000 per year in $US 2010). Other interviewed staff suggested that priority states generally received twice the annual budget allocation as non-priority states; therefore, $25,000 to $30,000 (in $US 2010) would be a reasonable estimate of the DOE funding received by non-priority states each year.

## 1.2 Evaluation Objectives

As noted above, this evaluation's scope primarily focuses on WPA's state-based activities in those states specifically targeted by the initiative. These state-based activities comprise several initiative elements, including the following:

- An anemometer loan program
- Wind resource mapping
- The creation of and support for wind working groups
- Wind for Schools program
- Annual workshops and conferences
- State-specific material development (e.g., small-wind development guides)

This study combined an impact and process evaluation to achieve four key objectives, described below. The first three (impact-related) objectives sought to assess key outcomes achieved through the WPA's state-based activities and include the following:

- Objective 1 – Estimate how many MW of the wind capacity added from 1999 to 2011 were influenced by WPA state-based activities and efforts[5]
- Objective 2 – Assess the degree to which wind working groups were able to leverage other organizations' funds to support their DOE-provided budgets[6]
- Objective 3 – Assess the degree to which partner and third-party organizations have replicated WPA activities and outputs[7]

The fourth (process-related) objective (Objective 4) sought to provide greater understanding of the particular processes that proved most effective in achieving those outcomes. These findings were analyzed in the context of overall progress toward the DOE's goals. The prioritized research objectives focused on the following researchable questions:

- What elements of WPA's state-based activities have been most successful and why?
- Which wind working groups have been most successful and why? What are the characteristics of the successful working groups that fostered their effectiveness?
- What, if any, common conditions were present for states where the wind working groups were less effective? What could be done to minimize these conditions in the future?
- What are the lessons learned and best practices from this evaluation for use by DOE in light of its future plans for expansion of wind development across the U.S.?

In addition, this evaluation provided for limited inquiry into the initiative's secondary impacts on states not directly targeted by WPA (i.e., if those states used WPA technical materials to educate the public or if landowners traveled to other states to attend WPA or working group conferences) as well as perceived influence from three WPA focus areas that were pursued at the national level (rural economic development, public power utility partnerships, and the federal wind power or Greening Federal Loads effort).

## 1.3 Overview of this Report

This report is organized into the following sections:

- Section 2. WPA Logic Model, presents a summary of the theory and logic underlying WPA's state-based activities. It discusses key initiative elements, including the market barriers to achieving WPA goals, targeted market actors, WPA activities, inputs, anticipated outputs/outcomes, and external influences. This logic model was used to help organize and prioritize researchable issues and their associated data sources for this effort.
- Section 3, Evaluation Methodology, describes the detailed methodology used to achieve the evaluation objectives. It includes an overview of the researchable questions and metrics explored, the research design, the approach to calculating a capacity-equivalent estimate of

[5] While this evaluation covers WPA initiative years 1999-2010, respondents acknowledged that the indirect nature of many activities' influence requires several months or years before capacity is installed that was subject to that influence. In addition, initiative outputs and outcomes may continue to influence capacity installed after WPA funding or organized activities have ceased in a particular state. As such, the evaluation uses the capacity installed in each state through the end of 2011 (the latest date for which capacity data was available) as the baseline end date for capacity exposed to WPA activities. Prior to this report's publication, installed capacity data for 2012 utility-scale wind became available. An estimate of the additional 2012 capacity that was influenced by WPA (under this report's methodology) appears in Section 4.

[6] This evaluation defines leveraged funds using an established DOE methodology. For an organization's resources or funds to be considered leveraged by the WPA initiative, those funds must have been 1) provided by another party for a primary or related activity in WPA's logic model, 2) secured concurrent with or following a wind working group's receipt of federal funding, and 3) been of a character and amount sufficient to impact the associated activities' impact or effectiveness (Wolf 2008).

[7] While a side benefit of the initiative may include impacts in the form of economic development (e.g., manufacturing facilities, construction jobs), such impacts were not a stated objective of the WPA's state-based activities and as such fall outside the scope of this evaluation.

WPA's influence, the sample development process, and the final disposition of the primary data collection effort.

- Section 4, WPA Impact Findings, characterizes and estimates WPA's share of the overall influence on wind power capacity additions. It estimates a capacity equivalent for that influence in states specifically targeted by the initiative, as well as any perceived influence in adjacent states that were not directly targeted. It also provides insights into WPA's secondary impacts, including the roles played by leveraged funding and third-party replication of state-based activities, respectively.
- Section 5, Process Evaluation Findings, describes the process evaluation approach and findings. It first provides a qualitative overview of findings related to the primary pathways for state-based activities' influence on wind capacity additions, then details respondents' perspectives on the most effective state-based activities. It also includes discussion of the characteristics of more successful wind working groups and characteristics of challenging state markets.
- Section 6, Conclusions and Recommendations, provides the study's conclusion—including a summary of key findings, best practices and lessons learned—and subsequent recommendations for the future design of DOE state wind deployment activities.

The report's appendices include the following:

- Appendix A, Interview Guides, includes the two market actor interview guides used in the evaluation.
- Appendix B, Model Input Data and Summary Output Tables, provides data inputs and summary output tables for the calculation of capacity-equivalent estimates of WPA's market influence.
- Appendix C, Overview of Relevant Federal Policies, discusses key federal policies that may have influenced the U.S. wind market.
- Appendix D, State Wind Market Development Case Studies, includes state-specific case studies that examine the development of the utility-scale and small-wind markets, and the WPA initiative's role therein, for each of the 17 states sampled for this evaluation.

# 2. WPA Logic Model

Program theory and logic models provide an organizing structure for evaluation activities. They enable the process evaluation to be closely integrated with the impact evaluation by providing a framework for assessing how program processes, activities, and outputs lead to the desired impacts and identifying opportunities for cost-effectively increasing impacts through improvements to a program's delivery.

This section presents a summary of the theory and logic underlying WPA's state-based activities. It discusses key program elements, including the market barriers to achieving the initiative's goals, targeted market actors, WPA activities, inputs, anticipated outputs/outcomes, and external influences.

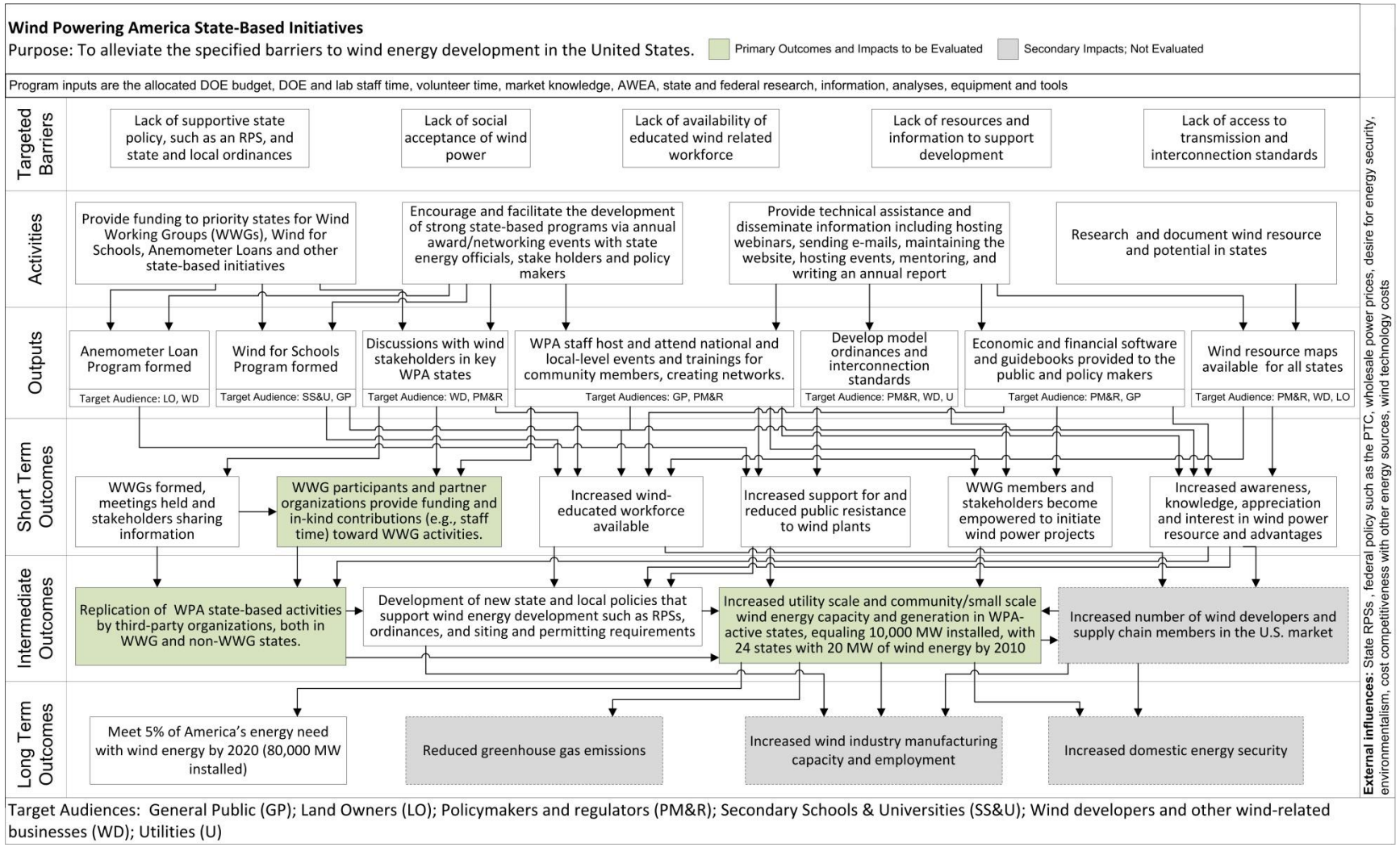
## 2.1 WPA Logic Model Diagram

Logic modeling is a thought process that program evaluators have found to be useful for at least 40 years and has become increasingly popular with program managers during the last decade (DOE 2012). A logic model presents a plausible and sensible model of how a program will work under certain conditions to solve identified problems. The logic model can be the basis for a convincing story of the program's expected performance—telling stakeholders and others the problem on which the program focuses and how it is qualified to address it. Development of a logic model is an important step in the evaluation planning process (Reed et al. 2007).

Figure 2-1, on the following page, presents a logic model diagram for WPA's state-based activities, showing the linkages between activities, outputs, and outcomes, and identifying the specific target audiences associated with each. The diagram in this report builds upon a draft logic model created during a 2010 strategic review of the entire WPA initiative (DesAutels, et al. 2010). Notably, prior to the 2010 version, no previous logic model existed as a formal reference for WPA's initial design and evolution or any subsequent measurement and evaluation efforts.

While the following logic model discussion seeks to provide a comprehensive picture of WPA state-based activities' many interrelated elements, note that this evaluation did not assess every output and outcome. Rather, the evaluation focused on selected activities based on 1) the availability and accessibility of reliable data for relevant progress indicators, and 2) indications from interviewed stakeholders on which activities were most likely to have contributed to achieving WPA's objectives. The three green boxes are related to the primary outcomes that are tied to the researchable questions in this evaluation. The grey boxes show the initiative's secondary outcomes, which are not the focus of this evaluation. The remaining white boxes (various activities, outputs, and outcomes) were assessed during the course of the evaluation to help analyze the three primary outcomes of focus.

## Figure 2-1. WPA State-Based Activities Logic Model Diagram




Source: Adapted from DesAutels 2010.

## 2.2 Market Barriers

Based on DOE's and NREL's technical expertise and stakeholder input, WPA staff identified a set of market barriers to the wide-scale deployment of wind power that could be addressed by activities within the scope of the WPA initiative. They include the following:

- Lack of supportive state policies (e.g., renewable portfolio standards [RPSs]) and state and local ordinances
- Lack of social acceptance of wind power
- Lack of availability of an educated, wind-related workforce
- Lack of adequate resources and information to support wind project development
- Lack of access to transmission and interconnection standards

The above barriers generally can be categorized as one of three types: awareness and acceptance of wind power, market demand for wind power, and the resources and technical factors required for its development and deployment. As discussed below, WPA staff attempted to design the initiative's state-based activities to address these barriers in a resource-efficient manner by prioritizing efforts and leveraging existing networks.

## 2.3 Stakeholders

The stakeholders targeted by WPA's state-based activities comprise a diverse group of industry players, government actors, and the general public. Depending on the specific market barriers and WPA activities involved, the initiative has targeted each of the following:

- Wind developers and other wind-related businesses
- Policymakers and regulators
- Non-governmental organizations (wind related)
- Power utilities
- Landowners
- Secondary schools and universities
- The general public

The logic model diagram in Figure 2-1 ties each WPA activity to its targeted market stakeholders.

## 2.4 WPA Inputs and External Influences

The initiative's ability to deliver its anticipated outputs and outcomes depends in part on the level, quality, and effectiveness of the inputs (resources) that support those efforts. In addition, external market influences can either help or hinder the initiative's ability to achieve those outcomes, and also make it difficult to isolate WPA-driven outcomes from external factors. Table 2-1 lists key inputs and potential external influences on progress toward WPA's objectives.

**Table 2-1. WPA Inputs and Potential External Influences**

| WPA Inputs |
|---|
| • Allocated DOE budget<br>• DOE and NREL staff time<br>• Volunteer time<br>• Market knowledge<br>• Research, information, analyses, equipment, and tools provided through state and federal agencies and the American Wind Energy Association (AWEA), as well as other established wind institutions |
| **External Influences and Other Factors** |
| • State RPSs<br>• Federal policies, such as the Production Tax Credit (PTC)<br>• Wholesale power prices<br>• Desire for energy security or development of domestic energy sources<br>• Cost competitiveness of wind technology with other energy sources<br>• Current economic conditions<br>• Availability and cost-effective access to transmission |

Source: Navigant analysis

## 2.5 WPA Strategies and Activities

Several strategic planning documents mention a set of guiding or operating principles adopted by WPA staff to address key market barriers. These principles include some variation of the following:

- Focus on the market margins or "stuck states" (i.e., dramatically underdeveloped markets with wind potential or those not strongly pursued by industry)
- Develop, educate, equip, and support state WWGs
- Create and disseminate targeted information, analyses, and tools
- Leverage existing federal partnerships
- Create strategic partnerships with outside organizations
- Coordinate with established wind institutions (e.g., AWEA, Utility Wind Integration Group [UWIG], National Wind Coordinating Collaborative [NWCC])
- Utilize and enhance national, regional, and local resources and expertise (e.g., webinars, state conferences)

These principles spanned all of WPA's activities. For state-based activities, however, they manifested in the following core activities:

- Provide funding to states for WWGs, Wind for Schools, Anemometer Loans, and other state-based activities
- Encourage and facilitate the development of strong state-based activities via annual award/networking events with state energy officials, stakeholders, and policymakers
- Research and document wind resource and potential in states
- Provide technical assistance and disseminate information, including hosting webinars, sending e-mails, maintaining the website, hosting events, mentoring, and writing an annual report

## 2.6 WPA Initiative Outputs and Outcomes

Clear identification of intended outputs and outcomes (short- or long-term) in a logic model helps implementers and evaluators to determine (and thereby measure) traceable paths of potential influence and impact from each activity to the initiative's objectives and eventual goals. It is important to distinguish between outputs and outcomes. This logic model defines outputs as the immediate results of specific WPA activities, while outcomes comprise the actions of initiative partners and target audiences (and the subsequent results of those actions). On a continuum, these activities will lead to immediate outputs that, if successful, will lead toward the achievement of anticipated short-term, intermediate, and long-term outcomes. For evaluation purposes, identifying such outputs and outcomes serves to develop a structured approach to assessing actual pathways to influencing the market.

Table 2-2 and Table 2-3 list outputs and outcomes, respectively, taken directly from the logic model, and associated measurable progress indicators. For each indicator, the tables present a potential data source or data collection approach. Note that data were not collected for some outputs, outcomes, or progress indicators. This omission of certain data sources or metrics results from limitations in WPA's historical data tracking and record keeping (see "Note on WPA Data Tracking and Records" in the adjacent box) as well as the evaluation's subsequent reliance on a non-statistical approach to determining WPA's influence on capacity additions. This approach (discussed in Section 3.2) instead focuses on incremental data collection from a large set of interviewees. Given the need to prioritize data collection efforts, certain data sources or metrics were excluded based on the following reasons:

- They were outside the scope of the evaluation.
- Interviews needed to be kept to reasonable lengths.
- Data were not reasonably accessible or consistently available for all states or time periods.

**Note on WPA Data Tracking and Records**

The 11-year timespan covered by this evaluation created challenges in acquiring data related to WPA's budget, activities and metrics that may have informed this study. While WPA staff was able to provide recent spending information, such data were unavailable beyond the past few years. This may arise partly from the 2006 transition of WPA oversight from DOE's regional field offices to NREL. Conversations with current and former WPA staff also revealed limitations and inconsistencies in the annual tracking and reporting of metrics for various states. For the data that was available, the availability and level of detail was similarly inconsistent across the evaluation period. Beginning in 2007, WPA began maintaining a State Maturity Index to track summary-level progress against three criteria (capacity installed, working group effectiveness, and policy environment), and many working group activities are catalogued on the WPA website. However, WPA did not formally track state-specific metrics to measure progress against short-term outcomes related to the initiative's activities and outputs (i.e., event attendance, leveraged resources, meetings held, public awareness or acceptance). This lack of data on non-capacity metrics reiterates the benefits of using a Logic Model to identify and track indicators and metrics that demonstrate the initiative's contributions to intermediate- and long-term goals.

**Table 2-2. WPA Outputs, Associated Indicators, and Potential Data Sources**

| Outputs | WPA Progress Indicators | Data Sources and Potential Collection Approaches |
|---|---|---|
| Anemometer Loan Programs formed | • Number and timing of Anemometer Loan Programs formed | • WPA records<br>• WWG websites<br>• WPA staff and stakeholder interviews |
| Wind for School Programs formed | • Number and timing of Wind for School Programs and Wind Application Centers (WACs) formed | • WPA records<br>• Wind for School websites |
| Discussions with wind stakeholders in key WPA states | • Number of meetings and other correspondence with stakeholders | • WPA staff and stakeholder interviews |
| WPA staff host and attend national and local-level events and trainings for community members, creating networks | • WPA-sponsored meetings or events | • WPA records<br>• Stakeholder interviews and records |
| Model ordinances and interconnection standards | • Model ordinances and standards created, and timing | • WPA records and staff interviews<br>• WWG/Database of Incentives for Renewables & Efficiency (DSIRE) websites |
| Wind resource maps available for all states | • Number of states with maps and timing of release | • WPA records and staff interviews |

Source: Navigant analysis

**Table 2-3. WPA Outcomes, Associated Indicators, and Potential Data Sources**

| Outcomes | WPA Progress Indicators | Data Sources and Potential Collection Approaches |
|---|---|---|
| **Short-Term** | | |
| WWGs formed, meetings held, and stakeholders sharing information | • Number and timing of WWGs formed | • WPA records<br>• WWG websites and records<br>• WWG and stakeholder interviews |
| WWG participants and partner organizations provide funding and in-kind contributions (e.g., staff time) toward WWG activities | • Value of third-party time and money contributed to WWG<br>• Importance of leveraged dollars and time in achieving WWG outcomes | • WWG participant and stakeholder interviews |
| Increased support for and reduced public resistance to wind plants | • Government and public support for state RPS<br>• Green power purchases | • DSIRE website<br>• Stakeholder interviews |
| Stakeholders become empowered to initiate wind power projects | • Number of project developments in WWG states | • AWEA database<br>• Stakeholder interviews |
| Increased awareness, knowledge, appreciation, and interest in wind power resource and advantages | • Availability of and relative purchases of utility green power<br>• Adoption of pro-wind ordinances | • Utility, EPA, or EIA historical data on green pricing<br>• WWG and stakeholder interviews |
| **Intermediate-Term** | | |
| Replication of WPA state-based activities by third-party organizations, both in WWG and non-WWG states | • New organizations or partnerships formed with similar objectives<br>• Other evidence of organizations replicating WWG/WPA activities | • WWG and stakeholder interviews |
| Development of new state and local policies that support wind energy development (RPSs, ordinances, and siting and permitting requirements) | • Number of supportive state and local policies and ordinances implemented in target states | • WWG records and interviews<br>• AWEA and DSIRE policy databases |
| Increased utility-scale and community-/small-scale wind energy capacity and generation in WPA-active states, equaling 10,000 MW installed, with 24 states with 20 MW of wind energy by 2010 | • Installed capacity (MW) of utility and small-scale wind | • AWEA, NREL and EIA records<br>• State small-wind incentive program records and interviews |

Source: Navigant analysis

Unlike utility resource acquisition programs, the WPA initiative was not designed to directly incentivize wind power installations. Instead, its activities aim to transform the market for wind power by removing or reducing the barriers to its adoption. This means that the initiative's impact on installed wind capacity is better characterized as indirect rather than direct. For example, initiative outcomes like increased awareness of wind energy or knowledge sharing among stakeholders lead to outcomes such as more supportive state and local policies. It is these supportive policies, however, that directly impact wind power capacity additions.

This evaluation acknowledges the market transformation approach and the indirect nature of WPA's impact on the market. The initiative's historical focus on capacity-based objectives, however, obscures the intermediary outcomes, indicators, and metrics that can help link specific WPA activities with capacity additions. For example, measuring improvements in stakeholder awareness and acceptance of wind power in a WPA-targeted state, as well as the role WPA activities played in those changes, would present a good case for the effectiveness of those specific activities. As mentioned in the discussion on WPA data and recordkeeping at the beginning of this section, WPA did not formally track state-specific metrics to measure progress against those short-term outcomes.

As a result, this study focused its data collection and evaluation efforts in two ways: 1) efforts were limited to those activities and outputs for which reliable data were expected to be reasonably accessible, and 2) priority was given to those indicators and metrics that could contribute to the development of the state-specific timelines that were used to inform the in-depth interview and Delphi processes discussed in Section 3.

# 3. Evaluation Methodology

This section presents the detailed methodology and research approach that was used to achieve the evaluation objectives. It includes the following sections:

- Section 3.1 provides an overview of the researchable questions and metrics explored.
- Section 3.2 presents the research design, including data collection tools, data analysis and the calculation of capacity-equivalent estimates of WPA's influence, a discussion of data limitations, and a discussion of statistical approaches considered for this evaluation.
- Section 3.3 discusses the sample development process.
- Section 3.4 provides the final disposition of interviews and Delphi responses from the primary data collection effort.

**Note on the Use of Non-Experimental Research Design to Evaluate Program Impacts**

Due to several program design and statistical considerations, discussed in this section, this evaluation could not utilize an experimental or quasi-experimental approach to estimating WPA's capacity-based impacts. Instead, the study relied on a combination of historical tracing and expert judging approaches, including a modified Delphi process, to quantify and characterize the overall share of capacity additions that could be allocated to the WPA initiative. The approach builds upon methodologies found in impact evaluation and attribution analysis literature (Violette and Cooney 2003, TecMarket Works Team 2006, Vine 2012, New York State Department of Public Service and the Evaluation Advisory Group 2012, Siebold et al. 2001); however, the evaluation's design does not provide for the same degree of rigor associated with an experimental or quasi-experimental approach. Readers are cautioned that implied causal linkages and attributions of market impacts cannot be supported by direct statistical analysis. As such, this report makes judicial use of impact- and attribution-related terminology, opting in most cases instead to describe WPA's allocation or share of influence on wind capacity additions rather than its "attributable impact."

## 3.1 Researchable Questions and Metrics

Based on the logic model for WPA's state-based activities and meetings with Lawrence Berkeley National Laboratory (LBNL) and WPA staff, evaluators established a number of researchable questions and associated metrics that formed the focus of its data collection efforts. These questions fall broadly into the following three categories:

1) Impact-related questions that seek to tie WPA activities to specific increases in wind capacity;
2) Questions that assess the relative level and importance of leveraged funding and resources as well as the degree to which third parties may have replicated WPA's and WWGs' efforts; and
3) Process-related questions that explore the differing levels of success of WWG activities and other WPA-related activities in targeted states.

Table 3-1 presents each of these researchable questions and their associated data collection and analysis activities.

**Table 3-1. Researchable Questions**

| Research Questions | Sources of Data | | | Types of Analysis | | |
|---|---|---|---|---|---|---|
| | Secondary Research | Staff Interviews | Stakeholder Interviews | Historical Tracing | Expert Judging | Delphi Process |
| ● Major Activity ◉ Secondary Activity ○ Minor Activity | | | | | | |
| **Impact Evaluation** | | | | | | |
| What has been the MW capacity growth in states that were influenced by WPA activities? Was a portion of the influence from other market factors (e.g., a state's adoption of an RPS) related to WPA's influence? | ○ | ◉ | ● | ○ | ● | ● |
| What is the perceived level and importance of resources or dollars leveraged by the states from DOE's investment for wind energy deployment activities? | ○ | ◉ | ◉ | ○ | ◉ | ◉ |
| What is the extent of replication that has occurred? | ◉ | ○ | ◉ | ◉ | ◉ | ○ |
| **Process Evaluation** | | | | | | |
| What elements of WPA's state-based activities have been most successful and why? | ○ | ◉ | ● | ◉ | ● | ◉ |
| Which WWGs have been most successful and why? What are the characteristics of the successful WWGs that fostered their effectiveness? | ◉ | ● | ● | ○ | ◉ | ○ |
| What, if any, common conditions were present for states where the WWGs were less effective? What could be done to minimize these conditions in the future? | ● | ◉ | ◉ | ● | ◉ | ○ |
| What are the lessons learned and best practices from this evaluation for use by DOE in light of its future plans for expansion of wind development across the U.S.? | ◉ | ◉ | ● | ○ | ● | ◉ |

Source: Navigant analysis

While most of the process-related findings relied on qualitative analysis and findings, the evaluation and reporting of the initiative's impact-related findings incorporated percentage- and ranking-based metrics collected through market actor interviews. For example, the interviews sought to establish the percentage of a certain state's capacity additions that were influenced by WPA or WWG activities. The team then applied that percentage to the state's actual capacity growth to calculate an estimated MW-equivalent of the capacity that was influenced by the initiative. Table 3-2 provides examples of the metrics that served as indicators for each of the research questions with quantifiable outcomes.

**Table 3-2. Metrics Evaluated through Primary Research Activities**

| Research Questions | Metrics Evaluated |
|---|---|
| What has been the MW capacity growth in states that were influenced by WPA activities? Was a portion of the influence from other market factors (e.g., a state's adoption of an RPS) related to WPA's influence? | • Percentage-based share and capacity-equivalent estimate of wind power additions influenced by WPA state-based activities and WWGs according to interviewed stakeholders<br>• Stakeholder estimates of how many fewer MWs would have occurred in a state (or how much later they would have occurred) had WPA and the WWG not existed |
| What is the perceived level and importance of resources or dollars leveraged by the States from DOE's investment for wind energy deployment activities? | • Stakeholder Likert-scale ranking of the importance of third-party funds and resources toward the success of a WWG's activities<br>• Stakeholder estimates of how many fewer MWs would have occurred in a state (or how much later they would have occurred) had the WWG not secured additional resources and funding |
| What is the extent of replication that has occurred? | • Number of organizations or partnerships formed with similar objectives as WPA and WWGs, including those in non-targeted states<br>• Number of organizations that have adopted WWG activities or tactics following reduction or elimination of DOE funding |
| What elements of WPA's state-based activities have been most successful and why? | • Frequency of unaided recall of WPA activities by interviewed stakeholders<br>• Likert-scale* rankings of state-based activity components |
| Which WWGs have been most successful and why? What are the characteristics of the successful WWGs that fostered their effectiveness? | • Comparison of WPA's share of influence on capacity additions in each state<br>• Open-ended, qualitative responses from respondents in states with high WPA influence |
| What, if any, common conditions were present for states where the WWGs were less effective? What could be done to minimize these conditions in the future? | • Comparison of WPA's share of influence on capacity additions in each state<br>• Open-ended, qualitative responses from respondents in those states with low WPA influence |
| What are the lessons learned and best practices from this evaluation for use by DOE in light of its future plans for expansion of wind development across the U.S.? | • Evaluation team analysis |

*A Likert scale is a tool commonly used in surveys whereby a respondent provides a response to a question using a predefined ranking scale.

Source: Navigant analysis

In addition, other metrics related to WPA outputs and outcomes were used in this evaluation to help corroborate and analyze interview responses related to the primary metrics outlined above. These secondary metrics included items such as the timing of particular activities (e.g., anemometer loan programs or annual conferences) in each state. Due to limitations on project scope, the evaluation team relied primarily on secondary research and data provided by WPA, DOE, and NREL to provide these metrics.

## 3.2 Research Design

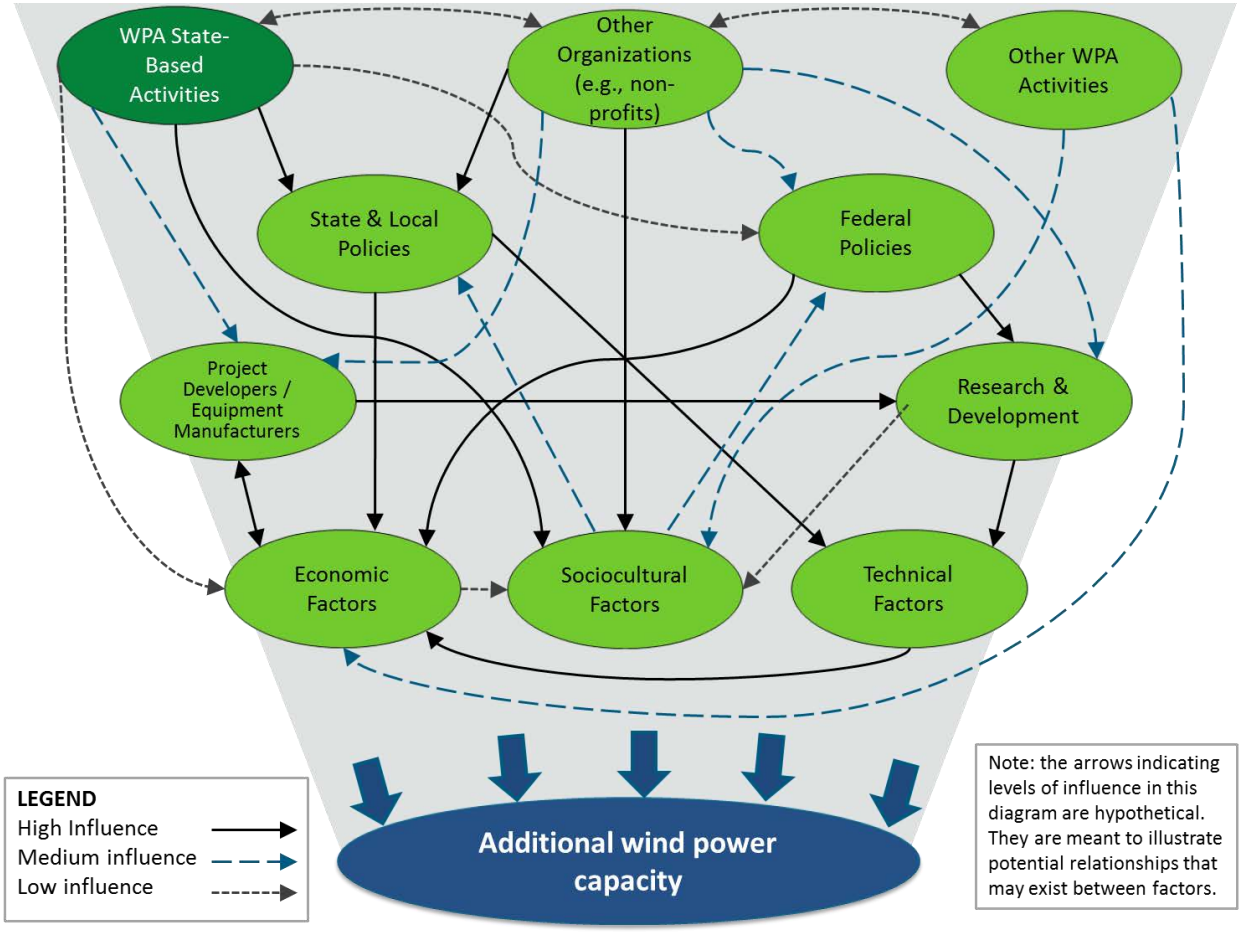
This evaluation's investigative approach combines historical tracing and expert judging methods to achieve its research objectives. The analysis primarily relied upon a set of in-depth interviews with a sample of key market actors in both active WWG states and those without WWGs (e.g., New York or Texas). A single set of interviews addressed both impact and process-related questions, with additional follow-on questioning conducted (via a Delphi process approach) for key impact questions. As will be discussed in Section 3.2.6, evaluators considered several statistical approaches to the evaluation, but concluded these methods were not appropriate given constraints of WPA's design and the limited availability of requisite data.

Notably, WPA's state-based activities in some states focused on promoting utility-scale wind development while others focused on small-wind additions. This evaluation defines "utility-scale" as installed projects greater than 1 MW and "small-wind" as projects of 1 MW or less. Interviews included questions on the various market factors (including WPA state-based activities) that influenced both utility-scale and small-wind capacity; however, to prioritize evaluation resources, the approach focused primarily on utility-scale wind in states that added significant capacity in that category. This means that, while the approach sought to characterize and quantify the degree of WPA's influence on both categories, the depth and extent of questioning was greater for utility-scale wind, as was the quality of the sample design. From 1999-2011, approximately 22,500 MW of utility-scale wind were added in states targeted by WPA, and about 106 MW of small-scale wind were added.

### 3.2.1 Historical Tracing Approach

The first step in the investigation for each sampled state included researching the historical activities of WPA and other potential market influences to create a Market Influence Diagram (MID) and a state-specific timeline. The MID appears below as Figure 3-1.

**Figure 3-1. Market Influence Diagram**




Source: Navigant analysis

The MID served two primary purposes. First, it helped illustrate the issue of cross-influence of market factors to interviewees and improved the likelihood that all respondents were treating the issue consistently. As noted to interviewees, the arrows between the ovals in the MID represent relative degrees of cross-influence between those market factors. For example, several types of market activities can influence state or local policies that may, in turn, have an effect on wind power capacity additions. Second, the MID listed and categorized examples of the myriad market factors and activities (e.g., wholesale power prices, utilities' willingness to sign power purchase agreements [PPAs], and environmental awareness) that may have influenced the timing and rate of capacity additions in the subject state. As shown in Table 3-3, many of these factors could be put into any one of several categories; therefore, the MID sought to provide clarity and consistency for all interview respondents about what belonged in each category.

**Table 3-3. Market Factor Categories and Example Activities or Factors from the MID**

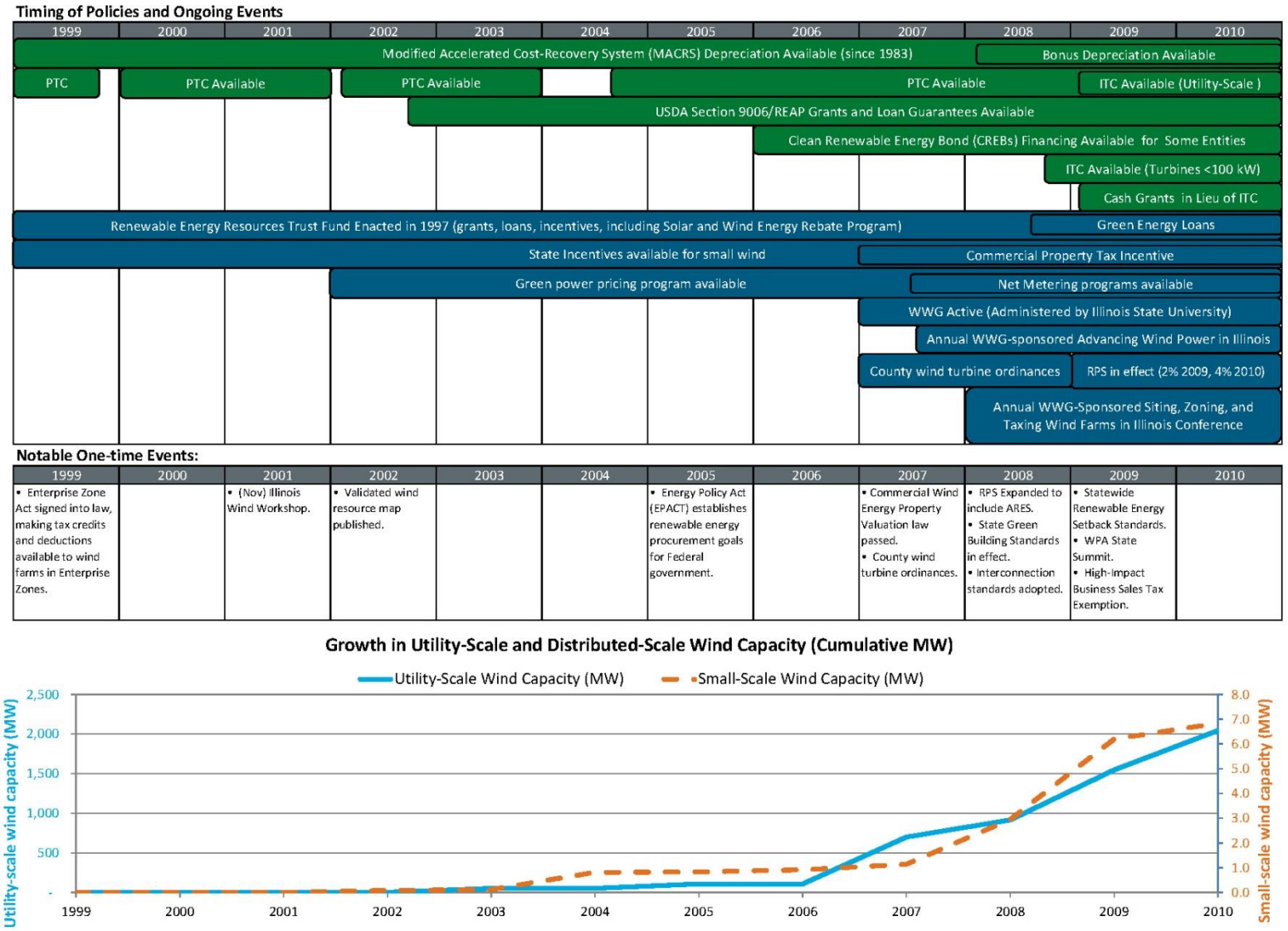
| | |
|---|---|
| **Technical Factors** | **Economic Factors** |
| Wind resource | Electricity demand |
| Access to transmission | Access to capital and investor interest |
| Wind power's levelized cost of energy (LCOE) | Availability of skilled labor |
| **WPA State-Based Activities** | Utilities' willingness to sign PPAs |
| Wind working groups | Utility green power pricing programs |
| Regular WWG meetings, webinars, and events | Wholesale and retail electricity prices |
| Federal and state-specific WWG websites | Competing energy sources' LCOE |
| Wind resource maps | Research and development (R&D) |
| Model wind ordinances and interconnection standards | Pilot or demonstration projects |
| Wind for Schools Program | Government R&D |
| Anemometer Loan Program | Private-sector R&D |
| State wind conferences and workshops | Publication of key wind-related reports |
| Economic and financial modeling tools | **Federal Policies** |
| Publication of state-specific materials | Production Tax Credit (PTC) |
| **Other WPA Activities** | Investment Tax Credit (ITC) |
| Rural economic development | Federal Farm Bills/Rural Energy for America Program (REAP) |
| Public utility partnerships | American Recovery and Reinvestment Act of 2009 (ARRA) |
| Federal Wind Power / Greening Federal Loads | ARRA State Energy Program funding |
| "20% Wind Energy by 2030" report | **State & Local Policies** |
| **Other Organizations (e.g., non-profits, independent system operators [ISOs])** | Renewable portfolio standards |
| State Energy Office | Siting and permitting ordinances |
| American Wind Energy Association | Interconnection standards |
| NWCC | Markets for trading carbon credits |
| UWIG | Small-wind incentives (e.g., utility and state rebates) |
| Clean Energy States Alliance | Net metering |
| National Council of State Legislators | Public Benefits Funds |
| Western Area Power Administration (WAPA) | **Sociocultural Factors** |
| Windustry | Public support (e.g., environmental; energy security) |
| Small Wind Certification Council (SWCC) | Economic impact to local communities |
| **Neighboring State Policies** | Reduced public resistance (e.g., visual or sound issues) |
| Renewable portfolio standards in neighboring states | |

Source: Navigant analysis

The selection of categories and the factors or activities included in each one sought to balance the comprehensiveness of considered factors with a desire to prevent the exercise from becoming too complex and lengthy (as it was only one part of an already lengthy interview). The goal in including non-WPA factors in the exercise (rather than just asking for estimates of the initiative's influence) was to force respondents to consider all of those market factors when providing their estimate of WPA's share of influence on capacity additions, and to do so in relative terms.

The detailed timeline for each sampled state plotted key activities from each category (both WPA and non-WPA-related) and charted the state's annual wind capacity additions. An example timeline appears in Figure 3-2, and each one is included in the state-specific case studies at the end of this report.

**Figure 3-2. Example State (Illinois) Wind Market Timeline and Wind Capacity Additions (1999-2010)**




Source: Navigant analysis

These timelines included key market activities and wind capacity additions for several years prior to when WPA activities began in order to provide a sense for what was occurring in each state without the initiative's influence. This initial effort served the following three primary functions:

1) It painted a detailed, state-specific picture of the context in which WPA state-based activities and outputs occurred over the evaluation period.
2) It provided key background for the in-depth interviews and aided respondents' ability to recall of the timing and potential relationships between various market activities (some of which are distant in time).
3) It enabled an iterative, expert judging process. Each respondent's insights were incorporated into the sampled state's timeline to inform a second round of interviews that built consensus around WPA's influence in that state.

The data sources that informed this initial historical tracing were largely secondary, supplemented with input from WPA staff interviews. In addition to WPA state-based activities, the MIDs and timelines included the following:

- The presence and major activities of other national or state-specific organizations that promoted or supported wind power in that state (e.g., AWEA or the National Wind Coordinating Committee)[8]
- Evidence of other WPA initiatives (e.g., rural economic development, utility partnerships) in the sampled state
- The timing of adoption or effective dates for a state RPS or other major, relevant state-level policies
- The passage, expiration, or extension of federal support policies such as the Production Tax Credit or stimulus funding
- Adoption of state/local siting ordinances or permitting rules
- A line graph (beneath each timeline) showing the timing of installed wind capacity (for both small and utility-scale wind)

Participating interviewees received the MIDs and timelines via e-mail a few days ahead of their scheduled interview so that they had time to review them and consider if anything was missing or inaccurate. Over the course of the expert judging process, the timelines were revised to reflect additional input received through the stakeholder interviews.

### 3.2.2 Expert Judging Approach

The central component of the evaluation involved a detailed expert judging process that drew on the insights and first-hand experiences of stakeholders that participated in each state's wind market. Iterative expert judging processes such as the Delphi process help ensure that evaluation participants consider several (potentially competing) points of view when assessing WPA's influence on market activities. The facilitated sharing of participants' responses and justifications combined with the confidentiality of the process helps foster consensus among respondents while mitigating some of the effects of personal and recall bias.

The expert judging process was structured around a set of stakeholder interviews that provided primary data for both the impact and process evaluations. Interviews in each sampled state were targeted to include at least one respondent in each of three categories of market actors that participated in or were familiar with WWG activities: private sector (i.e., wind developers); government agencies (e.g., state

[8] The inclusion of these other organizations in each state focused primarily on whether those programs had a significant presence in the sampled state and on any major activities that could be identified through secondary research. Primary research to detail the activities of each organization was beyond the scope of this evaluation.

energy offices); and non-government organizations (e.g., non-profits) (see Section 3.3 for sampling approach). To help counter respondent bias (i.e., from those with a perceived stake in the past success of a WWG), each state's interviews included at least one market actor not directly involved in managing that state's WWG. For non-targeted states or those without a WWG, the interview guides were somewhat shorter and focused on the perceived market effects of the initiative in non-targeted states that may have arisen from WPA state-based or WWG activities in targeted states. Following analysis of the initial responses for each state, evaluators prepared a summary of the impact-related responses and comments from all three respondents, as well as an updated timeline, to help guide an iterative, Delphi-based approach to narrowing the estimated range of WPA's share of influence on wind capacity additions in each state.

The following subsections describe how the interviews were structured to address both the process- and impact-related questions. The complete interview guides appear in Appendix A.

#### 3.2.2.1 Start of Interview (Initial Assessment of WPA Influence)

After confirming that interviewees had reviewed the MID and timeline of key activities in the subject state, each interviewee was asked to address the following issues related to WPA's influence on the state's wind power market:

- Are any important market factors missing from the state's MID or timeline?
- What market activities or factors had the greatest impact on the timing and rate of capacity additions in the state from 1999 through 2010?
- Did WPA state-based and WWG activities have an impact on the timing or rate of wind capacity additions during this time period? If so, which activities were most influential? Did that impact change over time?
- To what degree did WPA state-based and WWG activities affect the amount of or rate at which wind capacity was added in the state from 1999 through 2010? (Respondents were provided a Likert scale to estimate changes in amount or timing of capacity had there been no WWG [e.g., same amount of capacity; up to 25% less; 50% less; 75% less; or little or no capacity].)
- What percent of the total share of influence (i.e., out of 100%) should be allocated to WPA state-based and WWG activities in terms of the overall amount of wind capacity added from 1999 through 2010? What percent of the total share of influence should be allocated to other market factors?

For this last bullet, respondents were provided with a Market Influence Worksheet that they could use to keep track of the share of market influence that they allocated to each market factor category (including WPA state-based activities). The total for all shares had to total 100%, thereby requiring the respondents to acknowledge the relative importance of each factor in their estimates of WPA's influence. An example of the Market Influence Worksheet Input table used appears in Table 3-4.

**Table 3-4. Market Influence Worksheet Input Table 1 (ILLUSTRATIVE)**

| Market Factor | Example Activities | Share of Overall Influence on Capacity Additions (%) | |
|---|---|---|---|
| | | Utility-Scale (>1 MW) | Small-Scale (≤1 MW) |
| WPA State-Based Activities | Wind working group meetings, workshops and conferences; WPA and working group websites; Wind resource map; Model wind ordinances and interconnection standards; Wind for Schools Program; Anemometer Loan Program; Economic and financial modeling tools | 30% | 10% |
| Other WPA Activities | Rural economic development; Public power utility partnerships; Federal wind power; "20% Wind Energy by 2030" report | 0% | 0% |
| Other Groups' Activities | State Energy Office; American Wind Energy Association; National Wind Coordinating Committee; Clean Energy States Alliance; Utility Wind Integration Group; National Council of State Legislators; Western Area Power Administration (WAPA); Windustry; Small Wind Certification Council (SWCC) | 15% | 15% |
| State & Local Policies | Renewable portfolio standards (RPS); Siting and permitting ordinances; Interconnection standards; Markets for trading carbon credits; Small-wind incentives (e.g., rebates, tax credits); Net metering; Public Benefits Funds | 5% | 10% |
| Neighboring State Policies | Renewable portfolio standards in neighboring states | 10% | 0% |
| Federal Policies | Production Tax Credit; Investment Tax Credit; Federal directives; Farm bills; ARRA funding | 15% | 5% |
| Economic Factors | Electricity demand; Access to capital and investor interest; Availability of skilled labor; Utilities' willingness to sign power purchase agreements; Utility green power pricing programs; Wholesale and retail electricity prices; Competing energy sources' LCOE | 0% | 0% |
| Sociocultural Factors | Public support due to environmental and energy security concerns; Economic impact to local communities; Reduced opposition due to visual, sound, or other issues | 3% | 10% |
| Research & Development | Pilot or Demonstration Projects; Government R&D; Private-sector R&D; Publication of key wind-related reports | 2% | 10% |
| Technical Factors | Wind resource; Access to transmission; Wind power's LCOE | 20% | 40% |
| Other Factors | [Respondent to provide examples] | 0% | 0% |
| **TOTAL** | | **100%** | **100%** |

Source: Navigant analysis

As shown in the table, the process also allowed respondents to account for the influence of activities and policies in other states through the other market factor categories against which respondents had to weigh the influence of WPA's state-based activities. Most directly, a category called "Neighboring States' Policies" acknowledged the potential influence of an adjacent state's renewable portfolio standard on wind capacity that may have been installed in one state for export to the adjacent state.

In their supporting comments, some respondents indicated a specific factor within a particular category to which they were focusing their allocation of market influence for that category. For example, at least three respondents also mentioned neighboring states in the context of the "Economic Factors" category. Specifically, the perceived economic benefits of wind power development in a neighboring state (e.g., Iowa) may have encouraged pro-wind activities and momentum in a WPA-targeted state (e.g., Illinois). A few other respondents chose to add additional factor categories to the list. Notes on which activities and factors were mentioned by respondents when rating the influence of each market factor category appear in the state-specific case studies in Appendix D.

The interviews also sought to help characterize the various pathways through which the initiative affected the market by inquiring about WPA's share of influence on other primary market factors. For example, what level of influence did WPA and WWG activities have in the passage of state and local policies (like a state's RPS)? Again, respondents were asked to use the provided table to record their responses, but this time asked only for a range estimate of the initiative's share of the influence on each other market factor. An example of this second input table appears in Table 3-5.

**Table 3-5. Market Influence Worksheet Input Table 2 (ILLUSTRATIVE)**

| Market Factor | Example Activities | WPA/WWG Level of Influence on Market Factor | |
|---|---|---|---|
| | | Utility-Scale (>1 MW) | Small-Scale (≤1 MW) |
| State & Local Policies | Renewable portfolio standards (RPS); Siting and permitting ordinances; Interconnection standards; Markets for trading carbon credits; Small-wind incentives (e.g., rebates, tax credits); Net metering; Public Benefits Funds | 21-30% | 0% |
| Federal Policies | Production Tax Credit; Investment Tax Credit; Federal directives; Farm bills; ARRA funding | 21-30% | 0% |
| Economic Factors | Electricity demand; Access to capital and investor interest; Availability of skilled labor; Utilities' willingness to sign power purchase agreements; Utility green power pricing programs; Wholesale and retail electricity prices; Competing energy sources' LCOE | 0% | 0% |
| Sociocultural Factors | Public support due to environmental and energy security concerns; Economic impact to local communities; Reduced opposition due to visual, sound or other issues | 1-10% | 0% |
| Research & Development | Pilot or Demonstration Projects; Government R&D; Private-sector R&D; Publication of key wind-related reports | >50% | 41-50% |
| Technical Factors | Wind resource; Access to transmission; Wind power's LCOE | 1-10% | 0% |
| Other Groups' Activities | State Energy Office; American Wind Energy Association; National Wind Coordinating Committee; Clean Energy States Alliance; Utility Wind Integration Group; National Council of State Legislators; Western Area Power Administration (WAPA); Windustry; Small Wind Certification Council (SWCC) | 41-50% | >50% |
| Other Factors | [Respondent to provide examples] | 0% | 0% |

Source: Navigant analysis

#### 3.2.2.2 Middle of Interview (Process and Secondary Impact Questions)

Following the initial assessment, the interviews covered process-related and secondary impact issues (i.e., leveraged funding and replication of WPA activities). Some of these questions focused on which WPA state-based activities and outcomes were the most effective or influential, including the following:

- Increased wind-educated workforce available
- Increased support for and reduced public resistance to wind plants
- Increased awareness, knowledge, appreciation, and interest in wind power resource and advantages
- WWG members initiating wind power projects
- Development of new state and local wind-specific policies
- Improved information sharing among stakeholders, including policymakers and regulators

In addition, respondents were asked to estimate the relative significance of each of the national-level, WPA-sponsored initiatives that may have also affected market actors targeted by WPA's state-based activities. Given the evaluation's focus on state-based activities and the broad scope of the interview, these questions were limited to gaining high-level estimates of these initiatives' relative influence and importance. These other WPA activities include the following:

- Rural Economic Development
- Public Utility Partnerships
- Federal Wind Power/Greening Federal Loads

The middle of the interview also included several process-related questions to help identify the state-specific conditions that may have fostered more effective wind working groups and activities (or the conditions that prevented a greater degree of influence). Secondary impact questions asked respondents to estimate the existence and relative importance of third-party funding and resources for the working groups' efforts and the degree to which other organizations may have replicated WPA state-based activities.

The process- and impact-related questions in this portion of the interview sought both quantitative, close-ended responses (e.g., to quantify the relative importance of different WPA activities) and more qualitative, open-ended input to help describe more nuanced issues (e.g., the factors underlying a particular activity's or working group's lack of success).

#### 3.2.2.3 End of Interview (Reassessment of WPA Influence)

Before concluding the interview, interviewees were asked to revisit their earlier estimates regarding the relative share of influence that WPA and working group activities had on the timing and rate of capacity additions in the state. Respondents could change their responses (up or down) in light of the preceding discussion about the various components of the WPA state-based activities.

### 3.2.3 Modified Delphi Process (Seeking Consensus and Bounding Uncertainty)

Literature from the energy program evaluation industry includes several examples of using the Delphi approach to conduct impact and attribution analyses (TecMarket Works Team 2006, Vine 2012, New York State Department of Public Service and the Evaluation Advisory Group 2012, Siebold et al. 2001). In most cases, these approaches ask respondents to estimate a range within which the sought value is likely to fall. The evaluator then seeks to determine where in that self-reported range the respondent believes the true value most likely falls (e.g., by dividing the range into quartiles or asking for a point estimate). This iterative process may include sharing other respondents' estimates (or an average) with the individual. Due to the nature of this evaluation, however, it employed a modified Delphi process wherein uncertainty ranges were developed *after* each respondent had settled on a point estimate of the WPA initiative's share of market influence. The reason for this variation stems both from the number of factors influencing wind power capacity additions in each state and the differences in individual respondents' knowledge or ability to recall WPA-related events over the 11-year period.

To account for these two issues, the evaluators' used the first round of Delphi feedback to enable each respondent to learn from their peers' collective knowledge, familiarity, and recall of WPA and other market factors in each state. Following initial analysis of responses for each state, the evaluators compiled the responses related to the estimated share of each primary market factor's influence (including the WPA's state-based activities) on the state's capacity additions and the initiative's relative share of influence on each of those other primary market factors. This summary table included contextual comments that respondents provided to support their assessments. All responses and the identities of the respondents remained confidential to prevent any potential contaminating effects. Evaluators then

distributed each state's market influence assessment summary documents to the original respondents via e-mail with clear instructions on the Delphi panel process. Each respondent was asked to 1) respond to the ratings and supporting comments of the other reviewers and 2) revisit his or her original allocations of each factor's share of market influence in light of disparate ratings or comments. A summary of response rates for the Delphi process is included in Section 3.4.

The research approach anticipated that respondents would exhibit significant variation in their view of the initiative's influence in a particular state. The opportunity to adjust their allocations in consideration of their peers' ratings and comments aimed to address differences in knowledge of WPA and WWGs' activities (i.e., recall bias) as well as potential respondent bias (e.g., those directly involved in promoting WWG activities may have rated those activities as more influential than other respondents). Fifteen percent (15%) of respondents adjusted their initial percentage allocations of factors' market influence, and an even greater share commented on their colleagues' responses, during this initial round of feedback and revision. Based on these revisions and other respondents' apparent comfort with their initial estimates, it appeared that additional attempts at consensus-building would provide diminishing returns. Instead, the third round of input used the modified Delphi process to quantify the level of uncertainty surrounding each individual's estimate of the share of market influence allocated to WPA state-based activities and the other WPA national-level initiatives. Each respondent was asked to approximate a 90% confidence interval surrounding their revised point estimate of WPA's percentage share of influence on capacity additions. This uncertainty estimate (a range of percentages) provided a simple, albeit self-reported, approach to accounting for measurement error within each sampled state (see Electric Power Research Institute [EPRI] 2010 and Schare and Ellefsen 2007).

Essentially, respondents were asked how small and how large WPA's share of influence on capacity additions might have reasonably been. This range estimate was explained to the respondent to not be absolute (i.e., there may be some likelihood that the share of influence may fall below the low estimate and above the high estimate). This allowed the respondent to develop a practical estimate of the range rather than ask for absolute values, which are difficult for a respondent to envision.

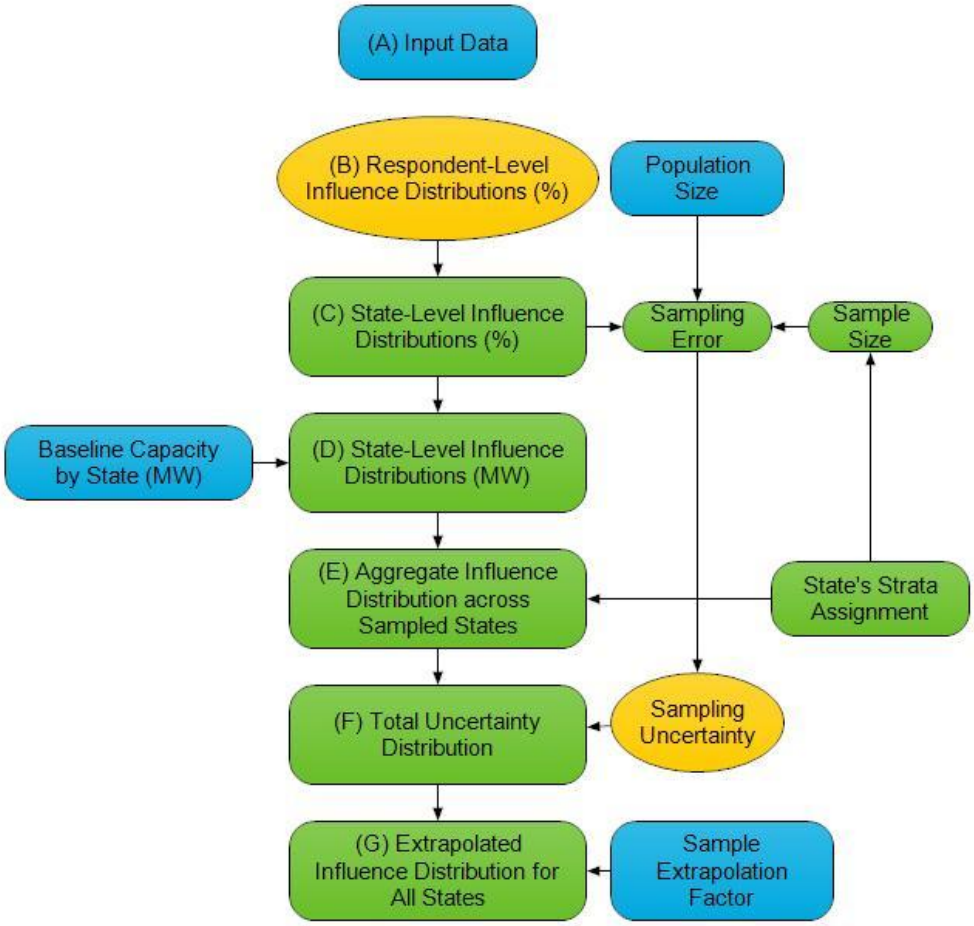
### 3.2.4 Data Analysis and Derivation of Capacity-Equivalent Estimates of WPA's Influence

Data analysis efforts focused primarily on 1) identifying and organizing state-specific information to provide historical tracing evidence of the timing and potential relationships among various market activities as described in Section 3.2.1, and 2) expert judging estimates of the initiative's share of influence on capacity additions as described in Section 3.2.2 and Section 3.2.3.

The evaluation's primary quantitative goal was to provide a reasonable range for the estimated share of capacity additions that were influenced by WPA state-based activities in each of the utility-scale and small-wind segments. Evaluators used an analytic model built in Analytica® to aggregate respondents' individual estimates of the expected value (including ranges of uncertainty) of WPA's influence on wind capacity additions, first into state-level average estimates and then into sample-wide estimates.[9] This estimate was then extrapolated to the broader population of all WPA-targeted states (i.e., including those that were not sampled) by accounting for sampling error and scaling the estimate to account for capacity added in non-sampled states. The respondent estimates and subsequent outputs were provided for each of four combinations of utility-scale and small-wind and WPA state-based and other national-level activities. A flow chart of this analytic process appears in Figure 3-3, followed by detailed explanation of each step.

[9] Analytica® is modeling software that uses a graphic, diagram-based approach to establishing the relationships between various inputs and sets of data. (www.lumina.com)

**Figure 3-3. Schematic Diagram of Approach to Capacity-Equivalent Influence Estimates**

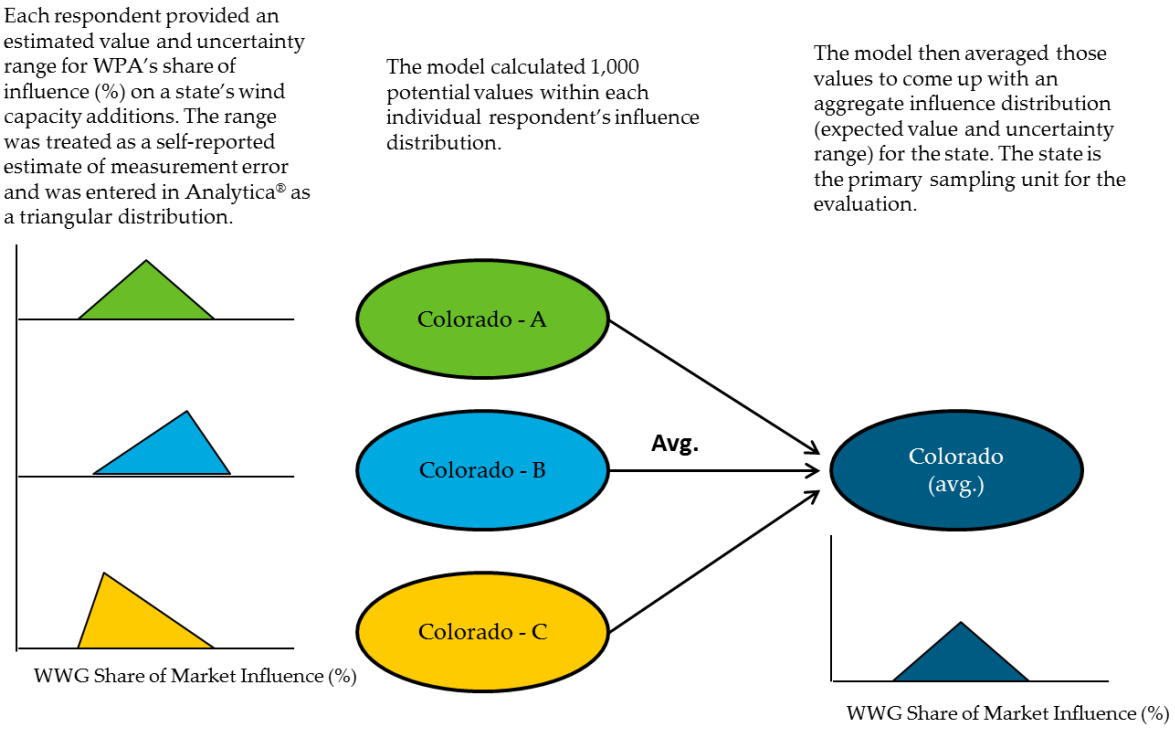



Source: Navigant analysis

Input Data included, for each respondent in each state, an estimate of the expected value and lower and upper bounds of the share (%) of a state's capacity additions influenced by each of WPA state-based activities and other WPA activities (e.g., the greening federal loads initiative). Respondents' uncertainty distributions approximated a 90% confidence interval. These influence range estimates were entered into the model as triangular distributions to create Respondent-Level Influence Distributions for each state-respondent combination.[10] For the calculation of each State-Level Influence Distribution, the model calculated 1,000 potential outputs within each Respondent-Level Distribution, and then averaged those outputs to determine an overall WPA influence distribution for that state. This provided an expected value and uncertainty range for the WPA share of influence on capacity additions in each state. Figure 3-4 illustrates the derivation of these State-Level Influence Distributions.

[10] A triangular distribution is a continuous probability distribution used in statistical analysis and modeling, often in cases where sampling data is limited. It is frequently based on a range of possible values (minimum and maximum) within which a "best guess" value is provided (as in the Delphi process).

**Figure 3-4. Illustrated Derivation of State-Level Influence Distribution**



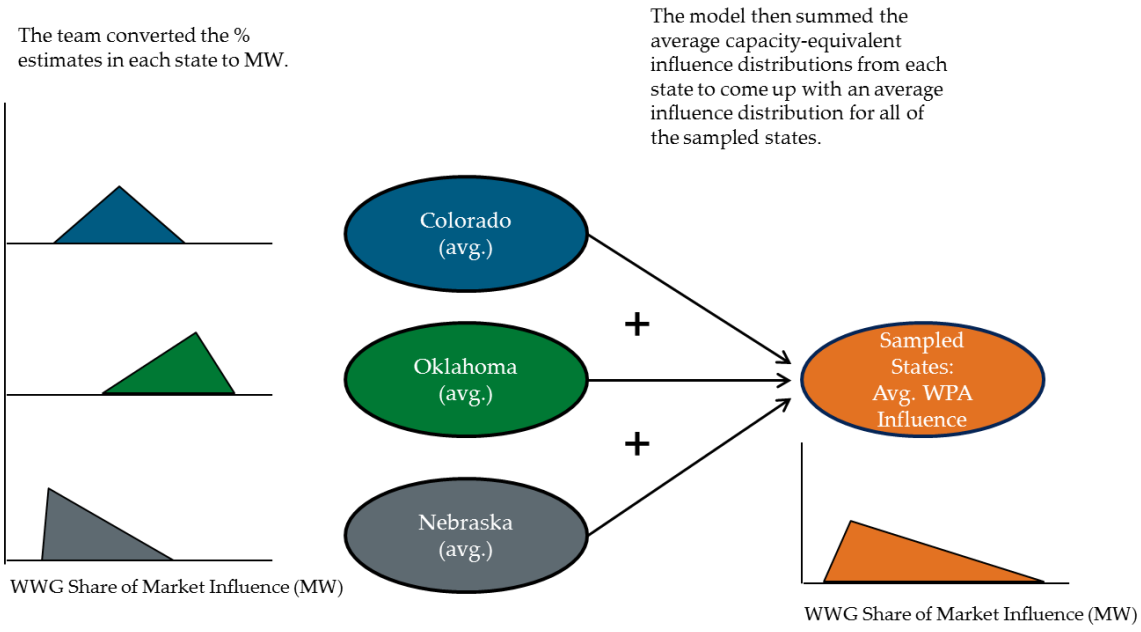

Source: Navigant analysis

To provide MW-based estimates of the range of WPA's influence in each state, the percentage-based estimates were multiplied by the baseline amount of capacity that had been added in state from (and including) the year that state's wind working group was founded through the end of 2011. This allowed the model to display State-Level Influence Distributions showing the capacity-based expected value (in MW) and range (within a 90% confidence interval) of WPA's estimated influence. While this evaluation covers WPA's activities from 1999 through 2010, the evaluation team (and respondents) acknowledged that the indirect nature WPA activities' influence often requires several months or even years before capacity is installed that was subject to that influence. In addition, WPA outputs and outcomes may continue to influence capacity installed after federal funding or organized activities have ceased in a particular state. As such, calculations used the capacity installed in each state through the end of 2011 (the latest date for which capacity data was available) as the baseline end date, with the start date of WPA influence based on the founding year of the wind working group in each state. For the small-wind market, annual incremental capacity data for the non-sampled states were unavailable; therefore, baselines used the cumulative capacity installed by year-end 2011.[11]

Summing these State-Level Influence Distributions produced an Aggregate Influence Distribution across Sampled States, as illustrated in Figure 3-5. This distribution estimates WPA's combined influence across all of the states that were sampled. The model also maintained each of three separate distribution estimates that included only the states within each of the three capacity-based strata (high-, middle-, and lower-tier states) used in the sampling approach (see Section 3.3).

[11] Prior to this report's publication, installed capacity data for 2012 utility-scale wind became available. An estimate of the additional 2012 capacity that was influenced by WPA (under this report's methodology) appears in Section 4.

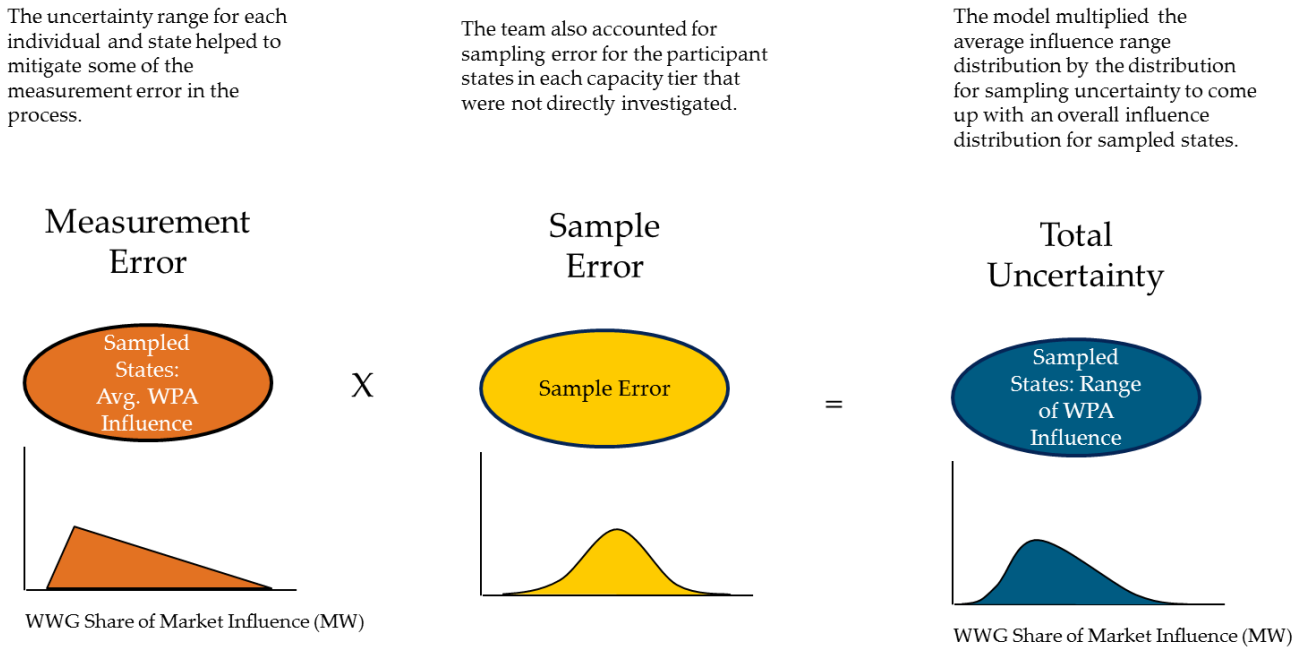
**Figure 3-5. Illustrated Derivation of Aggregate Influence Distribution across Sampled States**




Source: Navigant analysis

The additional uncertainty arising from sampling error was accounted for separately for each of the three capacity-based strata. A normalized Sampling Uncertainty Distribution for each of the three strata was then multiplied by the Aggregated Influence Distribution across Sampled States to produce a Total Uncertainty Distribution (for each strata). This aggregated distribution combined the estimated influence values and ranges, including sampling error, for each of the three sample strata to generate a Total Uncertainty Distribution for all sampled states. These steps are illustrated in Figure 3-6.

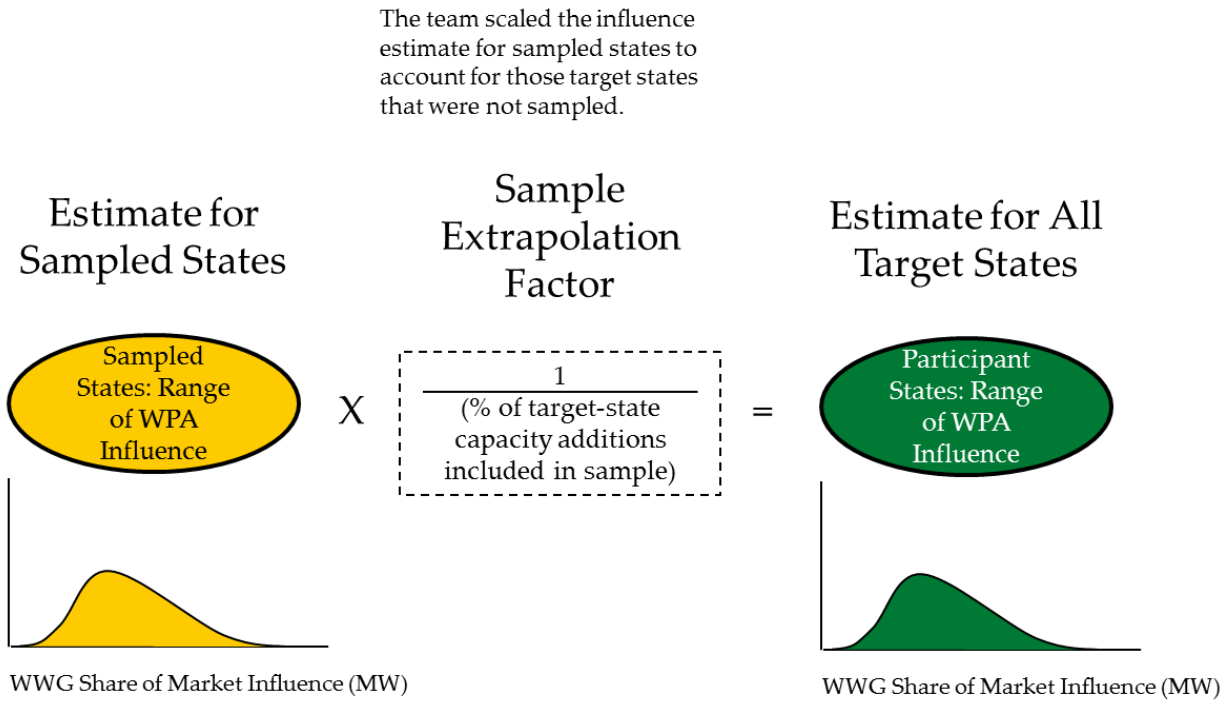
**Figure 3-6. Illustration of Steps to Address Measurement and Sampling Error**




Source: Navigant analysis

Finally, the Total Uncertainty Distribution was extrapolated to account for WPA's estimated influence on capacity additions in those states that were not included in the sample. This was done by multiplying a Sample Extrapolation Factor (1 / (percent of capacity added in WPA-target states that was included in the sample) to the Total Uncertainty Distribution for each of the three strata.[12] The resulting distributions were summed to produce an Extrapolated Influence Distribution for All States. This step is illustrated in Figure 3-7.

**Figure 3-7. Illustrated Extrapolation of Sampled-State Influence Distribution to All Target States**




Source: Navigant analysis

As noted above, the above process was applied to both the utility-scale and small-wind markets for each of the WPA state-based and other WPA activity categories. This same process was also used to calculate a capacity-equivalent estimate of WPA's influence on non-WPA-targeted states. However, for the non-targeted states, the results were not extrapolated beyond the three states sampled (i.e., the process stopped at Step E (Aggregated Influence Distribution) in Figure 3-3. Appendix B includes detailed input data and output summaries related to the modeling process.

### 3.2.5 Limitations of Data and Analysis

As described above, reasonable care was taken to account for uncertainty and bias in these estimates of WPA's influence on wind capacity additions. However, readers should recognize the inherent limitations of this type of data and analysis. Several underlying issues in the design of the initiative and this evaluation should be considered, including:

- **Lack of Counterfactual –** The state-specific nature of the many factors influencing wind capacity additions, as well as WPA's non-random selection of which states received state-based activity funding, makes it difficult to provide a reliable counterfactual case for participation in WPA state-based activities. States can be divided into three categories: WPA-targeted states (this

[12] Since the interviews included a census of the states in the top two capacity tiers for the utility-scale wind market, this step was only required for the low-tier strata. For the small-wind sample, it was conducted for all three tiers.

evaluation's sample frame), non-WPA "progressive" states (those that developed wind without direct WPA participation), and non-WPA low-wind states (those states, primarily in the southeastern U.S., with less attractive wind regimes). One could compare the rate and timing of capacity additions in each of these categories, as well as the timing of wind working group activity in WPA-targeted states (see Appendix B). However, trying to draw conclusions from such comparison raises several statistical reliability issues. Specifically, the states in each category do not differ solely by their assignment to participation in WPA. The timing, amount, and rate of capacity additions in a particular state are also subject to factors that include its wind resource, transmission system, electrical demand, and degree of policy support. In addition, relatively few non-WPA "progressive" states exist (N=5, California, Iowa, Minnesota, New York, and Texas) for counterfactual comparison to WPA-targeted states (N=36). These five states were specifically not targeted by WPA because each had already independently begun large-scale development of wind power (due primarily to their abundant wind resources and/or demand for wind power). The remaining states with wind resources considered sufficient to enable wind power development were all eventually targeted by the initiative to help reduce or remove remaining market barriers. This leaves very few non-WPA states (in the northeast and southeast parts of the country), all with unfavorable wind resources, for counterfactual comparison.

- **Potential Bias –** In each state, the sample included both individuals directly involved in the working group's administration and those who either attended or were simply aware of their activities. In some cases, respondents directly involved with coordinating a state's wind working group allocated a greater share of influence to WPA than those who were less involved. This variation may have occurred due to those respondents' interest in receiving a favorable "score" (respondent bias) or due to their greater familiarity with and ability to recall wind working group and WPA activities (recall bias). Both respondent and recall bias were mitigated to some degree through each of the two stages of the Delphi process (e.g., learning from other respondents' higher recall and acknowledging one's own bias via self-reported uncertainty ranges). For example, during the first round of Delphi feedback, some less involved respondents increased their estimates of WPA influence based on the supporting comments provided by their more involved peers. Additional efforts to directly discount potentially biased responses (i.e., from those directly involved in a state's WWG) would likely be arbitrary and potentially introduce additional bias on behalf of the evaluators.
- **Sample Sizes within States –** Given the unique context for WPA influence and effectiveness in each state, it was important to sample an adequate number of states to identify trends and differences in WPA's share of influence and in process-related issues. However, the approach also needed to include input from enough individual respondents within each state to provide sufficient coverage and balance of opinion (i.e., to mitigate potential bias) in that state. Scope and budget limitations demanded the prioritization of evaluation resources, leading to what was considered a reasonable balance between the number of states in the sample and the number of individuals targeted for interviews in each state. Despite the effort to achieve such balance within each state, the in-depth interview approach does not allow for sample sizes in each individual state that are large enough to fully control respondent bias.
- **Evaluation Period –** This evaluation covers an 11-year period (1999-2010) during which WPA state-based activities may have occurred in any one of the states sampled. While some wind working groups formed later in this period, individual respondents were still required to recall and estimate the influence of events and factors covering a three- to ten-year period depending on the state. In addition, some of these respondents (particularly utility-scale wind developers) were simultaneously active in and responsible for project development activities in several states during the evaluation time period, potentially making it more difficult to recall which activities occurred in a specific state. While respondents were asked to indicate the degree to which

WPA's influence may have changed over time, individuals' estimates of the initiative's share of influence on capacity additions were generalized over the target time period in each state.

- **Interrelatedness of Market Factors –** As discussed in Section 3.2.1, several categories of market factors may exhibit varying degrees of cross-influence on one another in a particular state. For example, a respondent may have rated state and local policies as having a significant share of the influence in a state, but rated federal policies as somewhat unimportant. Notably, this assessment only explicitly asked respondents to consider the direct influence of those federal policies on capacity additions in the state. It did not, however, ask respondents to consider the influence of those federal policies on other market factors. In some cases, an important state policy (e.g., an RPS) may not have occurred without the influence of favorable federal policies (e.g., the PTC). In an effort to reduce the length and complexity of the interviews, the potential inter-relatedness and sequencing of these other market factors was not explained in great detail; however, the concept was illustrated to respondents through the Market Influence Diagram. Regardless, a number of respondents did discuss the interrelatedness of factors in their supporting comments during the ranking exercise. For example, some pointed out that certain economic factors (e.g., utilities' willingness to sign power purchase agreements) are often dependent on technical and policy-related issues (e.g., a wind project's levelized cost of energy or a utility's RPS requirements).

### 3.2.6 Statistical Approaches Considered

As mentioned above, evaluators considered a variety of statistical analytical approaches to characterize and quantify WPA impacts on wind generation capacity. Identifying these effects using statistical analysis faces three main obstacles.

1) **Modeling Issue 1 – Non-Random Participation:** WPA's implementation of state-based activities was non-experimental—there was not a random assignment of the initiative across states—and so isolating the effect of WPA state-based activity impacts from other effects that occur contemporaneously, and which might be correlated with metrics of WPA activity, is a nontrivial statistical matter (Winship and Morgan 1999). The main issue in this regard is *endogeneity bias*; some of the unobserved factors influencing wind generation capacity also affect the measure of WPA activity.[13] For example, the passage of a favorable state-level policy (e.g., a renewable portfolio standard) in a state with underdeveloped wind resources may have simultaneously influenced WPA's funding of that state's wind working group (the independent variable) and some developers' decisions to complete wind power projects (the dependent variable).
2) **Modeling Issue 2 – Direct Versus Indirect Impact:** The effect of WPA on wind generation capacity is likely both direct and indirect, with indirect effects arising because the initiative influences factors that themselves directly impact wind generation capacity. For example, respondents in each state indicated that WPA and the wind working groups influenced any one of numerous state- or local-level policies (e.g., renewable portfolio standards or local siting ordinances) that in turn directly affected wind power installations. Consequently, in a statistical analysis accounting for both WPA and these other factors, the inclusion of these other factors as explanatory variables can mask the full effect of the WPA initiative.
3) **Modeling Issue 3 – Potential Scale-Specific Impacts:** The effect of the WPA initiative may be scale-specific; it may have relatively little impact on large-scale wind capacity development and

[13] A related issue is that the states included in the analysis were targeted for WPA participation on the basis of their wind resource; the excluded states are 10 states in the South with negligible wind resources. Impact estimates, therefore, would have applied to only those 40 states included in the analysis, and could not be interpreted as indicating the potential effect of the WPA initiative in the excluded states.

a considerable effect on small-scale development, or vice versa. This raises the possibility that the observable effect of the WPA initiative taken as an *average* across all wind development will appear to be statistically non-significant. For example, in Alaska, a state with primarily small-wind capacity installations, the initiative was perceived to have a high-level of influence, while in Nevada's utility-scale market, WPA was perceived as not influential.

Despite these potential obstacles, the research team sought to assess the ability to evaluate WPA's state-based activities through such methods. Of the statistical approaches considered, fixed-effects regression analysis (wherein the dependent variable is wind-generating capacity in a state-year and the set of explanatory variables includes measures of WPA activity) appeared to be the most promising because of its potential to address endogeneity bias. For instance, a two-way, linear, fixed effects regression (LFER) model accounts for two large classes of factors that are potential sources of endogeneity bias:

a. All state-specific, time invariant factors that are correlated with the WPA budget
b. All state-shared, time-varying factors that are correlated with the WPA budget

As a result, the only remaining sources of bias would be time-varying factors that also vary across states, such as a state's political climate with respect to wind development. Nonetheless, after carefully reviewing available data and developing a better understanding of the factors affecting changes in wind-generating capacity across WPA states, evaluators concluded that it was not feasible to use regression analysis to identify the impacts of WPA for the following reasons:

- **Insufficient sample size.** First, the panel data on which the analysis would have been based comprised about 400 observations (40 states, 10 years of observation for each state). After accounting for state and annual fixed effects, and allowing for 1- or 2-year lags, the degrees of freedom available for isolating the effect of WPA is about 250-300 observations.
- **Difficulty of identifying the proper metric of WPA activity**. An obvious choice would be the WPA dollars allocated each state-year, because this would convert a variety of WPA activities into a single index, and could be justified as implicitly assuming that states make the best use of the financial resources allocated via WPA. Unfortunately, it became apparent that this variable would not be available for all states and all years, and an alternative single metric or set of inclusive metrics would not be easy to construct.
- **Endogeneity bias likely to remain a serious issue.** Evaluators went to considerable lengths to construct a model that avoided the endogeneity bias discussed above. As the approach developed, however, it became clear that endogeneity bias would remain a serious issue in a regression analysis. The wide variety of other wind-related activities at the state and regional level are likely correlated with WPA activity and sufficient data that could help isolate those activities' impact are unlikely to be developed.

A potential alternative approach that could theoretically address the endogeneity issue is a quasi-experimental approach in which states are grouped into either control or treatment categories. Such an approach would still rely on regression analysis, but with differences in wind generating capacity between the control and treatment groups attributable to the effect of the WPA initiative. The attraction of the approach was also its undoing in the current context: the maintained assumption of the method is that, after correcting for observable variables, states are the same across groups *except* for the effect of the WPA. In other words, the approach is assumed to "clear out" endogeneity bias on the assumption that the same unobserved factors that affect the treatment groups affect the control group in equal measure. But this maintained assumption is untenable in the context of the WPA, where the allocation of resources reflects a selection process. Moreover, this selection issue aside, it is difficult to see how one might group states into control versus treatment categories in a way that stands up to close scrutiny.

As a result, the same issue that prevented the fixed-effects regression approach also afflicted a regression analysis that draws on quasi-experimental approaches. In both cases, the claim that the method removes

any correlation between WPA metrics and unobserved factors affecting wind generation capacity was not justified in light of the complexity and variation in wind development activities across states and over time.

Consequently, the evaluation utilized the investigative approach identified above that combines historical tracing with an expert judging process in place of the statistical approach. This interview-based research methodology enabled the team to achieve the combined impact and process evaluation objectives in an efficient manner while also providing more detailed insights about the nuances of WPA and wind working groups' influence in various states.

## 3.3 Sample Development

As noted in Section 3.2.4, the developed sampling plan intended to maximize the portion of the wind capacity market that could be reasonably evaluated within the project scope and timeframe. The sampling approach sought to optimize the selection of sampled states to meet the following objectives:

1) Include every state in each of the top two tiers of capacity additions for either utility-scale or small-scale wind. This objective seeks to directly estimate WPA's influence in those states with the most significant capacity additions.
2) Achieve 90/10 absolute confidence/precision in each of the utility-scale and small-wind categories.
3) Sample both priority and non-priority states, including priority states that were in the lowest tiers of capacity additions.
4) Include a small sample from those states with significant capacity additions that were not targeted by WPA in order to investigate potential effects from WPA activities in neighboring states.

The sampling approach was developed as follows:

- Identify states that had wind working groups during the evaluation period:
    - Identify states that had the greatest level of utility-scale wind additions
    - Identify states that had the most significant addition of small-wind capacity
- Rank the states in terms of installed wind capacity (MW) separately for utility-scale and small-wind plant additions into three strata:
    - Top 33% - those states with the largest MW additions that comprise about 33% of total additions (within each market category) over this period
    - Mid 33%
    - Lower 33%
- Determine sample-size targets required to achieve 90/10 absolute confidence/precision levels in each of the large- (n=14) and small-wind (n=12) capacity segments.
- Assign every state in the top two capacity tiers of either segment as sample states (n=12). Randomly select the remaining states needed to meet the WPA sample target (n=2) from priority states that were in the lower tier of both segments.
- Randomly select three states (n=3) from among those states that were not targeted by WPA but that still achieved significant capacity additions (N=8) to investigate any market effects in non-targeted states.[14]

Table 3-6, below, shows the original breakdown of states with wind working groups that fell into each capacity tier for the utility-scale and small-wind capacity addition scenarios based on the AWEA project database.

[14] These states include Texas, Iowa, California, Minnesota, New York, New Hampshire, Rhode Island, and Delaware.

**Table 3-6. Summary of State Wind Energy Capacity Additions (2000 through 2010): WWG States**

| Capacity Tier | Utility-Scale Additions | Small-Wind Additions |
|---|---|---|
| **Top MW Tier** | WA, OR, IL | AK, ND |
| **Middle MW Tier** | OK, WY, ND, IN, CO | OH, ID, CO, NE |
| **Lower MW Tier** | KS, PA, SD, NM, WI, WV, MT, ID, ME, UT, NE, AZ, MI, MD, HI, TN, AK, AR, CT, GA, KY, MA, NV, NJ, NC, OH, VA, MO | SD, IL, ME, UT, NM, ID, KS, MD, WI, MI, OK, PA, WY, AZ, AR, CT, GA, HI, KY, MA, MT, NV, NJ, NC, OR, TN, VA, WA, WV, MO |

Source: Navigant analysis

Table 3-7 shows the calculated sample sizes required for each market segment (i.e., utility-scale and small-wind markets) to achieve a 90/10 level of confidence and precision (in terms of the number of states sampled) on interview questions with a yes/no response, an evaluation industry standard. For the utility-scale sample, interviews were conducted in all of the top-tier and middle-tier states, along with six of the 28 lower-tier states. Similarly, for the small-wind sample, interviews were targeted for all states from the top and middle tiers, along with six of the 30 lower-tier states. Based on the low number of non-WPA-targeted states and the need to prioritize evaluation resources, 90/10 confidence and precision was not sought for the non-targeted states.

**Table 3-7. Sample Frame Development Summary[15]**

**Utility-Scale Additions**

| MW Addition Tier | # of states in tier | 90/10 target sample size |
|---|---|---|
| **Top 33%** | 3 | 3 |
| **Middle 36%** | 5 | 5 |
| **Lower 31%** | 28 | 6 |
| **Total** | 36 | 14 |
| **Overall Precision** | | 10% |

**Small-Wind Additions**

| MW Addition Tier | # of states in tier | 90/10 target sample size |
|---|---|---|
| **Top 34%** | 2 | 2 |
| **Middle 33%** | 4 | 4 |
| **Lower 33%** | 30 | 6 |
| **Total** | 36 | 12 |
| **Overall Precision** | | 10% |

Source: Navigant analysis

The sampling approach resulted in several states being included as interview targets in both the utility-scale and small-wind samples, apparently meeting the 90/10 sampling objective for both segments with only 14 targeted states. However, the initial sample targets for both utility-scale and small-scale were based on available capacity data from AWEA. After the initial sample was drawn, evaluators obtained a more comprehensive small-wind database from eFormative Options,[16] which revealed some significant differences from the AWEA data that affected which states should be included in each of the three small-wind capacity strata. However, the evaluators chose not to modify the list of target states due to the small-wind segment's lower overall contribution to capacity additions relative to utility-scale (i.e., from the perspective of estimating WPA's capacity-based influence, it was more important to achieve higher

[15] Alaska was originally included in both the utility-scale and small-wind segments; however, after collecting additional data, the team decided to categorize it only as a small-wind state, therefore reducing the population size of the utility-scale low-tier segment to 27.

[16] http://www.eformativeoptions.com/

precision in the utility-scale segment). The effect of this decision on the small-wind findings was essentially an added degree of uncertainty for the top- and middle-capacity tiers than if the sample had indeed included a census of those tiers. Despite this change, the small-wind sample still included targeted-states representing about 50% of installed small-wind capacity across those states. The three additional non-WPA-targeted states comprised a random selection from among the eight non-targeted states that achieved significant capacity additions during the evaluation time period.

Table 3-8 illustrates the final sample's coverage of each capacity tier and segment.

**Table 3-8. Detailed Summary of Final WPA-Targeted State Sample**

| Targeted State | Priority States | Large | | | Small | | | N |
|---|---|---|---|---|---|---|---|---|
| | | Top 33% | Middle 36% | Lower 31% | Top 32% | Middle 34% | Lower 34% | |
| **States in Top 2 Tiers for Utility-Scale Wind Capacity Additions** | | | | | | | | **8** |
| CO | | | S | | | | S | |
| IL | | S | | | | S | | |
| IN | x | | S | | | S | | |
| ND | | | S | | | | S | |
| OK | | | S | | | | S | |
| OR | | S | | | | | S | |
| WA | | S | | | | | S | |
| WY | | | S | | | | S | |
| **Remaining States in Top 2 Tiers for Small-Wind Capacity Additions** | | | | | | | | **2** |
| AK | x | | | | S | | | |
| AZ | x | | | x | | x | | |
| MA | x | | | x | x | | | |
| ME | | | | x | | x | | |
| MI | x | | | x | | x | | |
| NV | x | | | S | | S | | |
| OH | x | | | S | S | | | |
| WI | | | | x | | x | | |
| **States in Lower Tiers for Both Segments** | | | | | | | | **4** |
| ID | | | | S | | | S | |
| MD | x | | | S | | | S | |
| NC | x | | | S | | | S | |
| NE | x | | | S | | | S | |
| UT | x | | | x | | | x | |
| VA | x | | | x | | | x | |
| **Total (n/N)** | **6/12** | **3/3** | **5/5** | **6/27** | **2/3** | **3/7** | **10/26** | **14** |
| **Non-Targeted States with Significant Wind Capacity Additions (N=8) CA, DE, IA, MN, NH, NY, RI, TX** | | | | | | | | **3** |
| | | | | | | | **TOTAL SAMPLE:** | **17** |

(x) denotes a state falls into a particular category and tier.
(S) denotes states that were sampled. The three non-targeted states randomly selected for inclusion in the sample were Iowa, New York and Texas. Fourteen additional non-priority, WPA-targeted states fall into the lower tier of both the large- and small-wind segments that were not be included in the sample frame. They include AR, CT, GA, HI, KS, KY, MO, MT, NJ, NM, PA, SD, TN, and WV.
Source: Navigant analysis

For each sampled state, evaluators sought to conduct four to six interviews (68-102 total, increased from an originally planned three per state) and include at least one respondent in each of three categories of market actors that participated in or were familiar with WWG activities – private sector (i.e., wind developers); government agencies (e.g., state energy offices); and non-government organizations (e.g.,

nonprofits). To support the development of a robust sample frame, interview candidates were identified in each category and state who were likely to possess a high level of experience with WPA and overall familiarity with wind development in the state. The study team attempted to identify respondents that had been involved in promoting the wind market or developing wind capacity in the state for at least 1/3 of the years the state had a WWG or for three years of the 1999-2010 evaluation period (whichever is less).

An initial sample frame was drawn from WPA and wind working group records and other historical documents that show individuals' affiliation or involvement in a wind working group, attendance at state-level industry-related events, or association with wind projects developed in the state. Priority was placed on participants at high levels in their organizations (e.g., director, vice president, etc.) and all interviewees were screened for familiarity with or participation in wind working group activities during the evaluation time period.

## 3.4 Final Disposition of Interviews and Response Rates in Sampled States

This section presents a summary of the respondent-level statistics from the interviews achieved in each sample state. It includes the number of interviews achieved, the number of WPA influence estimates received for each market sector, and the Delphi process response rates.

**Table 3-9. Disposition of Completed Interviews and WPA Influence Responses**

| State | Target | Interviews Completed | Respondent Type | | | Unique Contacts Attempted | Influence Rankings Completed | |
|---|---|---|---|---|---|---|---|---|
| | | | WWG, Gov. or NGO | Utility-Scale Dev. or Utility | Small-Wind | | Utility-Scale | Small-Wind |
| AK | 4-6 | 5 | 2 | 0 | 3 | 13 | 0 | 5 |
| CO | 4-6 | 5 | 2 | 2 | 1 | 13 | 4 | 3 |
| NE | 4-6 | 5 | 2 | 2 | 1 | 10 | 5 | 3 |
| MD | 4-6 | 4 | 3 | 0 | 1 | 11 | 2 | 3 |
| OH | 4-6 | 4 | 2 | 0 | 1 | 10 | 2 | 4 |
| ID | 4-6 | 5 | 2 | 2 | 1 | 13 | 4 | 3 |
| OK | 4-6 | 7 | 2 | 2 | 3 | 13 | 4 | 3 |
| OR | 4-6 | 4 | 2 | 1 | 1 | 10 | 4 | 3 |
| WA | 4-6 | 4 | 2 | 1 | 1 | 21 | 2 | 3 |
| WY | 4-6 | 5 | 2 | 2 | 0 | 6 | 4 | 2 |
| IL | 4-6 | 5 | 2 | 2 | 1 | 9 | 5 | 3 |
| IN | 4-6 | 4 | 1 | 2 | 1 | 10 | 2 | 2 |
| NV | 4-6 | 6 | 2 | 2 | 2 | 10 | 4 | 4 |
| ND | 4-6 | 6 | 3 | 3 | 0 | 14 | 6 | 3 |
| IA | 4-6 | 4 | 2 | 1 | 1 | 9 | 3 | 3 |
| NY | 4-6 | 6 | 2 | 2 | 2 | 6 | 4 | 3 |
| TX | 4-6 | 3 | 2 | 1 | 0 | 7 | 3 | 3 |
| **Total** | **68-102** | **82** | **35** | **25** | **20** | **185** | **58** | **53** |

Note: The original interview target was 51 completes (3 per state), but was increased in order to improve the robustness of the evaluation.
Source: Navigant analysis

The response rates for each of the two rounds of Delphi input are summarized in Table 3-10.

**Table 3-10. Delphi Process Response Summary**

| | Round 1 - Update Influence Estimates Based on Aggregated Responses | Round 2 - Provide Uncertainty Estimates |
|---|---|---|
| Emails Sent | 80 | 80 |
| Replies | 53 | 73 |
| Respondents that Made Changes to Estimates | 12 | N/A |
| Response Rate | 66.25% | 91.25% |
| % of Respondents that Made Changes to Estimates | 23% | N/A |
| % of Total that Made Changes to Estimates | 15% | N/A |

Source: Navigant analysis

# 4. WPA Impact Findings

The market factors that contribute to the addition of wind power capacity are largely overlapping and inter-related, making it difficult to isolate the impact from any one factor. In addition, the unique regulatory, policy, sociocultural, and market context within each state means the share of influence on capacity additions from each factor will also vary. This chapter addresses these issues through the following sections:

- Section 4.1 provides capacity-equivalent estimates for WPA's perceived share of influence on wind capacity additions in states the initiative directly targeted.
- Section 4.2 estimates WPA's potential influence on a sample of states that were not directly targeted by the initiative.
- Sections 4.3 and 4.4 provide insights into secondary impacts, including the role played by leveraged funding and third-party replication of state-based activities, respectively.

**Note on the Use of Non-Experimental Research Design to Evaluate Program Impacts**

Due to several program design and statistical considerations discussed in this section, this evaluation could not utilize an experimental or quasi-experimental approach to estimating WPA's capacity-based impacts. Instead, the study relied on a combination of historical tracing and expert judging approaches, including a modified Delphi process, to quantify and characterize the overall share of capacity additions that could be allocated to the WPA initiative. The approach builds upon methodologies found in impact evaluation and attribution analysis literature (Violette and Cooney 2003, TecMarket Works Team 2006, Vine 2012, New York State Department of Public Service and the Evaluation Advisory Group 2012, Siebold et al. 2001); however, the evaluation's design does not provide for the same degree of rigor associated with an experimental or quasi-experimental approach. Readers are cautioned that implied causal linkages and attributions of market impacts cannot be supported by direct statistical analysis. As such, this report makes judicial use of impact- and attribution-related terminology, opting in most cases to instead describe WPA's allocation or share of influence on wind capacity additions rather than its "attributable impact."

## 4.1 WPA's Influence on Wind Capacity Additions in Targeted States

The underlying challenge for this evaluation arises from the difficulty in isolating the influence of multiple, inter-related factors on a particular state's wind capacity additions. As illustrated in the Market Influence Diagram in Figure 3-1, cross influences among market factors abound. State and local policies, for example, can play a key role in supporting or facilitating wind power projects; however, lawmakers and regulators may not adopt such policies without influence from developers, non-governmental organizations, or the general public. And economic factors (e.g., utilities' willingness to sign power purchase agreements [PPAs]) are inextricably linked to regulatory (e.g., RPS requirements) and technical (e.g., wind resource) factors.

This section presents findings on WPA's estimated share of influence on wind power capacity additions. It also discusses the "noisy" context within which WPA and the wind working groups were trying to influence the market. The historical tracing and market actor interviews were designed to help estimate the degree of influence WPA's state-based activities and other initiatives had within the broader (and complex) political, regulatory, and market context in each state.

### 4.1.1 Market Factors' Perceived Share of Influence on Wind Capacity Additions

Each in-depth stakeholder interview opened with an introductory conversation about the Market Influence Diagram and state-specific timeline in an effort to remind each respondent of the various factors that may have played a role in the development of that state's wind market. After an open-ended discussion of the factors the respondent considered to have been most influential on wind power capacity additions in their state, the evaluator asked the respondent whether they perceived WPA and its state-based activities (e.g., the wind working group) to have had an impact on either the timing or rate of wind capacity additions in their state. A majority (71%) of respondents perceived that the initiative's state-based activities had at least some impact in their state. Another 20% said the activities had little to no impact, while 9% were unsure.

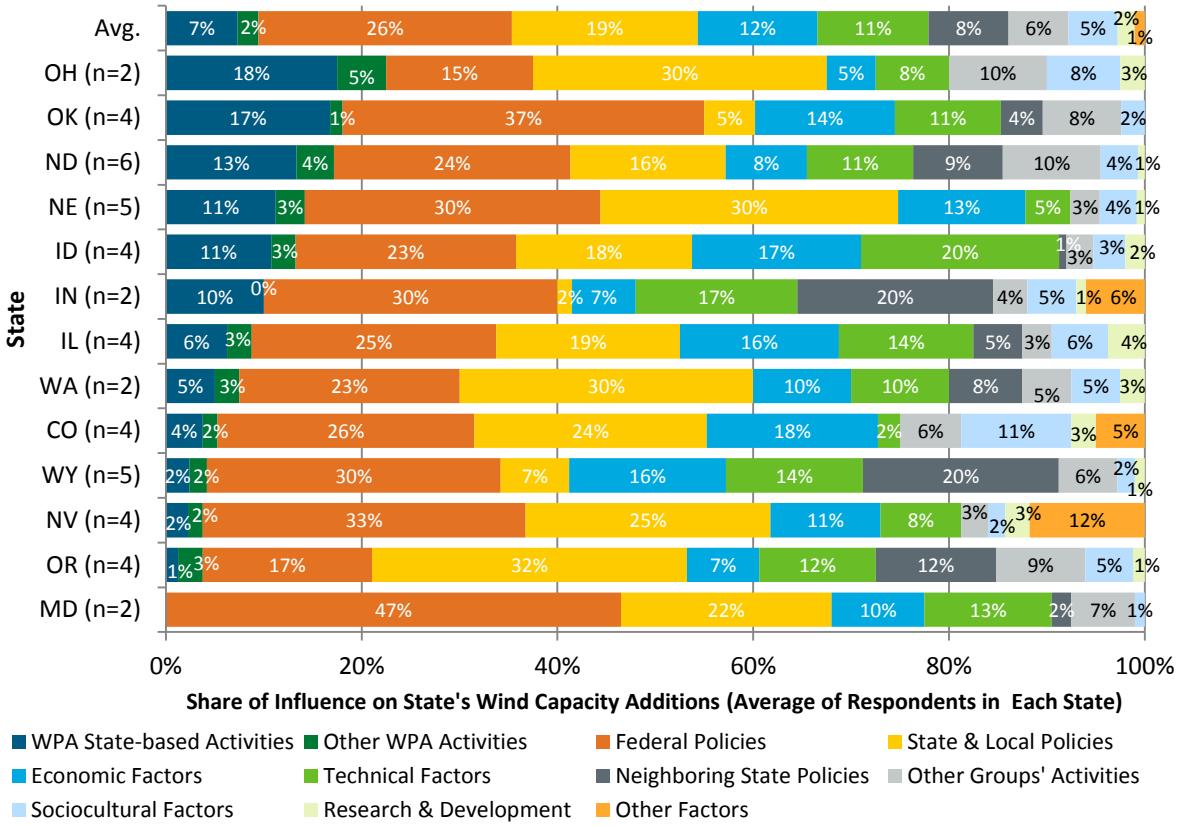
*A majority (71%) of respondents perceived that the initiative's state-based activities had at least some impact in their state. Another 20% said the activities had little to no impact, while 9% were unsure.*

After providing these initial responses regarding key market factors and WPA's influence, respondents were asked to use the Market Influence Worksheet (see Table 3-4) to allocate shares of the overall influence on wind capacity additions among each of ten market factor categories; the total shares allocated across all factors had to total 100%.[17] The goal of the exercise was to have respondents quantify the share of installed wind capacity influenced by WPA state-based and other national-level activities in the context of the other market factors that also influenced capacity additions in that state.[18] Some respondents provided answers for either the utility-scale or small-wind markets; others provided estimates for both.

This section explores overarching trends from those responses across each of the 14 sampled states that were targeted by WPA.[19] It does not, however, provide extensive details about the market's development in each state. Readers are encouraged to review the state-specific case studies that appear in Appendix D to better understand the wide-ranging events, activities, and factors that affected each state's market. In order to identify overarching trends, the estimated share of influence provided by each respondent for a particular factor within each state was averaged across all respondents in that state. Readers should similarly note that a given state's respondents may have shown substantial differences in their individual perceptions of each factor's importance in that state. The in-state averages used in the next two figures do not account for such variation; however, such uncertainty is addressed in the subsequent calculations of capacity-equivalent estimates of WPA's influence and in the state-specific case studies in Appendix D. Figure 4-1 shows a breakdown of the average share of influence allocated to each factor category by respondents in each state for the *utility-scale wind market.*

[17] The exact wording of the question was: "I'd like to get your assessment of each market factor's relative impact on [state's] wind capacity additions for [utility-scale/small-scale] wind. In other words, we'd like to divide the overall influence on the state's wind market among different market factors, with each receiving between 0 and 100% of the credit for influencing the addition of wind capacity. The total for all factors will equal 100%." The complete interview guide appears in Appendix A.
[18] Specific examples of the types of activities or factors included in each category appear in Table 3-3; however, respondents were allowed to suggest and rank additional factors that they thought did not fit in one of the provided categories.
[19] Alaska was only counted as a part of the small-wind sample given the nature of its installed wind capacity. Therefore, the total sample size for targeted states was 13 for the utility-scale market and 14 for the small-wind market.

**Figure 4-1. Factors' Perceived Share of Influence on Utility-Scale Wind Capacity Additions by State**




Note: The average is weighted by the amount of utility-scale capacity added from the year of each state's WWG founding through 2011. This graphic does not account for the variation in estimates among respondents within each state. The variation by factor is discussed in the individual state case studies in Appendix D. The number of individuals responding in each state is indicated on the y-axis.
Source: Navigant analysis

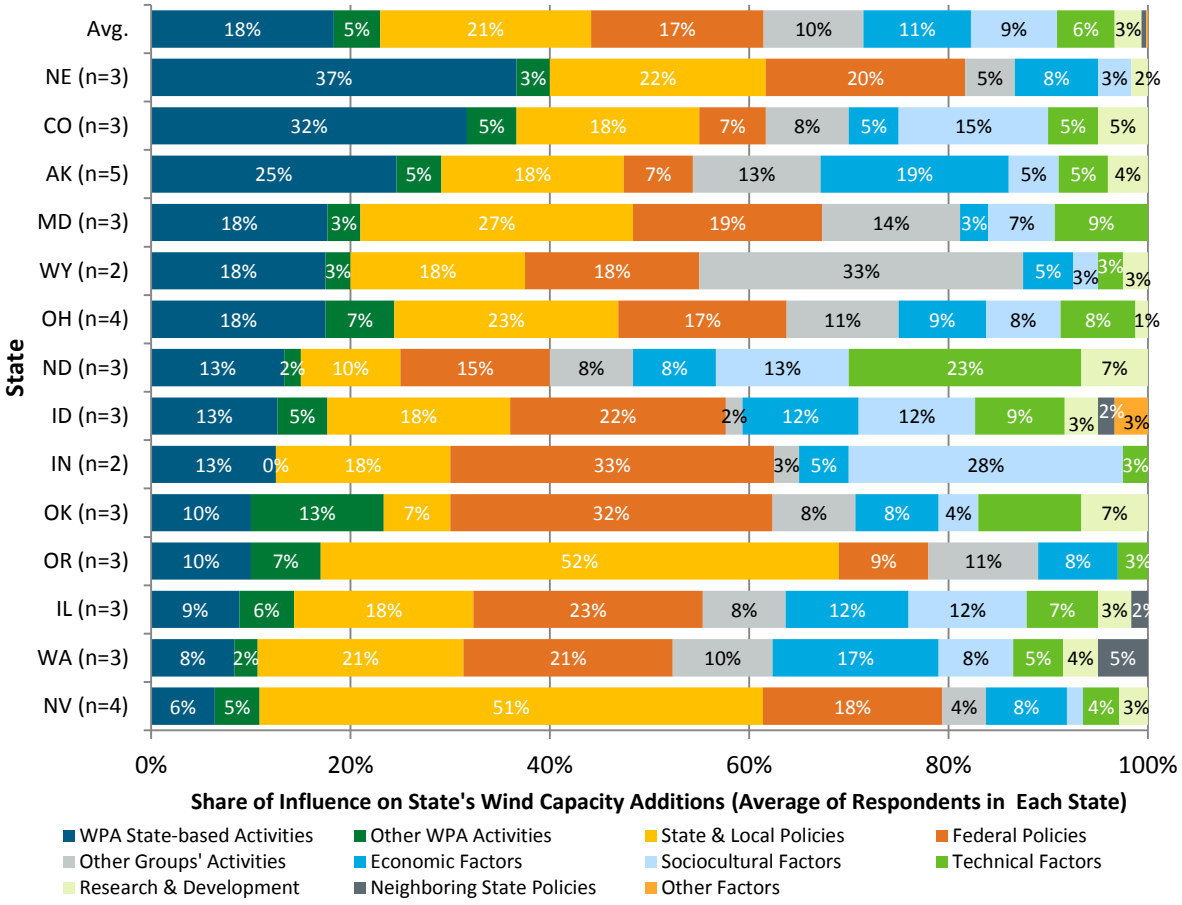
The following key findings emerged from the exercise:

- Federal policies were perceived to have had the greatest share of influence on utility-scale capacity additions in 9 of the 13 states. (Federal policy was ranked equally with state and local policies in Nebraska.) Respondents most often mentioned the PTC, though the ability of utility-scale wind to use the ITC (starting in 2009) was also cited.
- State and local policies were perceived to have had the greatest share of influence in 3 of the 13 states. (Again, Nebraska was split between state and local and federal policy.) In most cases, these respondents specifically mentioned a state's RPS as the primary factor; however, others cited the importance of state-level tax incentives (e.g., Oregon's Business Energy Tax Credit) or specific regulatory decisions by a state's utility commission (e.g., Idaho's administration of the Public Utility Regulatory Policies Act [PURPA]).
- In two states (Indiana and Wyoming), respondents allocated a 20% share of influence on capacity additions to neighboring states' RPSs and the demand they created for exporting wind power. This was also a notable factor in Oregon and Washington as well as North Dakota (due to California and Minnesota's portfolio standards, respectively). Neighboring states' policies received an allocation of influence in nine of the thirteen sampled utility-scale states, with an average allocation of 8% across all sampled states. In five states, the influence from neighboring states' policies was greater than that from WPA state-based activities.

- Economic and technical factors were each allocated a 10% or greater share of influence in nine states, though some respondents noted the difficulty in separating the two. Economic factors frequently cited include the cost of competing power sources like natural gas (Colorado, Illinois, and Oklahoma) and electric load growth (Illinois, Maryland, Nevada, and North Dakota). Technical factors generally included wind resource quality (Maryland, North Dakota, Oklahoma, and Wyoming) or access to transmission (Idaho, Illinois, Indiana, Oregon, Washington, and Wyoming).
- WPA state-based activities were perceived to have had a 10% or greater average share of influence on capacity additions in six states.

Figure 4-2 shows the breakdown of the average share of influence on wind capacity additions allocated to each factor category by respondents in each state for the *small-wind market.*

**Figure 4-2. Factors' Perceived Share of Influence on Small-Wind Capacity Additions by State**




Note: The average is weighted by the amount of utility-scale capacity added from the year of each state's WWG founding through 2011. This graphic does not account for the variation in estimates among respondents within each state. The variation by factor is discussed in the individual state case studies in Appendix D. The number of individuals responding in each state is indicated on the y-axis.
Source: Navigant analysis

The following key findings emerged for the small-wind market estimates:

- The relative share of influence among various factors was more diverse for the small-wind market than for utility-scale. Federal policies (particularly the ITC cash grant option) and state and local policies (e.g., utility or state rebates and net metering) were perceived to have the

greatest share of influence in four states (plus Washington, where it was split evenly between the two).

- Notably, WPA state-based activities were perceived to have had the greatest share of influence on small-wind capacity additions in three states (Alaska, Colorado, and Nebraska). WPA state-based activities received 10% or more of the perceived influence on capacity additions in 8 additional states.
- In six states, respondents allocated 10% or more of the share of influence to other groups' activities (e.g., industry trade organizations or environmental groups). This often included a state energy office (Alaska, Ohio, Maryland, Washington, and Wyoming) or non-governmental organization (e.g., the Renewable Energy Alaska Program, the Renewables Northwest Project [Washington], the Energy Trust of Oregon, and Green Energy Ohio).
- Sociocultural factors were also more likely to receive a 10% or greater share of the estimated influence on small-scale wind capacity additions. In five states (Colorado, Idaho, Illinois, Indiana, and North Dakota), respondents generally cited issues related to environmental awareness or a desire for self-reliance (or less reliance on a utility).
- Economic factors (primarily electricity rates) received a 10% or greater share of perceived market influence in four states (Alaska, Idaho, Illinois, and Washington).

### 4.1.2 WPA's Estimated Influence on Wind Capacity Additions in Targeted States

This section provides results from the detailed analysis of the initiative's estimated influence on wind capacity additions across all of the states targeted for WPA state-based activities. It follows the detailed capacity-equivalent derivation approach as discussed in Section 3; complete input data and additional summary output tables are found in Appendix B.

#### 4.1.2.1 Capacity-Equivalent Estimates of WPA's Influence in Sampled Target States

The above exercise included respondents' estimates of the share of influence on wind capacity additions that they would allocate to each of two categories of WPA activities—state-based activities (e.g., wind working groups, anemometer loan programs) and other WPA activities (e.g., national-level efforts like the greening federal loads effort). However, using the above simple averages of respondents' estimates of WPA's influence in each state does not account for two types of uncertainty surrounding those estimates:

- each individual's uncertainty about their own estimate, and
- any disparity in estimates between respondents in each state.

As noted in the methodology section, each respondent was asked to approximate a 90% confidence interval around their initial estimates (i.e., expected value) of WPA's share of influence on installed wind capacity (for both state-based and other WPA activities). These percentage-based estimates and ranges were applied to the baseline capacity that has been added in each state from the year that the wind working group was founded through the end of 2011, thereby converting each respondent's estimate and range to a capacity-based estimate of WPA's influence.[20] These capacity-based expected values and uncertainty ranges within each state (assuming a triangular distribution) were then averaged to produce a state-level, capacity-based estimate and range of the initiative's influence on utility-scale and small-wind additions. Table 4-1 lists these state-level estimates of the capacity-equivalent share of influence for WPA state-based activities. The summary table for other WPA activities is found in Appendix B.

[20] While this evaluation covers WPA activities from 1999 through 2010, the evaluation team (and respondents) acknowledged that the indirect nature of many activities' influence may often require several months or even years before capacity is installed that was subject to that influence. In addition, WPA outputs and outcomes may continue to influence capacity installed after federal funding or organized activities have ceased in a particular state. As such, calculations used the capacity installed in each state through the end of 2011 as the end date for capacity additions exposed to WPA influence. The start date for exposed capacity was based on the year the wind working group was founded in each state.

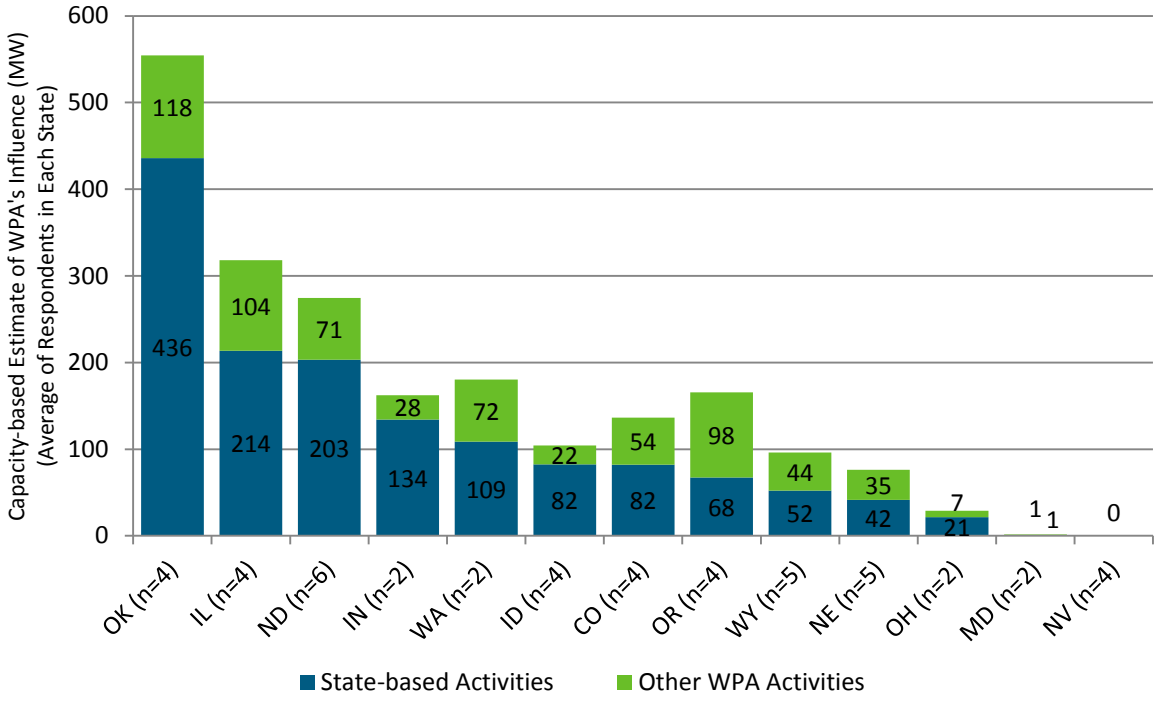
**Table 4-1. State-Level Capacity-Equivalent Estimates and 90% Confidence Intervals for WPA State-Based Activities' Influence in Sampled Target States**

| State | Utility-Scale Capacity Estimate Range (MW) | | | Small-Wind Capacity Estimate Range (MW) | | |
|---|---|---|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound | Lower Bound | Expected Value | Upper Bound |
| Alaska[a] | N/A | N/A | N/A | 2.7 | 3.0 | 3.4 |
| Colorado | 60 | 82 | 106 | 0.5 | 0.7 | 0.8 |
| Idaho | 65 | 82 | 105 | 0.3 | 0.3 | 0.4 |
| Illinois | 171 | 214 | 261 | 0.6 | 0.7 | 0.8 |
| Indiana | 102 | 134 | 166 | 0.4 | 0.6 | 0.8 |
| Maryland | 0 | 1 | 2 | 0.2 | 0.2 | 0.3 |
| Nebraska | 31 | 42 | 58 | 0.6 | 0.6 | 0.8 |
| Nevada[b] | 0 | 0 | 0 | 0.3 | 0.4 | 0.4 |
| North Dakota | 173 | 203 | 232 | 0.2 | 0.3 | 0.3 |
| Ohio | 19 | 21 | 25 | 1.9 | 2.1 | 2.3 |
| Oklahoma | 323 | 436 | 569 | 0.1 | 0.1 | 0.2 |
| Oregon | 38 | 68 | 104 | 0.1 | 0.2 | 0.2 |
| Washington | 82 | 109 | 133 | 0.2 | 0.2 | 0.3 |
| Wyoming | 35 | 52 | 71 | 0.4 | 0.5 | 0.6 |
| **Total** | **1,100** | **1,444** | **1,833** | **8.4** | **9.9** | **11.6** |

[a] Alaska's capacity was categorized as small-wind capacity as defined by this evaluation.
[b] Nevada did not have any utility-scale wind power installed until 2012.
Source: Navigant analysis

Figure 4-3 shows the aggregated capacity-based estimates of the initiative's influence on *utility-scale wind power additions* in each state. The stacked bars show the average estimated capacity-based values for each of WPA state-based and national-level activities in each state.

**Figure 4-3. WPA's Average Estimated Influence on Sampled States' Utility-Scale Capacity Additions**




Source: Navigant analysis

As Figure 4-3 shows, the capacity-equivalent estimate of WPA state-based activities' perceived influence on utility-scale wind power additions was greater than 100 MW in 5 of the 13 states sampled. Notably, the capacity associated with each set of WPA activities is partly a function of the amount of capacity that has been added in those states since the wind working group was founded. For example, three of the states with the highest capacity-equivalent levels of WPA influence (Oklahoma, North Dakota, and Washington) are among those that had some of the earliest wind working groups (beginning in 2000, 2001, and 2002, respectively) and, therefore, larger total installed capacity levels that were exposed to WPA's influence. However, this relationship should not be dismissed as the primary determinant, as the other two states with estimates greater than 100 MW began their wind working groups much later (Indiana in 2005, and Illinois in 2006). Furthermore, other states with early working groups and large subsequent capacity additions were found to have lower capacity-equivalent estimates of WPA's share of influence (e.g., Oregon in 2002 and Colorado in 2003).

To account for these dynamics, this evaluation considers a state's wind working group as successful if either its percentage- or capacity-based estimate of WPA state-based activities' influence falls above the average for all states. For example, successful states with an above-average percentage-based estimate of market influence include Ohio, Nebraska, and Idaho. Illinois has an above-average capacity-based estimate of WPA's influence, while Oklahoma, North Dakota, and Indiana were successful under both criteria. Table 4-2 further illustrates the comparison between the timing of each state working group's founding, the wind power capacity added since that year, and the average percentage- and capacity-based estimates of WPA's share of influence on those additions. The table notes also indicate which state working groups would be considered successful under each of the two criteria described above.

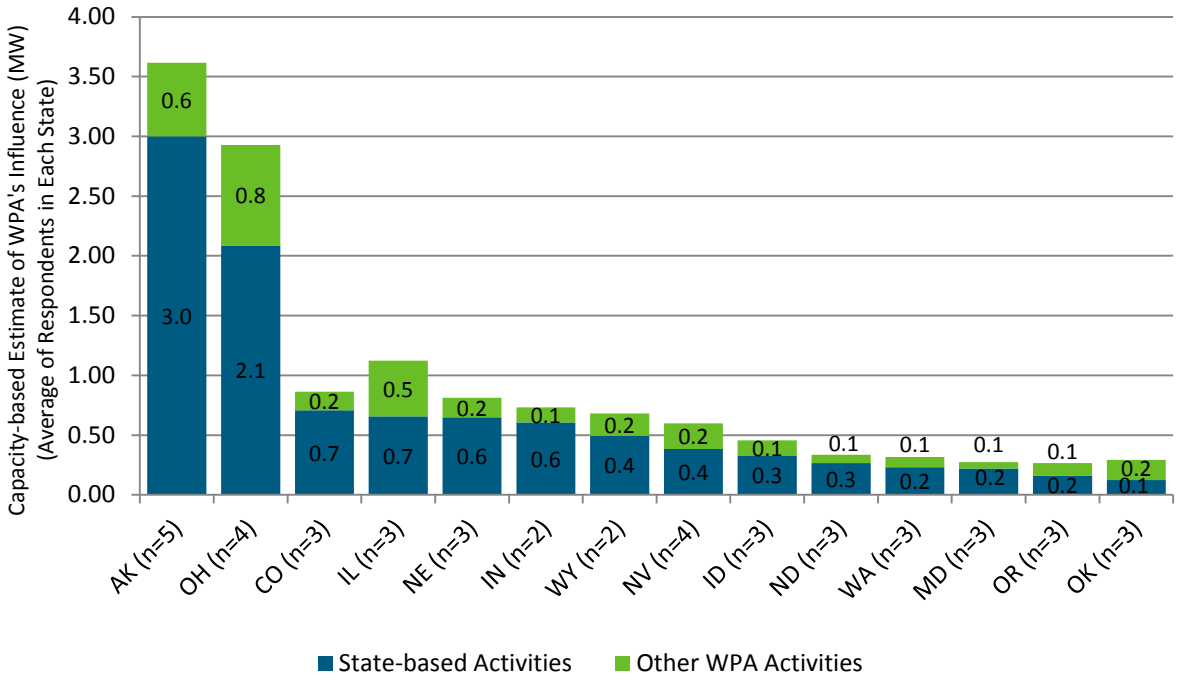
**Table 4-2. Summary of WPA's Share of Influence on Sample State's Utility-Scale Capacity Additions**

| State (n) | WWG year | Average Estimated Share of Influence | | Capacity Added (MW) | Average Estimated Influence (MW) | |
|---|---|---|---|---|---|---|
| | | State-Based Activities | Other WPA Activities | | State-Based Activities | Other WPA Activities |
| OK (4)[a,b] | 2001 | 22% | 6% | 2,007 | 436 | 118 |
| IL (4)[b] | 2006 | 8% | 4% | 2,635 | 214 | 104 |
| ND (6)[a,b] | 2000 | 14% | 5% | 1,444 | 203 | 71 |
| IN (5)[a,b] | 2005 | 10% | 2% | 1,340 | 134 | 28 |
| WA (2) | 2002 | 5% | 3% | 2,396 | 109 | 72 |
| ID (4)[a] | 2001 | 13% | 4% | 618 | 82 | 22 |
| CO (4) | 2003 | 5% | 3% | 1,743 | 82 | 54 |
| OR (4) | 2002 | 3% | 4% | 2,356 | 68 | 98 |
| WY (5) | 2007 | 5% | 4% | 1,124 | 52 | 44 |
| NE (5)[a] | 2007 | 16% | 13% | 266 | 42 | 35 |
| OH (2)[a] | 2003 | 19% | 7% | 112 | 21 | 7 |
| MD (2) | 2005 | 1% | 1% | 120 | 0.9 | 0.9 |
| NV (4) | 2002 | N/A | N/A | 0 | 0 | 0 |
| **Average/Total** | | **9%** | **4%** | **16,161** | **1,444** | **655** |

Note: The (n) in each state represents the number of respondents providing estimates for the utility-scale market in each state.
[a] State working group considered successful due to above-average allocation of share of market influence (%).
[b] State working group considered successful due to above-average allocation of capacity influenced (MW).
Source: Navigant analysis; Capacity Added values adapted from WPA 2012

Figure 4-4 shows the aggregated capacity-based estimates of the initiative's influence on *small-wind power additions* in each state.

**Figure 4-4. WPA's Average Estimated Influence on Sampled States' Small-Wind Capacity Additions**




Source: Navigant analysis

In Ohio and Alaska, high average estimates of WPA's perceived share of influence (18% and 37%, respectively) combined with high levels of small-wind capacity additions (more than 10 MW each) provide for relatively high capacity-based estimates of WPA's influence.[21] However, some states with relatively high amounts of capacity additions but lower estimates of WPA's share of influence (e.g., Illinois) still resulted in relatively high capacity-based estimates of WPA's influence. Similarly, some states with lower total capacity levels but higher estimates of WPA's influence also resulted in relatively high capacity-based estimates of the initiative's influence (e.g., Colorado). In other words, there was no single, common formula for those states where the initiative was estimated to have had the greatest influence. For the small-wind market, this evaluation considers a state's wind working group as successful if its percentage-based allocation of influence on the state's wind capacity additions falls above the average for all states. This includes Alaska, Ohio, Colorado, Wyoming, and Nevada. Table 4-3 lists the timing of each state working group's founding, the small-wind capacity added since that year, and the average percentage- and capacity-based estimates of WPA's share of influence on those additions.

[21] This evaluation considers small-wind to be inclusive of projects of 1 MW and less total capacity, regardless of the number or size of individual turbines involved. In several cases, this may include what other studies would separately consider to be small-scale (turbines of 100 kW and less) and community-scale wind (projects that use one or more turbines in the 100 kW to 1 MW range).

**Table 4-3. Summary of WPA's Share of Influence on Sampled States' Small-Wind Capacity Additions**

| State (n) | WWG year | Average Estimated Share of Influence | | Capacity Added (MW) | Average Estimated Influence (MW) | |
|---|---|---|---|---|---|---|
| | | State-Based Activities | Other WPA Activities | | State-Based Activities | Other WPA Activities |
| AK (n=5)[a] | 2003 | 28% | 6% | 10.7 | 3.0 | 0.6 |
| OH (n=4)[a] | 2003 | 19% | 8% | 10.9 | 2.1 | 0.8 |
| CO (n=3)[a] | 2003 | 29% | 6% | 2.5 | 0.7 | 0.2 |
| IL (n=3) | 2006 | 9% | 6% | 7.4 | 0.7 | 0.5 |
| NE (n=3) | 2007 | 13% | 3% | 5.2 | 0.6 | 0.2 |
| IN (n=2) | 2005 | 15% | 3% | 4.1 | 0.6 | 0.1 |
| WY (n=2)[a] | 2007 | 19% | 7% | 2.6 | 0.4 | 0.2 |
| NV (n=4)[a] | 2002 | 21% | 12% | 1.9 | 0.4 | 0.2 |
| ID (n=3) | 2001 | 15% | 6% | 2.2 | 0.3 | 0.1 |
| ND (n=3) | 2000 | 16% | 4% | 1.6 | 0.3 | 0.1 |
| WA (n=3) | 2002 | 10% | 4% | 2.4 | 0.2 | 0.1 |
| MD (n=3) | 2005 | 18% | 4% | 1.2 | 0.2 | 0.1 |
| OR (n=3) | 2002 | 10% | 7% | 1.6 | 0.2 | 0.1 |
| OK (n=3) | 2001 | 11% | 14% | 1.2 | 0.1 | 0.2 |
| **Average/Total** | | **18%** | **6%** | **55.4** | **9.9** | **3.4** |

Note: The (n) in each state represents the number of respondents providing estimates for the small-wind market in each state.
[a] State working group considered successful due to above-average allocation of share of market influence (%).
Source: Navigant analysis; Capacity Added values adapted from eFormative Options 2012

As noted above, average percentage-based estimates of WPA's influence were higher for the small-wind market than for utility-scale wind. Several factors may contribute to this difference. For example, the small-wind market has generally received less widespread policy support in the form of incentives and rebates than utility-scale wind. As noted in Section 4.1.1, utility-scale wind stakeholders are quick to point to the federal PTC and various states' portfolio standards as key drivers for capacity additions. Economies of scale and longer-standing tax incentives like the PTC have positioned utility-scale wind as an affordable way for many utilities to meet RPS obligations. For the small-wind market, however, low retail electricity rates and utilities' disinterest in (or opposition to) net metering for on-site generation have often contributed to challenging economics, even with the availability of federal and state incentives. This relative lack of favorable policy and other market factors may serve to elevate the perceived influence of WPA and the wind working groups' activities. To the degree that wind working groups have influenced the adoption of the more localized policies and regulations that facilitate small-wind installations (e.g., net metering or siting ordinances), the initiative may have played a larger role in those projects' success.

Wind working groups and other WPA-sponsored activities may also have more opportunities to directly influence small-wind installations relative to utility-scale wind. As will be discussed further in Section 5, several respondents cited WPA's wind resource maps, anemometer loan programs, and the Wind for Schools programs when discussing WPA activities that they perceived as influential. Given the quality and granularity of data provided by the anemometers and maps, and the size of turbines likely to be involved in school wind projects, it is possible these activities were perceived as relatively more important (compared to other factors) for the small-wind market.

#### 4.1.2.2 Capacity-Equivalent Estimates of WPA's Influence in Non-Sampled Target States

The above results were extrapolated to estimate WPA's capacity-based influence in those targeted states that were not included in the research sample. To do this, the team aggregated the ranges of WPA's capacity-equivalent influence across each of the sampled states (from Table 4-1), effectively summing these state-level estimates and uncertainty ranges to arrive at market- and WPA activity-level capacity-equivalent estimates of WPA influence for all of the sampled target states. By using each state's own capacity baseline in the previous calculations, each state's estimate of WPA's influence was already capacity weighted for the aggregate estimates. Table 4-4 summarizes these sample-wide estimates of WPA's capacity-based influence in each wind market and for each set of WPA activities.

**Table 4-4. Capacity-Based Estimates of WPA's Influence and 90% Confidence Intervals for All Sampled Target States**

| Market / Activity Category | Capacity Estimate Range (MW) | | |
|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound |
| ***Utility-Scale Market*** | ***1,742*** | ***2,110*** | ***2,534*** |
| State-Based Activities | 1,237 | 1,449 | 1,680 |
| Other WPA Activities | 505 | 660 | 854 |
| ***Small-Wind Market*** | ***12.0*** | ***13.4*** | ***14.9*** |
| State-Based Activities | 9.1 | 9.9 | 10.9 |
| Other WPA Activities | 2.9 | 3.4 | 4.0 |
| **Total: All Markets and WPA Activities** | **1,754** | **2,123** | **2,549** |

Source: Navigant analysis

Next, an additional uncertainty interval was applied to each capacity-based estimate of WPA influence to account for sampling error for the states in the low-capacity tier that were not sampled. The results were then scaled based on the capacity baselines for each non-sampled state that WPA targeted, again using the year each state's wind working group was founded as a starting point.[22] Table 4-5 summarizes the overall capacity-equivalent estimates of WPA's influence across all 36 of the states targeted by the initiative for each wind market and set of WPA activities.

**Table 4-5. Capacity-Based Estimates of WPA's Influence and 90% Confidence Intervals for All WPA-Targeted States**

| Market / Activity Category | Capacity Estimate Range (MW) | | |
|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound |
| ***Utility-Scale Market*** | ***2,966*** | ***3,350*** | ***3,752*** |
| State-Based Activities | 2,074 | 2,306 | 2,546 |
| Other WPA Activities | 891 | 1,044 | 1,206 |
| ***Small-Wind Market*** | ***22.8*** | ***24.6*** | ***26.5*** |
| State-Based Activities | 17.0 | 18.1 | 19.4 |
| Other WPA Activities | 5.8 | 6.5 | 7.1 |
| **Total: All Markets and WPA Activities** | **2,988** | **3,375** | **3,779** |

Source: Navigant analysis

[22] For the small-wind market, annual incremental capacity data were unavailable for the non-sampled states; therefore, baselines used the cumulative capacity installed by year-end 2011.

**Accounting for 2012 Utility-Scale Capacity Additions**

Subsequent to the preparation of this evaluation's draft report, AWEA released data for utility-scale capacity installations that occurred in 2012. As discussed in Section 3.2.4, respondents acknowledged that the indirect nature of many WPA activities' influence means that several months or years may pass before that influence results in any new capacity additions. In addition, WPA outputs and outcomes may continue to influence capacity installed after federal funding or organized activities have ceased in a particular state. In order to provide a sense for the additional 2012 wind capacity that may have been influenced by WPA under the above methodology, the capacity-equivalent estimates of WPA influence were recalculated using the new 2012 installed capacity data. The resulting estimate of total capacity-based influence of WPA activities in targeted states through 2012 is 5,139 MW out of a total baseline installed capacity of 30.4 GW. This equates to nearly 23% of the wind capacity installed in WPA-targeted states and 8.6% of the almost 60 GW installed nationwide. Notably, several such states had significant (greater than 200 MW) capacity additions in 2012, including Kansas (1,437 MW), Michigan (611 MW), Montana (260 MW), and Pennsylvania (550 MW). Appendix B includes a revised version of Table 4-5 that summarizes the 2012 capacity-based estimates of WPA influence on all 36 of the states targeted by the initiative for each wind market and set of WPA activities.

These capacity-based estimates of WPA's influence were compared to the total utility-scale and small-wind capacity additions across all WPA-targeted states to estimate the equivalent share of wind capacity additions influenced by the initiative. As shown in Table 4-6, the capacity-based estimates of WPA state-based activities' influence equates to between 9.2% and 11.3% of the utility-scale capacity added in targeted states. The expected value (average) of that influence is just over 10% of capacity additions. The share of capacity additions is higher for the small-wind market, with WPA state-based activities' capacity-equivalent influence equaling approximately 17% of the small-wind capacity added in target states. When aggregating across both wind markets and including the other WPA activities, the capacity-based estimate of WPA's overall influence equates to 14.9% of all wind capacity additions in targeted states.

**Table 4-6. Capacity-Based Estimates of WPA Influence as a Percent of Overall Wind Capacity Additions in All WPA-targeted States**

| Market / Activity Category | Estimate's Share of Overall Capacity Installed | | | Capacity Added (MW) |
|---|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound | |
| ***Utility-Scale Market*** | ***13.2%*** | ***14.9%*** | ***16.6%*** | 22,546 |
| State-Based Activities | 9.2% | 10.2% | 11.3% | |
| Other WPA Activities | 4.0% | 4.6% | 5.4% | |
| ***Small-Wind Market*** | ***21.6%*** | ***23.3%*** | ***25.1%*** | 105.61 |
| State-Based Activities | 16.1% | 17.2% | 18.4% | |
| Other WPA Activities | 5.5% | 6.1% | 6.7% | |
| **Total: All Markets and WPA Activities** | **13.2%** | **14.9%** | **16.7%** | |

Source: Navigant analysis

#### 4.1.2.3 Estimating State Market Progress without WPA Intervention

To help qualify WPA's influence on capacity additions in targeted states, interviewees were asked a two-part question about what they thought might have changed had the subject state not been targeted by WPA (i.e., not had a wind working group). The first part asked respondents what would have changed in terms of the *amount* of capacity installed in the state, while the second asked about changes in the *timing* of capacity additions. Respondents were provided a pre-coded scale for each part of the question. These responses are summarized in Table 4-7 and Table 4-8.

**Table 4-7. Frequency of Responses: Anticipated Effect of WPA's Absence on Amount of Wind Capacity Installed by State**

| State | Change in Amount of Wind Capacity Installed by 2010 | | | | | |
|---|---|---|---|---|---|---|
| | n | Same Amount | 1-25% Decrease | 26-50% Decrease | 51-75% Decrease | Little to No Wind |
| AK | 2 | | 1 | 1 | | |
| CO | 4 | 1 | 2 | 1 | | |
| ID | 5 | | 2 | 2 | 1 | |
| IL | 5 | 1 | 3 | 1 | | |
| IN | 2 | | | 2 | | |
| MD | 4 | 2 | 1 | 1 | | |
| ND | 4 | 1 | 2 | | 1 | |
| NE | 4 | | 2 | 1 | | 1 |
| NV | 2 | 2 | | | | |
| OH | 3 | | 1 | 2 | | |
| OK | 4 | 1 | 2 | 1 | | |
| OR | 5 | 4 | 1 | | | |
| WA | 2 | 1 | | 1 | | |
| WY | 4 | 2 | 2 | | | |
| **Total** | **50** | **15 (30%)** | **19 (38%)** | **13 (26%)** | **2 (4%)** | **1 (2%)** |

Source: Navigant analysis

**Table 4-8. Frequency of Responses: Anticipated Effect of WPA's Absence on Timing of Wind Capacity Installed by State**

| State | Change in the Timing of Wind Capacity Additions | | | | |
|---|---|---|---|---|---|
| | n | No Delay | Up to 2-year Delay | Up to 5-year Delay | > than 5-Year Delay |
| AK | 4 | | 1 | 1 | 2 |
| CO | 4 | 1 | 1 | 2 | |
| ID | 5 | 1 | 1 | 3 | |
| IL | 5 | 2 | 2 | 1 | |
| IN | 2 | | 1 | 1 | |
| MD | 3 | 1 | 2 | | |
| ND | 4 | | 4 | | |
| NE | 3 | | | 3 | |
| NV | 1 | 1 | | | |
| OH | 3 | | 2 | 1 | |
| OK | 3 | | 1 | 2 | |
| OR | 5 | 5 | | | |
| WA | 2 | 2 | | | |
| WY | 4 | 2 | 2 | | |
| **Total** | **48** | **15 (31.3%)** | **17 (35.4%)** | **14 (29.2%)** | **2 (4.2%)** |

Source: Navigant analysis

As can be seen in the two tables, there was a lack of consistency among respondents within each state, and not every interviewee responded to the question (the total sample size for all targeted states was 69). This inconsistency, combined with the low number of respondents representing each state, makes it

difficult to draw defensible conclusions on an individual state basis. Across all of the sampled states, however, the following trends emerged:

- Seventy percent of respondents felt that there would be some decrease in the *amount* of wind capacity installed in the subject state by 2010 without the initiative, with most citing a 1-25% decrease.
- Those states where respondents perceived WPA to have had a lesser share of influence on capacity additions (i.e., Oregon, Maryland, Nevada, and Wyoming) were also less likely to perceive that the initiative's absence would have caused substantial changes in installed capacity.
- A similar share of respondents (69%) felt that there would be a significant delay in the *timing* of wind capacity added in the subject state.
- Notably, those states where at least one respondent expected a delay of up to five years include three of those for which respondents perceived that WPA's state-based activities had an above-average share of influence on capacity additions (i.e., Ohio, Oklahoma, and Nebraska).

In a sense, both of these findings could lead to a similar conclusion: that in most cases, the WPA and the state working groups facilitated and expedited the installation of wind capacity in targeted states.

The "without WPA" scenario must also be placed in the context of the other market factors that have contributed to capacity additions over time. For many states, WPA and the WWG may have provided a "springboard" effect at just the right time, allowing the state's wind market to get up and running at a time when it could benefit from high natural gas prices and stable demand growth during most of the evaluated period. One could argue that had this springboard effect happened later (or had the state's market failed to get off the ground), the steep decrease in natural gas prices and flattened demand growth may have contributed to an overall lower installed capacity in those states.

#### 4.1.2.4 Estimates of WPA Influence in the Context of WPA's Wind Capacity Objectives

As discussed in Section 1.1.2, WPA's goal of increasing wind energy deployment in the U.S. included two capacity-related objectives: achieving 10 GW of total installed capacity by 2010, and 30 states (originally 24) with 20 MW of installed capacity by 2010. Given the indirect nature of the initiative's influence on capacity additions (e.g., via its influence on stakeholder awareness or supportive state and local policies), it is difficult to compare the capacity-based estimates of WPA's influence directly to these objectives. The MW estimate of WPA influence cannot be linked to specific wind turbines or projects; it does not represent 3,375 MW of wind capacity that WPA directly incentivized. This capacity-based estimate equates to almost 15% of the 22.6 GW of wind capacity added in targeted states during the time they were exposed to wind working group activities (see Table 4-6). Similarly, this estimate of WPA's influence equates to nearly 34% of the 10 GW the initiative sought to have installed in the U.S. by 2010. However, one cannot simply consider this to be WPA's "share of the credit" for this objective being reached.

A more helpful means for contextualizing the initiative's influence may lie in respondents' estimates of what would have occurred in the initiative's absence. As discussed in the preceding section, 70% of respondents felt that the capacity installed in a particular state by the end of 2010 would have been lower without WPA's intervention. Similarly, 69% of respondents felt that capacity additions would have been delayed in the initiative's absence. In the context of the second objective (that 30 states achieve 20 MW of installed capacity by 2010), WPA's influence on increasing the amount and timing of capacity installed in the states it targeted can more clearly be considered successful.

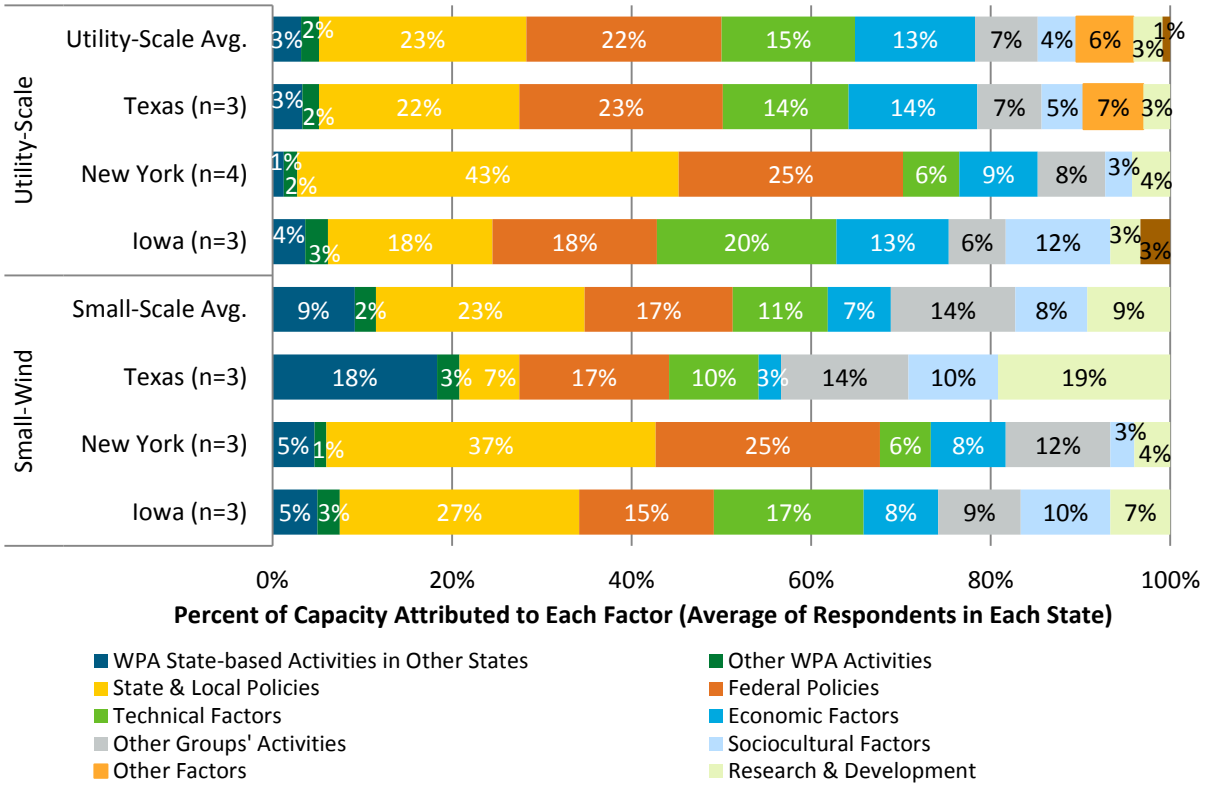
## 4.2 WPA's Influence on Wind Capacity Additions in Non-Targeted States

In addition to the states specifically targeted by the initiative for state-based activities and wind working groups, this evaluation also included interviews with wind market stakeholders in three states (Iowa, New York, and Texas) that WPA did not target, but which had significant wind capacity additions. The goal was to estimate the degree of influence that WPA's activities in neighboring states and at the national level may have had on states that did not receive targeted WPA funding nor have a wind working group of their own. This section provides a high-level summary of WPA's estimated influence on wind capacity additions in these non-targeted states.

### 4.2.1 Market Factors' Perceived Share of Influence on Capacity Additions

These respondents were asked the same questions as those in targeted states about various factors' perceived shares of influence on wind capacity additions. The focus on WPA activities, however, shifted slightly to account for the influence of wind working group activities in neighboring states as well as other national-level WPA activities (e.g., the public utility partnerships). Figure 4-5 illustrates the average share of influence allocated to each factor category by respondents in each state for both the utility-scale and small-wind markets.

**Figure 4-5. Factors' Perceived Share of Influence on Wind Capacity Additions in Non-Targeted States**




Note: The averages are weighted by the amount of utility-scale capacity added in each state between the beginning of 2000 and the end of 2011. This graphic does not account for the variation in estimates among respondents within each state. The variation by factor is discussed in the individual state case studies in Appendix D. The number of individuals responding in each state for each market is indicated on the y-axis.
Source: Navigant analysis

The averaged responses within each of the three non-targeted states exhibited similar trends as in states targeted by WPA. For the *utility-scale wind market*, a combination of federal and state and local policies received between 36% and 68% of the estimated share of influence in each state. All three states have long-standing renewable portfolio standards: Iowa (1983), New York (2004), and Texas (1999). Adding technical factors (e.g., wind resource and access to transmission) and economic factors (Texas and New York were both exposed to rising natural gas prices) brings the total share of influence allocated in each state to between 69% and 83%, leaving relatively little influence for the remaining factors (e.g., other group's activities, sociocultural factors). Notably, respondents in Iowa discussed its citizens' historically high levels of awareness and acceptance of wind power, and allocated an average 12% share of influence to sociocultural factors. Despite the stated importance of these other factors, at least two respondents in each state acknowledged that WPA and the wind working groups had some degree of influence on the wind market in their respective states. On average, WPA state-based activities and other WPA activities received only 3% and 2% of the perceived share of influence on utility-scale wind additions, respectively.

Average responses varied more for the *small-wind market*, with Iowa and New York roughly aligned, but respondents in Texas provided significantly different allocations of market influence. In the first two states, estimated allocations of influence were similar to those for targeted states, with state and local policies perceived as playing a key role, followed closely by federal policies like the ITC cash grant. WPA state-based activities received 5% of the average share of influence in both of these states. In particular, two respondents in New York mentioned the influence of wind working group activities in neighboring Massachusetts as having some degree of influence on New York's approach to small- and community-scale wind.

In Texas, respondents mentioned that very few state or local policies existed to specifically support the small-wind market; one respondent discussed the difficulty stakeholders had experienced in trying to enforce net metering requirements on utilities. More notable, however, is the perceived role of research and development and the WPA state-based activities; both received high allocations of perceived influence from two of the state's three respondents. For the R&D activities, one respondent described a long-running small-wind pilot and demonstration project program administered by the State Energy Conservation Office (SECO) as playing a big role in educating the public about small-scale wind power. In regards to WPA activities, the same respondent claimed that the state had implemented its own (somewhat unsuccessful) wind for schools program patterned after WPA's programs in other states. The other respondent discussed WPA's general role in educating stakeholders, including the public, about small-scale wind. As with utility-scale wind, respondents allocated other WPA activities an average share of only 2% of the influence on small-wind capacity additions. (See Section 4.4 for more on replication of wind working group activities)

### 4.2.2 WPA's Estimated Influence on Wind Capacity Additions in Sampled Non-Target States

As with the target-state interviewees, each respondent in non-targeted states was asked to approximate a 90% confidence interval around his or her initial estimate (i.e., expected value) of WPA's share of influence on capacity additions for both state-based and other national-level activities. These percentage-based estimates and ranges were applied to the baseline capacity that has been added in each state, starting in the average year that surrounding states' wind working groups had been founded through the end of 2011.[23] Averaging the expected values and uncertainty ranges within each state (assuming a triangular distribution) produced a state-level, capacity-based estimate and range of the initiative's influence on utility-scale and small-wind additions. Table 4-9 lists these state-level estimates of the

[23] For Texas, Oklahoma, and New Mexico, wind working groups were founded in 2001. For Iowa, neighboring states formed wind working groups in 2003 (SD), 2006 (IL), and 2007 (NE, MO, and WI). For New York, groups were formed in 2004 (PA), 2005 (MA), 2006 (NJ), and 2007 (CT).

capacity-equivalent share of influence for WPA state-based activities. The summary table for Other WPA Activities appears in Appendix B.

**Table 4-9. State-Level Capacity-Equivalent Estimates and 90% Confidence Intervals for WPA State-Based Activities' Influence in Sampled Non-Target States**

| State | Utility-Scale Capacity Estimate Range (MW) | | | Small-Wind Capacity Estimate Range (MW) | | |
|---|---|---|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound | Lower Bound | Expected Value | Upper Bound |
| Iowa | 125 | 187 | 259 | 1.3 | 1.7 | 2.3 |
| New York | 32 | 59 | 96 | 0.3 | 0.4 | 0.5 |
| Texas | 300 | 417 | 549 | 1.6 | 1.8 | 1.9 |
| **Total** | **458** | **663** | **903** | **3.1** | **3.8** | **4.6** |

Source: Navigant analysis

As shown in the above table, the average capacity-based estimates for WPA influence (from all activities) in the three non-targeted states fall between 458 and 903 MW. Similar calculations result in a capacity based estimate of WPA influence between 3.1 and 4.6 MW of small-wind capacity between the three states. As shown in Table 4-10, these capacity-based estimates of WPA state-based activities' influence equate to between 3.5% and 5.4% of the utility-scale capacity added in these three non-targeted states, with an expected value of around 4.4% of capacity. This share of influence is higher for small-wind capacity additions, with an expected value of about 9.2% of capacity additions. When aggregating across both wind markets and including the other WPA activities, the overall capacity-based estimate of WPA's influence equates to 7.7% of the wind capacity added in these three non-target states during the time when they were potentially exposed to WPA activities in neighboring states.

**Table 4-10. Capacity-Based Estimates of WPA Influence as a Percent of Wind Capacity Additions in Three Non-Targeted States**

| Market / Activity Category | Estimate's Share of Overall Capacity Installed | | | Capacity Added (MW) |
|---|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound | |
| ***Utility-Scale Market*** | ***6.2%*** | ***7.6%*** | ***9.3%*** | 15,253 |
| State-Based Activities | 3.5% | 4.4% | 5.4% | |
| Other WPA Activities | 2.7% | 3.3% | 4.0% | |
| ***Small-Wind Market*** | ***10.9%*** | ***12.9%*** | ***15.1%*** | 41.5 |
| State-Based Activities | 7.9% | 9.2% | 10.6% | |
| Other WPA Activities | 3.0% | 3.7% | 4.5% | |
| **Total: All Markets and WPA Activities** | **6.2%** | **7.7%** | **9.4%** | |

Source: Navigant analysis

While the evaluation included these direct estimates of influence for the three non-target states sampled, the above estimates were not extrapolated to the other two non-targeted states with significant capacity additions (California and Minnesota) due to the additional sampling error that would have to be applied given the small sample and population sizes. For comparison, however, California added approximately 2,300 MW of utility-scale wind capacity from the beginning of 2000 to the end of 2011. Minnesota added about 2,450 MW.

Additional details about WPA's perceived influence in these three non-targeted states appear in their respective case study write-ups in Appendix D.

## 4.3 Wind Working Group's Ability to Leverage WPA Funding

One of this evaluation's other impact-related research objectives was to examine the degree to which state wind working groups were able to leverage other organizations' funds to support their DOE-provided budgets. Prior DOE literature outlines specific criteria that define what constitutes leveraged funds and resources (Wolf 2008). In this evaluation, an organizations' resources or funds can be considered as leveraged by a wind working group when those funds have been 1) provided by another party for a primary or related activity in WPA's logic model, 2) provided concurrent with or following a wind working group's receipt of federal funding, and 3) been of a character and amount sufficient to impact the associated activities' own impact or effectiveness. This section presents the findings of that research and analysis.

### 4.3.1 Availability of WPA Budget Data

Data on annual WPA budgets were limited. The research team asked specific, targeted questions about state-level expenditures to the WPA management team (i.e., current and former NREL and DOE staff) and to all state interview respondents. However, aside from high-level, annual budgets provided by NREL (see Figure 1-2), WPA staff and individual states' wind working group contacts were able to provide little to no detailed information on annual state working group budgets or other WPA funding. The budget and spending level data received was either inconsistent or incomplete, indicating only that initiative funding levels varied by state and over time. Several factors contributed to this lack of accessible data, including the following:

- The long time period covered by this evaluation (i.e., requiring records for each of the 11 years covered);
- Differences in record-keeping conventions from one year to the next
- Changes in management of the WPA initiative, both between organizations (DOE versus NREL) and individuals;
- DOE's reorganization and elimination of its regional offices, which helped administer the initiative;
- Individuals having left DOE or NREL and the state-level agencies or organizations responsible for coordinating the state wind working groups, thereby no longer having access to past WPA files; and
- A lack of consistent record-keeping practices (according to some interviewees) that was sufficient to provide the types of data requested by the evaluation team.

As a result, much of the team's analysis of the extent and role of leveraged funds relies on interview respondents' anecdotal evidence and recollections of third-party resources and their subsequent ranking of the importance and contribution of those resources to the state working group's activities.

### 4.3.2 WPA Approach to Initiative Funding

WPA staff managers determined specific state funding levels based on their evaluation of each state's relative need and the perceived opportunity for WPA's state-based approach to improve the market for wind development in that state. Staff used criteria such as the state's wind potential, previously installed wind power capacity, and the state's policy and regulatory environment to inform these decisions. In general, WPA staff sought to focus the initiative's resources on "stuck" states—those that had a good wind resource or favorable policies, but had not yet achieved significant capacity additions or where other barriers remained to a well-developed market for wind energy projects. Thirteen of these designated "priority" states often received twice the level of funding as non-priority states. Notably,

interview respondents in some states indicated that the initiative required that the receiving organization provide matching funds as a condition for accepting DOE grant funds. In these cases, the program would have essentially required some level of outside funding at the state level. In other cases, respondents reported that they received WPA funds without a match from the state.

### 4.3.3 Sources and Importance of Leveraged Funding

The interviewees who provided responses to budgetary questions generally indicated that the federal funds served as important seed money, but were often insufficient on their own for running a productive group or organization. Wind working group coordinators in six of the 14 states indicated that other funding had been critical to the group's effectiveness or helped provide it with additional credibility. In every instance where a sampled state still had active wind working groups or state-based activities, supplementary funding was considered to have become quite necessary. Respondents most often cited a state's energy office as a key supporter of the working group and other state-level activities through financial as well as staffing and logistical support.

Respondents in various states reported that they secured additional funding for WPA state-based activities from a wide range of sources. Table 4-11 lists the categories of funding sources mentioned by at least one respondent in each sampled state.

**Table 4-11. Sources of Additional Wind Working Group Funding or Support in Sampled States**

| State | Other Federal Agency | State Energy Office | Other State Agency | University | Private Foundation | Corporate | Utility | Event Fees | Local Support |
|---|---|---|---|---|---|---|---|---|---|
| AK | ✓ | ✓ | ✓ | | | | | | ✓ |
| CO | | ✓ | | ✓ | ✓ | | | | ✓ |
| ID | | ✓ | | | | | | | |
| IL | ✓ | ✓ | | | | ✓ | | ✓ | |
| IN | | ✓ | | | | | | | |
| MD | | | | | | | | | |
| ND | ✓ | ✓ | ✓ | ✓ | | | | | |
| NE | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | |
| NV | | | ✓ | | | | ✓ | | |
| OH | | ✓ | | | | ✓ | | | |
| OK | | ✓ | | | | | | | |
| OR | | ✓ | | | | | | | |
| WA | | | | | | | | | |
| WY | | ✓ | | | | | | | |

Note: Not all respondents were familiar with or able to provide comments on working group budgets or funding sources. This table reflects responses received and should be considered neither definitive nor comprehensive.
Source: Navigant analysis

Respondents in at least three states also explicitly reported receiving significant levels of support via in-kind contributions of time and materials from a variety of sources. However, as participation in the wind working group was voluntary, much of the time spent by attendees and committee members on their own behalf or that of their employers could itself be considered a form of in-kind support. Specific, illustrative examples of the above categories of third-party funding sources include, but are not limited to, those listed in Table 4-12.

**Table 4-12. Illustrative Examples of Leveraged Funding Sources**

| Funding Category | Examples |
|---|---|
| Other Federal Funding | - The Denali Commission in Alaska has distributed federal funds for a variety of development projects, including support for renewable energy projects.<br>- Nebraska received USDA grant funding for the Wind for Schools Program. |
| State Energy Office | Almost every state reported some support or involvement of their state energy office. |
| Other State Funding | - Twelve of the 24 turbines installed as part of the Nebraska Wind for Schools project were funded through grants from the Nebraska Department of Environmental Quality's Supplemental Environmental Program.<br>- Colorado received additional state funding for its anemometer loan program. |
| Universities | Universities provided various types of support in several states through such activities as administering anemometer loan programs and providing technical support (Colorado), or coordinating and hosting wind working groups (North Dakota, Illinois, and Idaho). |
| Private Foundation | One Colorado respondent cited private foundation support as very important to the state's wind working group, at times amounting to 25% of the group's budget. |
| Corporate Donations | - Several utility-scale wind developers provided funds to wind working groups to help them conduct education and outreach (Ohio, North Dakota, and Nebraska).<br>- An Illinois wind working group respondent reported receiving sponsorship funds from private companies, including wind developers and turbine manufacturers. |
| Utility Support | The Nevada wind working group is currently coordinated and funded entirely by NV Energy (which has no currently allowable means for receiving additional contributions). |
| Local Fundraising | One Colorado respondent reported that the state's Wind for Schools Program received an estimated $5,000 per project through private donations received by the schools. |
| Event Fees | A respondent from Illinois specifically mentioned the wind working group collecting registration fees to help offset the cost for conferences and events. |

Source: Navigant analysis

When asked to characterize the importance of these outside funding sources (e.g., very, somewhat, or not very important), 14 of the 21 respondents deemed them to be "very important" in terms of affecting the wind working group's ability to influence wind capacity additions in their respective states. However, the estimated share of working group funds represented by such third-party resources varied from 20% to 95% of the working groups' total budgets. In some cases, outside funding sources were cited as representing an increasingly greater share of the working group's budget over time as the group attracted more participants and sources of support.

Respondents were also asked to characterize how much less of an impact their state's wind working group would have had on capacity additions if it had been unable to secure additional funds or in-kind support beyond its federal funding. Again, responses varied widely, with estimates ranging from "no change in impact" to a 75% decrease in impact.

### 4.3.4 Coordinating Organizations' Ability to Secure Additional Funding

As shown in Table 4-13, the type of organization that received funds for and was tasked with coordinating each state's wind working group and related activities varied significantly.

**Table 4-13. Organizations Hosting WWGs in Sampled States**

| State | NGO | State Energy Office | Utility | University | Other |
|---|---|---|---|---|---|
| Alaska | ✓ | | | | |
| Colorado | ✓ (2003) | ✓ (2009) | | ✓ (ALP) | |
| Idaho | | | | ✓ | |
| Illinois | | | | ✓ | |
| Indiana | | ✓ | | | |
| Maryland | | ✓ | | | |
| North Dakota | | | | ✓ | |
| Nebraska | ✓ | | | | |
| Nevada | | | ✓ | | |
| Ohio | | ✓ | | | |
| Oklahoma | | ✓ | | | |
| Oregon | | ✓ | | | |
| Washington | | | | ✓ | |
| Wyoming | | | | | ✓ |

Note: ALP = Anemometer Loan Program. Ohio's group was coordinated by the Ohio Department of Development. Wyoming's group was coordinated under contract to a private consultant. This table does not list working group affiliations for WPA-targeted states that were not sampled.
Source: Navigant analysis

Based on the interview responses, those working groups associated with universities (e.g., North Dakota and Illinois) and non-governmental organizations (NGOs) (e.g., Alaska and Nebraska) were more likely to cite higher levels of third-party funding than those based within a state agency. Notably, both types of organizations (universities and NGOs) tend to require some level of fundraising from external sources (e.g., grants, corporate partnerships, and donations), and their staff may be more accustomed to seeking out such funding. In addition, respondents in states whose working groups had university affiliations acknowledged long-standing commitments and involvement from specific faculty or staff members, suggesting that those working groups may have benefitted from those individuals' stable or consistent involvement. On the other hand, respondents from some (but not all) states where the working group was affiliated with a state energy office acknowledged high rates of turnover (every 1-2 years in some cases) among the individual responsible for coordinating working group activities. This inconsistency was cited as contributing to lost momentum or disorganization for those working groups.

### 4.3.5 Timing of Leveraged Funds

Evaluators asked respondents in each state whether WPA funding and the wind working group initiated new efforts to support the state's wind market or if they helped to advance efforts that were already underway or being led by other organizations. Respondents in 10 of the 14 sampled states perceived the wind working group as either the initiator or (in a few states) a co-developer of new activities to support the state's wind market. For example, one Nevada respondent stated that the wind working group "absolutely helped to initiate new efforts on intermittency and transmission." In both Idaho and Illinois, respondents indicated that their respective working groups had been clear leaders in the state, particularly in creating awareness of wind power's potential positive economic impacts.

Examples of states where respondents cited the working group as co-developing new efforts include Indiana, where one respondent claimed that the working group had collaborated with groups like AWEA to advance the state's wind market. In Illinois, one respondent discussed how the wind working group

initiated efforts to provide information for and raise awareness among landowners while other groups initiated efforts to advocate for the state's RPS. In general, interview responses indicate that the working groups either initiated new efforts or worked collaboratively with other organizations to co-develop or push forward existing efforts, depending on the particular situation in each state.

## 4.4 Replication of WWG Activities

In addition to the initiative's influence on wind capacity additions, the evaluation also sought to characterize the extent of secondary impacts that may have arisen from other organizations' replication of WPA state-based activities. In interviews with WPA staff and state wind-market stakeholders, respondents were asked to recall any instances where WPA state-based activities or tactics had been replicated by other organizations, either within the state or in surrounding states. Similarly, they were asked if other organizations had carried forward any wind working group activities as DOE funding to specific states decreased or was discontinued.

The objective of this inquiry was not to quantify the capacity-based impact of any replication (as one would first have to determine the direct impacts of those replicating efforts). Rather, its purpose was to identify which, if any, of the initiative's activities or tactics were perceived as effective enough to be implemented by other programs or organizations. As with the budgetary and funding questions, respondents in most cases were unable to provide evidence or extensive details about such replication; however, respondents did offer some specific examples. This section summarizes a few general themes that emerged.

### 4.4.1 Internal Replication—Inter-organizational and Interstate Sharing of Knowledge and Best Practices

The principal method of replication of WPA activities was through the exchange of knowledge, lessons learned, and best practices in overcoming specific barriers to wind market development in a given context. The multiple forums provided by WPA state-based activities brought together disparate people and organizations with the shared theme of discussing the various aspects of wind energy as it pertained to their state. Information including the technical and business aspects of wind energy was transferred from professionals and academics within the industry, as well as between community members and organizations. This knowledge and information was in turn made accessible to their respective organizations and personal and professional networks.

Interview respondents in most states discussed a high degree of overlapping memberships and involvement of working group members in other organizations that focused on and contributed to the wind market's collective progress. For example, members of the Idaho wind working group reported becoming involved in the Advisory Council for the Idaho Power Integrated Resource Plan and advocating for inclusion of wind energy in that process. Similarly, a respondent from Alaska's wind working group reported that the Utility Wind Integration Group (UWIG, previously the Utility Wind Interest Group) has borrowed broadly from the tactics of the working group there.

A respondent from North Dakota, one of the earliest wind working group states, reported that a number of other states adopted their basic methodology of generating grassroots level interest through frequent informational meetings. Successful WPA state-based activity coordinators from Colorado, Nebraska, North Dakota, and Illinois reported that—either through their own initiative or through requests from WPA or contacts in other states—they traveled to other states to share their experiences and best practices to help replicate the wind working group mode and activities elsewhere. A respondent from Illinois reported that research papers published by Illinois State University and publicized by the wind working group were used to support the case for improved wind legislation in Ohio. Similarly, model zoning ordinances promoted by wind working groups and adopted by their states lent credibility to those ordinances and enabled them to be shared and adopted (or at least referenced) by additional states and

municipalities considering those issues. While this cross-state replication occurred as a natural offshoot of the initiative's state-specific focus and design, the sharing of best practices and the ability to "see it being done elsewhere" can have significant influence on garnering support for wind power via state policy and public sentiment.

This type of internal (i.e., within WPA-sponsored groups) replication is consistent with the original design of the WPA initiative, and it was the most common type of response to questions about replication of WPA activities. One wind working group coordinator explained having had numerous similar conversations over the years with people who wanted to start (or restart) working groups in other states, including Indiana, Ohio, Michigan, Wisconsin, and Missouri. Another respondent from the Alaska wind working group reported that his own exposure to the activities of other states' wind working groups—and his subsequent replication of their approaches—was critical to the success of his group. In several instances, attendance records from states' annual wind conferences indicate that these events frequently attracted attendees from other states as well. One WPA staff interviewee also reported that colleagues in other countries have expressed interest in replicating the WPA model abroad.

### 4.4.2 Replication of the Working Group Model for other Topics and Issues

Some individuals involved in wind working groups also reported applying the working group approach to other markets, issues, or technologies. A former working group coordinator in Indiana reported efforts to initiate additional working groups focused on each of biomass and solar power using the same stakeholder outreach model; however, the groups failed to sustain their momentum. Another respondent in Idaho suggested that the approach and tactics of the wind working group there had influenced the Snake River Alliance to broaden its mandate from an anti-nuclear organization to one that was more broadly pro-renewables organization.[24] A former wind working group coordinator from Colorado suggested that the Colorado Harvesting Energy Network (a project of Colorado Working Landscapes) was modeled after the wind working group approach, but included support for all renewable energy technologies.[25]

### 4.4.3 Post-Funding Replication of Activities

Wind Powering America staff and state respondents were asked if other organizations had funded or independently carried forward any of the wind working groups' former activities after their federal funding ended. Respondents in most states cited other organizations that were carrying on the work of the WPA and the wind working groups to varying degrees; however, few respondents provided examples of specific activities. Rather, it seemed that members of the various organizations that had also participated in wind working groups have carried their knowledge, momentum, and relationships formed through the working group forward to continue influencing the market, whether independently or collaboratively. In addition to state energy offices, the list below includes a sampling of some of the supporting organizations mentioned as continuing various aspects of the work initiated by the wind working groups:

- **Alaska:** Seed funding, expertise, and experience used to initiate working groups, anemometer loan programs, wind for schools, and wind application centers led to the development of the Renewable Energy Alaska Project, which grew beyond the original scope of WPA and the wind working group and replicated these approaches for other renewable energy initiatives. The Wind Diesel conference initiated in Alaska as a part of WPA state-based activities has grown into a premier international event on the topic, and the Alaska Center for Energy and Power has taken over management of the event.

[24] http://snakeriveralliance.org/.
[25] http://www.workinglandscapes.com.

- **Colorado:** Organizations mentioned as contributing to the market's continued progress include Interwest Energy Alliance (IEA), Environment Colorado, Western Resource Advocates (WRA), Colorado Independent Energy Association , Colorado Cleantech Industries Association, Center for Renewable Energy and Economic Development, Office of Economic Development and International Trade, Colorado Energy Office, Metro Denver Chamber of Commerce, and Colorado Harvesting Energy Network (CHEN). At least three of these organizations (IEA, WRA, and CHEN) were active members of the state's wind working group.
- **Illinois:** The work of the Illinois wind working group dovetailed and essentially merged with The Illinois Wind Energy Coalition, Wind on the Wires, AWEA, Windustry, and the Great Lakes Wind Collaborative.
- **North Dakota:** The work of the former North Dakota wind working group is largely carried on by the North Dakota Alliance for Renewable Energy. One respondent indicated that "at the point that wind got up and running, the [working group's] work was done. Barriers were removed, legislation was put in place; the only thing left to discuss was permitting issues like setbacks and other things." This respondent also suggested that that the wind working group was instrumental in establishing the Renewable Energy Council, a state grant making organization that provides funds for renewable energy projects.[26]
- **Oregon:** In Oregon, some existing organizations—the Renewable Northwest Project and the Northwest SEED (Sustainable Energy for Economic Development) as well as the Oregon Small Wind Energy Association (OSWEA)—were reported to be carrying on various activities of the state's former wind working group. One respondent indicated that OSWEA was actually created in response to a sentiment that the wind working group and other groups had not done enough to specifically support small-wind development.
- **Nevada:** NV Energy (an investor-owned utility in Nevada) took over coordination of the WWG efforts after state legislation allowed them to establish their Wind Generations Program. In the words of one respondent, "NV Energy stepped up to take over. It's been basically the utility and the state laws and the RPS that said they should be looking at this area. It's been an evolution that the wind working group ended up with the Wind Generations Program (which is adjunct to the utility). They've provided a coordinator's time and a couple of other people."

In addition, several universities continue to support various WPA activities (including Wind Application Centers), including the following:

- Colorado State University
- University of Alaska Fairbanks
- Northern Arizona University
- Boise State University
- Kansas State University
- Montana State University
- University of Nebraska, Lincoln
- Appalachian State University
- Pennsylvania State University
- South Dakota State University
- James Madison University

In two separate states, respondents noted that WPA stopped funding just as the wind working groups were beginning to make progress in their respective states. Other respondents in various states answered the question about replication by providing unsolicited thoughts on the market's future needs. One indicated that the strong foothold that wind had gained nationally (e.g., policies are in place and projects are happening) meant that the work of the working group was done. Another indicated, at this point in

[26] http://www.nd.gov/ndic/renew-infopage.htm

the national evolution of wind energy, that WPA should shift its focus to exclusive promotion of small-wind development.

### 4.4.4 Replication of Activities in Non-Targeted States

As described in Section 4.2.2, respondents in the three non-targeted states sampled (Iowa, New York, and Texas) offered examples of how WPA activities had positively influenced their states' wind market. While evidence of replication of WPA activities was more limited, a few specific examples were cited and are detailed below.

At least one respondent in all three states expressed that the state was more a leader than a follower in regards to wind power, and that the state's efforts likely influenced wind development in other states. As one Texas respondent suggested, "The influence has gone the other way." At the same time, an Iowa respondent cited the usefulness and credibility of the early information that WPA produced, including general information about wind's legitimacy and specific information to support local siting ordinances.

One respondent (a utility-scale developer) discussing the Iowa market suggested that smaller stakeholder coalitions used the wind working group model of targeted outreach at the municipal and county level to foster the adoption of siting ordinances that would facilitate smoother development of projects across the state. Even though Iowa was one of the leading states in terms of capacity, its stakeholders may have learned and benefitted from the tactics employed by working groups in other states. As this respondent noted:

> "There were some efforts from coalitions of folks reaching out at the local and county level that became resources to put ordinances in place in counties that helped guide the development or ensure the development of wind in the state as regulated in a rational manner and helped projects go forward and not get caught up, and I think WPA had a role in that."

Another respondent in Iowa suggested that the Iowa Wind Energy Association was shifting its focus somewhat to a more regional level rather than concentrating solely on the state's market:

> "One of the interesting things is that our state wind organization is one of the most vibrant in the U.S. One of the things they're trying to do is look more regional in scope. There are some good opportunities there: The Midwest Governors association has been working diligently for a number of years to support the industry's growth. And [Iowa is] looking to reach out to other states to help facilitate the reduction of transportation permitting barriers in all Midwest states."

While the respondent did not offer the connection himself, this transition to more regional issues and collaboration mirrors similar steps that WPA has taken in the past few years as individual states have succeeded in getting their own markets off the ground.

In New York, three different respondents discussed the state as "self-contained" or an "isolated case" in terms of its wind market's development. However, one respondent did describe a lobbying effort around the early part of the decade dubbed "Wind Powering New York" that was focused on helping to pass the state's RPS. Despite the similarity in name, the project was cited as an outcropping of AWEA lobbying efforts and its regional partners' model that eventually led to the founding of another organization, the Alliance for Clean Energy New York, to help carry forward the RPS. Another NY respondent mentioned that the state used WPA's technical information as background for its own wind resource modeling effort, which it conducted in partnership with AWS Truewind. Given the coincidence of wind resource modeling efforts in several states and backed by several organizations, it would be difficult to determine causal links between WPA and such efforts in non-targeted states.

In Texas, one respondent mentioned that the state attempted to replicate the WPA Wind for Schools Program, but with limited success:

> "We tried to implement their model [the Wind for Schools program] here, but [the state] went with smaller wind turbines in the program they put together here. Most of our schools, however, weren't interested in the smaller ones; they wanted 50kW turbines. Unfortunately, the turbines that were out there had some bad reputations. Lots of people were interested in small-scale, but it was expensive and price fluctuations of natural gas and electricity meant it was never really cost effective. In places where there was a need, people were less excited about being the first to do it. So there was a lot of discussion and planning and trying to pull things together, but since schools were required to provide matching funds, they decided there were more important things [from a budget perspective]."

While such anecdotal evidence of WPA activity replication exists, the most oft-cited forms appear to relate to the positive network effects that stem from WPA's approach to its state-based activities. Such positive externalities and impacts arise as the network of individuals and organizations connected to the initiative grows. In a sense, the value of the initiative to each individual participant increases as the initiative expands, providing access to a growing network of knowledge, experts, technical information, best practices, and lessons learned. However, as the initiative reduces funding for state-based activities and includes fewer active individuals, organizations, and states, such network effects will diminish to some degree.

# 5. Process Evaluation Findings

The process evaluation sought to identify elements of WPA's approach and recurring themes that contributed to the initiative's success or could be improved upon for delivery of comparable future endeavors. The findings presented in this section were gathered through a review of WPA's structure, history, and documentation as well as a series of interviews with WPA staff and in-depth interviews with wind working group organizers and participants in 14 states. The process findings serve to enrich the evaluation by providing historical context and qualitative insight to a topic that may not be fully understood through impact analysis alone. This chapter addresses these process-related findings in the following sections:

- Section 5.1 provides a qualitative overview of findings related to the various pathways for state-based activities' influence on wind capacity additions.
- Section 5.2 details respondents' perspectives on the most effective state-based activities.
- Sections 5.3 and 5.4 discuss characteristics of more successful wind working groups and characteristics of challenging state markets.

## 5.1 Market Influence Pathways for WPA State-Based Activities

This section provides additional context for the process evaluation by comparing the major pathways through which wind working groups and WPA's other state-based activities positively influenced the environment for wind capacity additions in targeted states. The initiative's state-specific approach enabled WPA and the wind industry stakeholders in each state to prioritize their efforts and activities based on the particular market barriers and needs in that state.

For example, in a state where landowners or the general public had low awareness of, or high opposition to, wind power (i.e., sociocultural issues), a wind working group might focus on activities that could help build awareness of the economic opportunity that wind power provides in the state. This could include promoting a published wind resource map to prove the quality of the resource and holding landowner meetings to share financial modeling tools and provide access to landowners who had benefited from leasing land to project developers in other states. For small-scale wind power, the group may focus on facilitating demonstration projects through a Wind for Schools Program or conducting collaborative research with universities to increase the visibility and acceptance of small- or community-scale wind turbines.

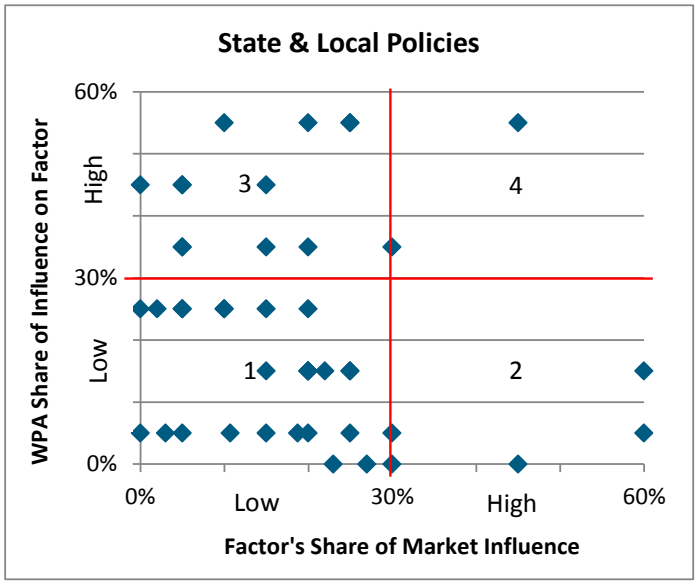
Alternately, if a state's barriers are primarily driven by a lack of supportive regulation or clear policies, the wind working group might focus on building stakeholder networks and sharing knowledge and best practices. This could include hosting meetings with key stakeholders (including policymakers) to foster discussion about the issues preventing wind power development and provide examples of policies and regulations that have been successfully implemented in other states. Even if these meetings do not include the policymakers themselves, the conversations can help working group members reach consensus about the types of policies they might advocate for on behalf of their respective organizations.

### 5.1.1 Mapping WPA Pathways to Achieving Market Influence

During the in-depth interviews, respondents were asked to estimate the share of influence that WPA and their state's wind working group had on each of the other primary market factors that affected capacity additions in the state (see Table 3-5). For each market factor category (see Table 3-4), each respondent's assessment of that factor's share of influence on a state's market was plotted (on the x-axis) against the respondent's estimate of WPA and the wind working group's influence on that factor (on the y-axis). This two-dimensional assessment provides insight into the perceived importance of WPA's various

activities and outputs as they relate to its overall influence on the market in each state (and on capacity additions as a whole). An example of the resulting scatter plot appears in Figure 5-1.

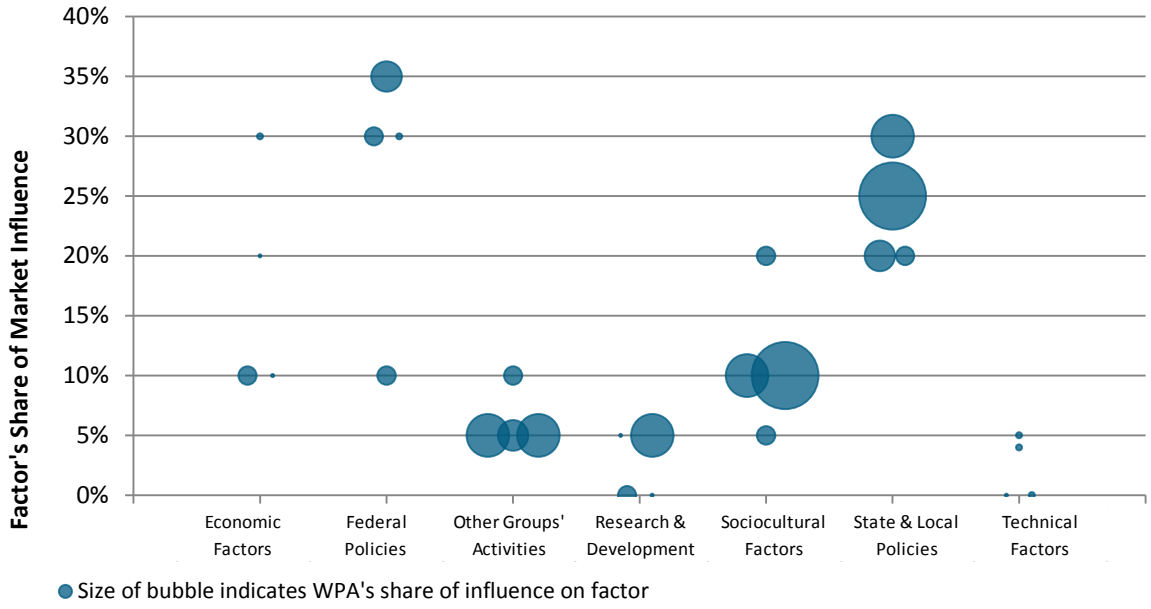
**Figure 5-1. Example Plot of a Factor's Share of Market Influence against WPA's Share of Influence on that Factor (Utility-Scale)**




Source: Navigant analysis

As shown in Figure 5-1, each quadrant represents a combination of a factor's influence on the market (low-to-high) and WPA's share of the overall influence on that factor (low-to-high) as it relates to wind capacity additions. In this case, most respondents fall in quadrant 1, meaning they considered that state and local policy had a low-to-moderate share of influence on the market, and that WPA had a low–to-moderate level of influence on those policies. However, as shown in quadrant 3, several respondents felt that WPA had a relatively higher share of influence on state and local policies that had a low to moderate level of influence on the market. In quadrant 4, two other respondents thought WPA had a higher share of influence on state and local policies that also had a high share of influence on the market. Taken alone, these findings provide only limited insights. However, some important findings emerge when examining responses within each state or comparing aggregated responses across factor categories. Figure 5-2 shows an example of a state-level comparison for Colorado's utility-scale market.

**Figure 5-2. Example State-level Comparison of Respondent Influence Rankings: Colorado Utility-Scale Market**



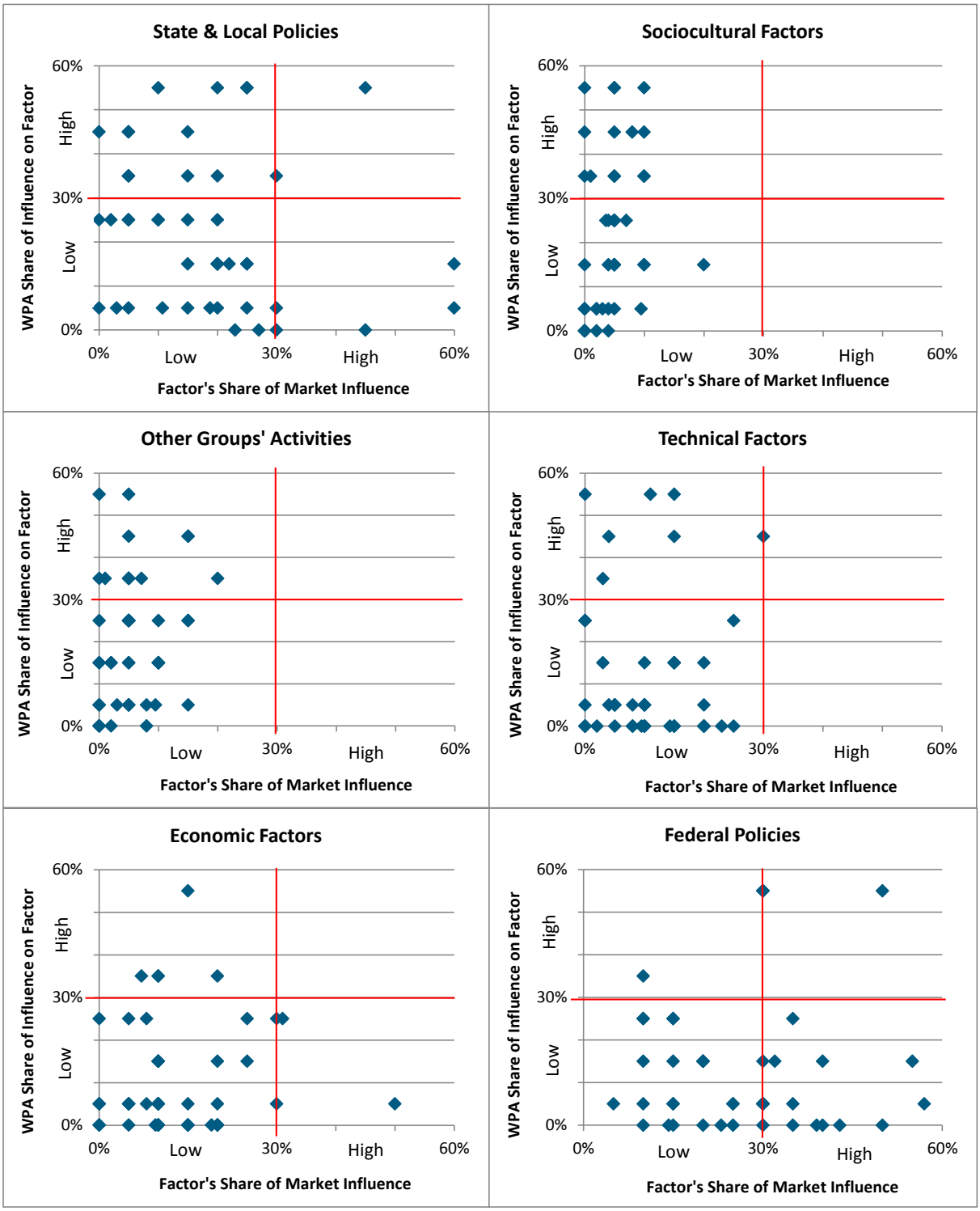

As shown in Figure 5-2, respondents in Colorado generally considered federal policies and state and local policies to have had a higher relative influence on the state's capacity additions (as shown by the position of bubbles along the y-axis in each factor's column). However, respondents also felt that WPA had a relatively larger share of influence on state and local policies, as indicated by the larger size of the bubbles in that column. A similar factor influence chart appears at the beginning of each state case study in Appendix D.

### 5.1.2 Common Pathways to WPA Market Influence

The remainder of this subsection focuses on the high-level trends that emerge when comparing the aggregated responses across all factors. Viewing the plot for each factor side-by-side allows a direct comparison of WPA's perceived influence on various market factors and those factors' subsequent share of influence on wind capacity additions in a particular state. Figure 5-3 shows the aggregate plots for each of six primary market factors for the utility-scale wind market in all 13 sampled states.[27]

[27] The plot of Research & Development was omitted due to space constraints. All but one respondent estimated its share of impact on the market at less than 10% (Low), with most data points also falling below the mid-point on the y-axis.

**Figure 5-3. WPA and WWG Cross Influence on Primary Market Factors (Utility-Scale Market)**




Note: This approach relies on percentage-based estimates provided by respondents in each sampled state. It does not account for differences in the baseline capacity in the specific state against which each factor's percentage-based estimate of its share of market influence would be applied.
Source: Navigant analysis

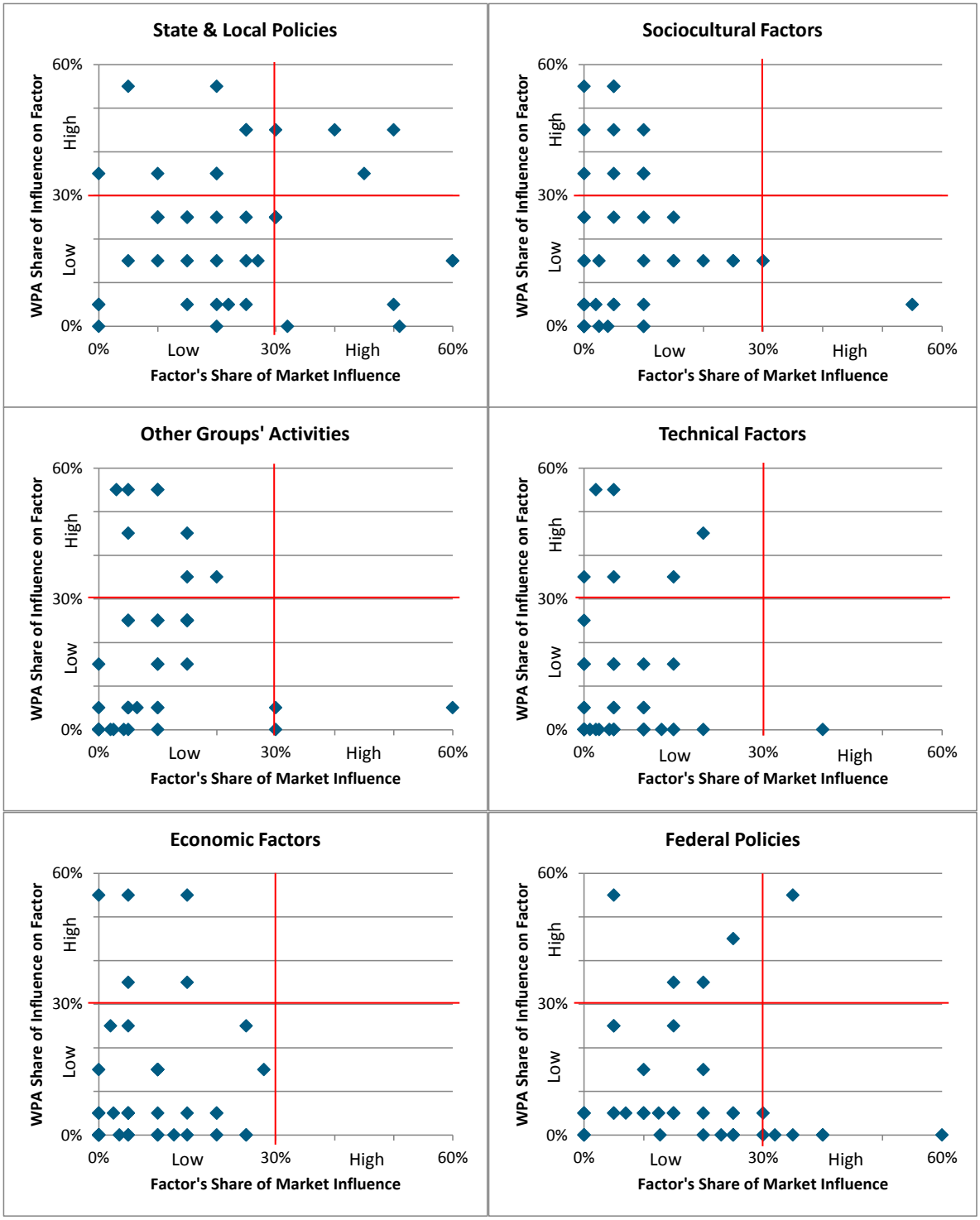
A relatively clear trend emerges from the plot for state and local policies (top-left). Of the six factors plotted in the figure, state and local policy appears to show the broadest distribution of responses in moderate-to-high regions of the four quadrants and has the fewest number of points touching either of the axes (which would indicate zero share of influence). This finding suggests that stakeholders perceive WPA's influence on state and local policies as an important pathway for affecting utility-scale capacity additions.

As shown in the top-right plot, roughly one-third of respondents perceived that WPA and their state's wind working group had a moderate to high level of influence on sociocultural factors related to wind power in their state. However, as shown by those points' positions on the x-axis, most respondents allocated a relatively small share of influence on capacity additions to those sociocultural factors. In fact, any points on the far left side of the plot (touching the y-axis) were respondents who considered sociocultural factors to have had almost no share of the influence on their state's wind capacity additions. The plot for other groups' activities follows a similar trend. Taken on their own, the overall capacity-equivalent influence that might be allocated to WPA via its influence on either one of these individual factors might be considered somewhat moderate. However, adding together these two factors' share of influence on the market (their x-axis values) results in a more significant share of market influence. Given WPA's moderate-to-high level of influence on each of those factors, the collective importance and contribution of those activities becomes clearer.

The bottom-right plot shows the distribution for responses related to federal policies. When compared to the other five plots, this box clearly shows that respondents, on average, allocated the greatest share of influence on utility-scale capacity additions to federal policies. However, only three respondents perceived that WPA and the wind working groups had more than a moderate share of influence on those policies, with several points lying on the x-axis (indicating respondents who perceived that WPA had no influence on the factor).

As shown in Figure 5-4, similar conclusions can be drawn for the small-wind market when comparing respondent plots for that market. Notably, sociocultural factors were perceived to have had a greater share of influence on small-wind capacity additions than utility-scale additions.

**Figure 5-4. WPA and WWG Cross Influence on Primary Market Factors (Small-Wind Market)**

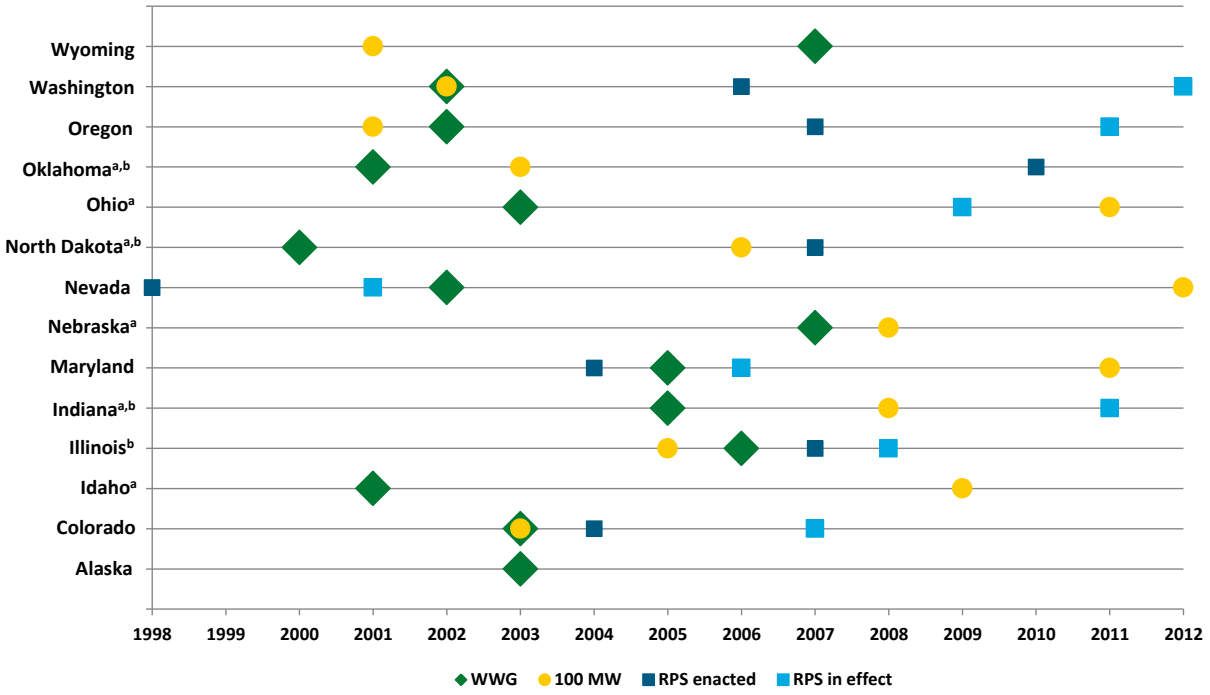



Note: This approach relies on percentage-based estimates provided by respondents in each sampled state. It does not account for differences in the baseline capacity in the specific state against which each factor's percentage-based estimate of its share of market influence would be applied.
Source: Navigant analysis

### 5.1.3 Market Diffusion Stages in Targeted States

The timing of WPA's "entry" into a particular state market (via the formation of a wind working group) is another key consideration in estimating its potential share of influence on subsequent capacity additions, particularly in relation to the adoption of key state and local policies (e.g., an RPS). The state-specific market timelines prepared for each state (see Appendix D) were intended to provide respondents with that context. The timelines reveal the approximate timing of WPA and wind working group activities in each state; the adoption or effective date of key state policies; and the growth in cumulative installed wind capacity for both the utility-scale and small-wind markets. In most of the states targeted by WPA, the establishment of a wind working group preceded either the passage of a state's RPS or significant increases in the rate of capacity additions. Figure 5-5 provides a summary view of the timing of these key events, showing the year that each state formed a wind working group, the year that its RPS was either adopted or effective, and the timing of that state reaching the 100 MW threshold for installed wind capacity.

**Figure 5-5. Timeline of Key Market Events in Sampled Target States**




[a] State working group considered successful due to above-average allocation of share of market influence (%)
[b] State working group considered successful due to above-average allocation of capacity influenced (MW)
Sources: WPA 2012, DSIRE 2012

As shown in Figure 5-5, the formation of the state's wind working group preceded either the establishment of a state's RPS or that state achieving the 100-MW installed capacity threshold in 11 of the 14 states sampled.[28] This includes each of the six states whose working groups were labeled as "successful" in Section 4.1.2 based on WPA's estimated share of influence on that state's utility-scale wind market. In two cases, states had already adopted an RPS (Nevada in 1997 and Maryland in 2004) prior to the formation of the state's wind working group. Notably, however, neither of these states achieved the 100-MW capacity threshold until 2011, indicating that they were likely "stuck" in terms of wind market development and, therefore, targeted by WPA. Similarly, each of five states achieved the

[28] Alaska was excluded, as its installed capacity has primarily been small-scale wind. It does not have an RPS.

100-MW threshold prior to or in the same year as its wind working group's founding. These include Colorado, Illinois, Oregon, Washington, and Wyoming. Notably, three of these states (Colorado, Oregon, and Wyoming) are among those for which respondents allocated a below-average share of influence to WPA's state-based activities (see Figure 4-3). This finding suggests that the effectiveness of (or need for) those state-based activities may have been lower in those states where market or political forces had already contributed to the development of wind power projects.

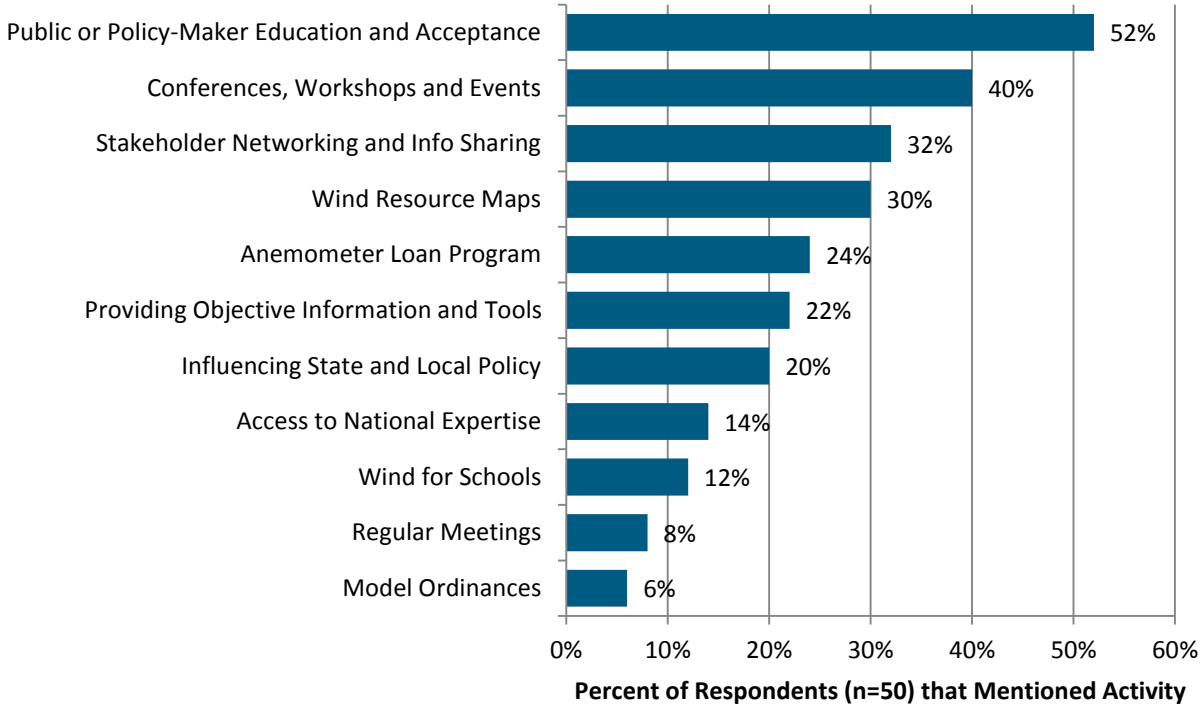
## 5.2 Most Influential WPA State-Based Activities

The above section identified aggregate trends regarding the pathways through which the initiative has contributed to wind capacity additions (via its influence on other primary market factors). However, these pathways to market influence have varied by state, as have the underlying activities that contributed to that influence. Regardless, interview responses suggest that the core state-based activities of WPA (e.g., wind working groups, wind resource maps, anemometer loan programs) have generated national recognition and a level of cohesion among those states that received funding, despite differences in the individual approach used by each wind working group. This section explores respondents' input regarding the specific WPA state-based activities that have played the greatest role in the initiative's influence on capacity additions.

### 5.2.1 Most Influential WPA Activities: Unaided Response

For those respondents who, in response to an initial open-ended question, indicated that the initiative had an impact on capacity additions in their state, evaluators asked them to "describe the WPA and wind working group activities that influenced the addition of wind capacity." The question was open-ended, and responses varied widely. Figure 5-6 illustrates the frequency with which respondents mentioned WPA activities or outputs that fell within each of 11 categories (as coded by the evaluation team).

**Figure 5-6. Frequency of Response: Working Group Activities or Outputs That Respondents Considered Influential**




Note: Responses are not mutually exclusive, as many respondents discussed multiple activities. This question was asked only of those 50 respondents who indicated, in response to an initial open-ended question, that WPA had had an influence in their state (see Question 6 in the Interview Guide in Appendix A).
Source: Navigant analysis

As shown, just over half of the respondents who perceived an influence from WPA's state-based activities mentioned the importance of the working group's role in educating the general public (e.g., landowners) and policymakers and raising awareness about wind power's benefits. The conferences, workshops, and events mentioned represent one of the primary avenues for that awareness-building. Nearly one-third of respondents discussed the positive influence of the wind working groups in bringing together a diverse set of stakeholders to network, share information, and generally foster a positive dialog about ways to address the barriers affecting the wind market in each state. One in five respondents who initially affirmed that WPA's state-based activities had affected wind capacity additions suggested that WPA or the state's working group had a positive influence on either state or local policies.

While many respondents provided specific examples of the WPA and wind working group activities they considered influential, at least seven (14% of respondents) expressed difficulty in trying to distinguish the activities of the working group from some of the other organizations who either collaborated with or shared members with the working group. For example, one Alaska respondent could not distinguish wind working group activities from those of the Renewable Energy Alaska Project (the organization that facilitates the work group). In Ohio, one respondent commented that both the WPA activities and those of Green Energy Ohio had influenced the market, but that it was hard to delineate between the two as "they were basically working in conjunction with each other." While these comments help demonstrate WPA and the wind working groups' success at collaborating with other groups, it also reiterates the difficulty in attempting to allocate an isolated share of market affects to the initiative.

### 5.2.2 Most Influential WPA Activities: Comparative Approach

As noted above, interviewed respondents generally expressed a reasonable familiarity with most of WPA's state-based activities, particularly the educational conferences and workshops, anemometer loan program, and wind resource mapping. This finding suggests that the core state-based activities were a successful means to brand the initiative and reach stakeholders across many sectors of the wind power market. Later in the interview, however, evaluators applied a secondary, aided-recall approach to assessing which WPA activities and outputs produced the greatest influence on the market. This additional approach served to make sure respondents were remembering and considering all of WPA's various state-based activities in their assessment. Interview respondents were presented with descriptions or examples of WPA state-based activities and outcomes in each of seven categories, as shown in Table 5-1.[29]

**Table 5-1. WPA State-Based Activities and Outputs Presented to Respondents**

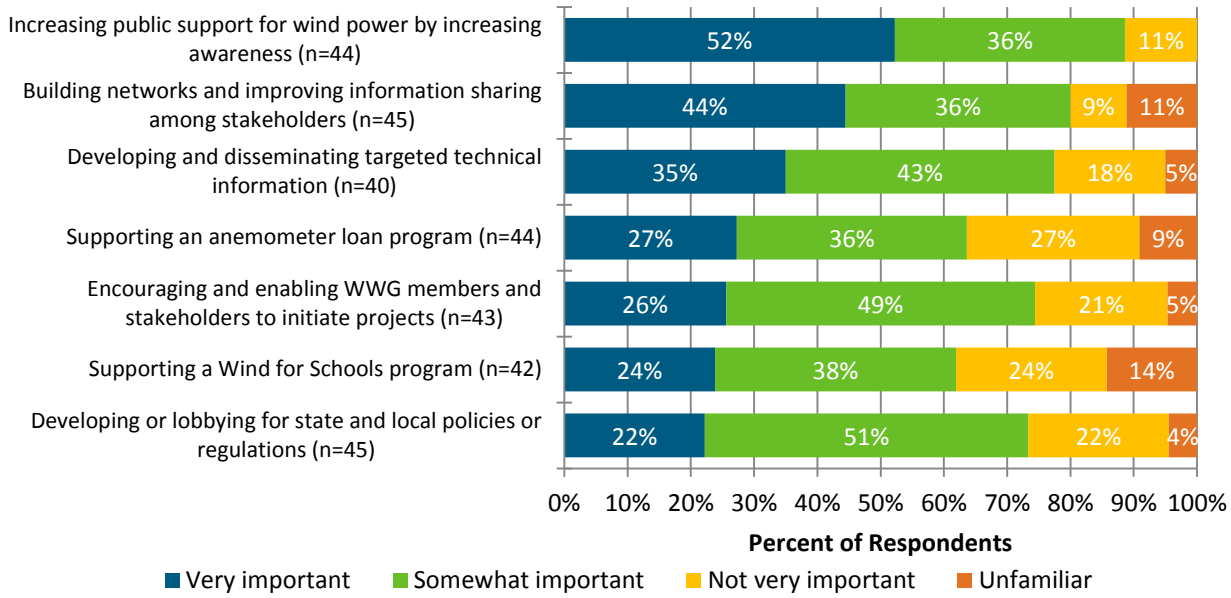
| State-Based Activities and Outputs | |
|---|---|
| 1. | Supporting an anemometer loan program that allows participants to borrow equipment to measure wind resources and determine wind potential in selected areas. |
| 2. | Supporting a Wind for Schools program that sought to increase the visibility of small-scale wind turbines and improve the availability of a wind-educated workforce. |
| 3. | Increasing the general public's support for (or reducing resistance to) wind turbines and wind farms by increasing awareness, knowledge, and appreciation of wind power's benefits. |
| 4. | Encouraging and enabling wind working group members, project developers, and landowners to initiate wind power projects or installations. |
| 5. | Developing and disseminating targeted technical information such as detailed wind resource maps, small-wind development guides, or economic and financial analysis tools. |
| 6. | Building networks and improving information sharing among stakeholders—including policymakers, regulators, and developers—through meetings, workshops, and annual award and networking events. |
| 7. | Developing or lobbying for state and local policies or regulations to support wind power, including permitting and siting ordinances, transmission and interconnection regulations, or renewable portfolio standards. |

Note: WPA and the wind working groups were precluded from directly lobbying for specific policies or regulations; however, individual working group members could advocate for such policies on behalf of their respective organizations. Item 7 in the above list sought to assess the perceived importance of the *direct* influence working group activities may have had on state and local policies; it was not intended to suggest to respondents that WPA or the working groups themselves directly lobbied policymakers. In addition, other activities on this list may have had a more *indirect* influence on state and local policies. For example, Item 6 (improving information sharing among stakeholders) may have led to increased policymaker awareness of wind development in other states and subsequently to the passage of similar policies in their own state.
Source: Navigant analysis

Evaluators read through the above list and asked interview respondents to rate the level of importance each of the WPA state-based activity categories had in terms of contributing to the initiative's influence on the wind power market in the respective state. Figure 5-7 shows the distribution of responses for the utility-scale market. Figure 5-8 shows the distribution for the small-scale market.

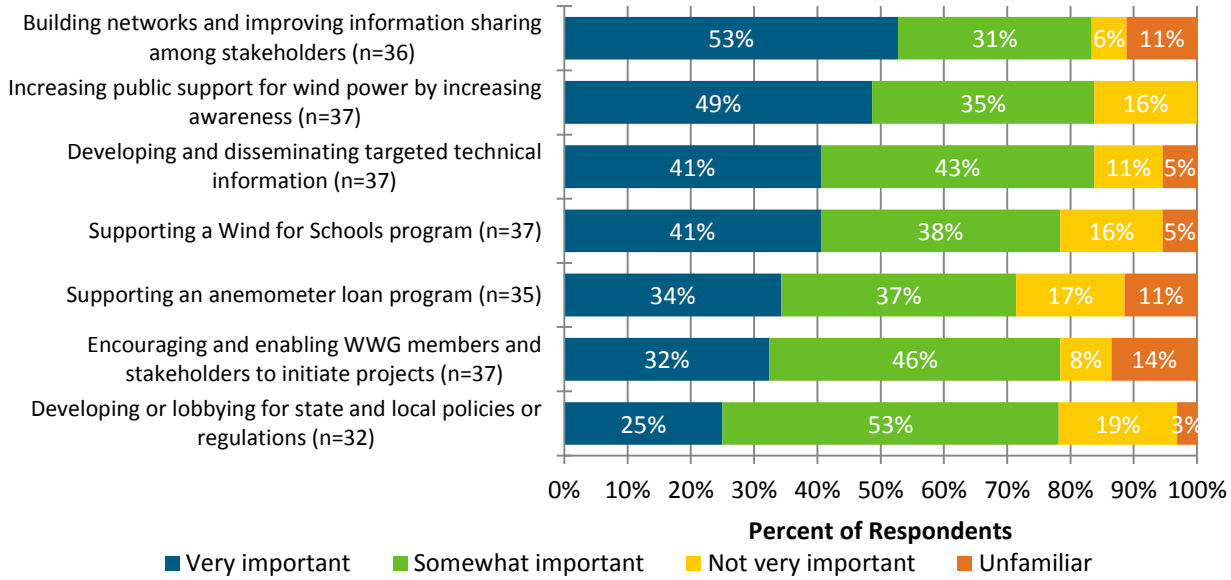
[29] The evaluation team found that some WPA state-level initiatives were vaguely defined or included a large number of specific subtopics; for interview structure it was beneficial to define categories that would incorporate a broad range of initiative elements.

**Figure 5-7. Perceived Relative Importance of Various WPA State-Based Activities and Outputs: Utility-Scale Wind Market**




Source: Navigant analysis

**Figure 5-8. Perceived Relative Importance of Various WPA State-Based Activities and Outputs: Small-Wind Market**




Source: Navigant analysis

The remainder of this section focuses on each of four themes that emerged from the above analysis.

### 5.2.3 Building Networks and Improving Information Sharing and Increasing the General Public's Support for Wind Power

As shown in Figure 5-7 and Figure 5-8, both utility-scale and small-scale interview respondents considered activities and outputs aimed at either increasing public support or building networks and sharing information among stakeholders as the most important. These activities were predominantly ranked as "very" or "somewhat important." In at least five states (Idaho, Illinois, Indiana, Nebraska, and Oklahoma), the wind working groups were cited as providing organized and structured meetings with an inclusive "open-door" policy and were able to assemble a diverse group of wind power stakeholders who could exchange information and address key issues. WPA-sponsored conferences and workshops provided education and outreach to a broad audience of diverse stakeholders ranging from rural landowners to policy decision-makers, particularly at the local and state levels. One respondent from Washington also stated that the WPA state-based activities helped stakeholders at the state level to "connect with key players at the national level," which has implications for enhancing local support.

### 5.2.4 Developing and Disseminating Targeted Technical Information

The above figures also indicate that WPA's ability to serve as a repository for technical information was seen as another driver for successful state-based activities, and was generally considered to be quite influential by interviewees. The state-specific wind resource maps were highly visible and regarded as a good starting point for resource assessment by a wide range of respondents, including utility-scale wind developers and small-wind champions. One Colorado respondent stated that "indirectly, the wind resource maps were pretty powerful. They showed that wind energy is credible [and they] helped to create an environment where wind projects could be developed." Other respondents referred to the wind resource maps as starting points where stakeholders could gain a high-level snapshot of geographic resource distribution and focus on key areas as needed.

The small-wind guidebooks were also mentioned by some market actors as a resource useful to private parties interested in pursuing small-wind installations. Respondents indicated that the public nature of such technical information provided a non-biased resource, especially when reports and webinars were associated with national labs or universities. For example, in Illinois, four of the five interviewed stakeholders indicated that WPA and the wind working group's positive influence on the Illinois wind market stemmed largely from their role as an objective source of credible information about wind. The Illinois wind working group was considered by these respondents to have been instrumental in increasing public support for wind, particularly through materials distributed to landowners and studies regarding the effect of wind energy on property values.

### 5.2.5 Anemometer Loan Programs

The anemometer loan programs were widely recognized by interview respondents as a tangible component of WPA, and many thought that the initiative to demonstrate existence of a viable wind resource was a valuable effort. In some instances, respondents expressed confusion about who was running a particular program; some anemometer loan programs were run out of state energy offices or universities, while others may have been funded from multiple sources or varied over the course of several years.

Although generally well known and considered by most to be a worthwhile effort, responses suggest that the anemometer loan programs were a less significant driving factor for wind capacity additions. This is particularly evident for the utility-scale market, as indicated by the number of market actors who responded "not very important" in Figure 5-7. Some respondents indicated that the data made public from these programs were not "trusted" by developers or investors, partially due to the comparably low meteorological tower heights and often condensed monitoring periods. However, Figure 5-8 shows that the anemometer loan programs were considered to be more important for community and small-scale

purposes, and the existence of the program was itself an educational lesson in resource assessment. As one North Dakota respondent noted, in regard to that state's program, "because there were only 20-meter towers, [it was not promoted much] except for small or mid-scale machines, [and was] more of an educational tool than any kind of data resource." Similar themes were mentioned in Idaho, Oregon, and Washington.

### 5.2.6 Developing or Lobbying for State and Local Policies

As noted below Table 5-1, this category of WPA activities and outputs sought to assess the perceived importance that the influence working group activities may have had *directly* on state and local policies. Including the word "lobbying" in the question, however, appeared to confuse some respondents, as several pointed out that WPA and the wind working groups were precluded from directly advocating for specific policies or regulations. Notably, this category received the lowest share of "very important" responses in both markets. Respondents' earlier supporting comments suggest that the wind working groups did influence policy matters, but primarily through indirect means (e.g., by fostering discussion among stakeholders and sharing best practices and model ordinances from other markets).

## 5.3 Characteristics of Successful State WWGs

This section provides insights into some of the characteristics common to successful wind working groups. As discussed in Section 4.1.2, working groups were considered successful based on either a higher percentage share of market influence or a greater MW-equivalent being allocated to the group by respondents in that state (see Table 4-2).

It is important to note the programmatic theme that WPA was designed to focus in particular on markets where the resource potential for wind was adequate, but where existing capacity was limited or barriers to development still existed. The success of each state wind working group was tied to its ability to establish itself as a credible contributor that could help address the important issues and barriers to wind power development in a particular state. Findings suggested that successful groups tended to establish a niche role within the realm of interested market actors and stakeholders. For any particular state, the role had to be such that the working group could engage key stakeholders in either the utility or small-scale market, and provide a forum for interested parties to assemble when they might otherwise not have done so. As previously stated, WPA and the working groups were not intended as advocacy organizations; rather, the initiative's focus was on sharing best practices and technical information through the stakeholder networks which the wind working groups helped to establish.

Several specific examples arose of wind working group characteristics that respondents considered to be effective; however, directly comparing groups' effectiveness between different states is challenging due to the unique nature of each market, available resource, and other factors. In states like Ohio and Idaho, for example, respondents believed that the wind working groups acted as "catalysts" that had a mostly secondary influence via other key market drivers that affected capacity additions. This theme was also echoed by respondents in other states throughout the interview process.

### 5.3.1 Information Sharing and Stakeholder Networks

In at least 11 of the 14 targeted evaluation states, market actors indicated information sharing and the ability to bring together a diverse set of stakeholders were key characteristics contributing to the effectiveness of the wind working group. Policymakers, landowners, wind developers, utility companies, and other stakeholders could each contribute a unique perspective on the industry, and the neutral forum created by successful working groups was a good place to do so. In Idaho for example, the structure of the wind working group allowed various stakeholders an opportunity to discuss key policy issues relating to the Public Utility Regulatory Policies Act and to develop more of a unified approach toward engaging the Idaho Public Utilities Commission on these issues. Similarly, one utility-scale developer in Indiana stated that the state's working group was "a good cross-section [of] organizations and the state….it had developers, manufacturers, utilities." Another utility-scale developer from Illinois said that the state's working group and conferences were "a non-exclusionary group [with] executives from multi-billion dollar companies and town trustees showing up in overalls." In successful wind working groups, members were able to exchange information for the sake of mutual benefit.

**Idaho's working group served as a catalyst through information sharing and stakeholder engagement.**

WPA first funded the Idaho wind working group in 2001, and it has been administered by Boise State University's Wind Application Center since 2002. In addition to regular workshops and exhibits, the working group supports an active Wind for Schools program and anemometer loan program. In discussing the working group's influence on the state's wind market, three respondents each mentioned the importance of the working group's ability to pull stakeholders together in an open forum to discuss key barriers to wind development, particularly policy and regulatory issues. In addition to bringing diverse stakeholders to the table, the working group was noted for its strong focus on education and information sharing. These characteristics were cited by two of the five respondents who each described the wind working group as a "catalyst" in moving the state's wind market forward. As an example of this influence, respondents discussed the critical role that working group meetings played in stakeholders' ability to understand and present a coherent and consistent position on the Public Utility Commission's (PUC's) administration of the Public Utilities Regulatory Policies Act (PURPA). As indicated by respondents, the PUC's subsequent decisions related to PURPA played a significant positive role in the development of Idaho's wind market.

The capacity of a wind working group to find a niche where it could be successful also depended to some degree on its ability to minimize duplication of efforts or even competition with similarly oriented groups in the state, some of which may have had longer presence in the state, greater visibility or reach, and significantly higher levels of funding. The Illinois wind working group exemplified such success at finding a niche among other groups. Interviewed respondents recognized the importance of the Illinois working group's ability to separate its efforts from those of the Illinois Wind Energy Association and Wind on the Wires. These groups were perceived to have collaborated well, but the wind working group was seen as maintaining its status as a third-party group by both industry and public officials, whereas the other groups were perceived as more advocacy-oriented. In some instances, the existence of a supportive marketplace or other prominent pro-wind groups prior to the wind working group's entrance may have contributed to a perception that the working group was either ineffective or altogether unnecessary. This was evident in Washington and Oregon, where well-respected and established groups like Renewable Northwest Project, Energy Trust of Oregon, the Northwest Energy Coalition, and Northwest SEED were all highly involved during the same time period in critical issues surrounding the renewable energy market.

### 5.3.2 Wind Energy Champions

Interview respondents from Idaho, Illinois, Maryland, Nebraska, North Dakota, and Washington made a point of identifying by name a small number of individuals in those states whose dedication to promoting and pushing forward the market for wind development were a vital part of the wind working group's success. Some considered these individuals to be champions for the wind industry because of their ability to expand the sphere of influence. According to these interviewees, the actions of these individuals had a notable influence on the capacity additions in their respective states. Respondents from more than half of the states also specifically mentioned the WPA initiative technical directors as directly contributing factors. This finding should not be overlooked, as it demonstrates that market effects are influenced by the work of individuals who successfully connect the right people.

### 5.3.3 Partnerships, Diversity of Stakeholders, and Inclusiveness

Another factor mentioned by respondents as contributing to the effectiveness of some wind working groups was their ability to partner broadly with other entities. For example, in Idaho, Illinois, Indiana, Maryland, Nebraska, and Oklahoma, respondents indicated that the wind working groups established working relationships with universities. These types of partnerships helped the groups to gain wider credibility and objectivity. In Wyoming, one market actor thought that the wind working group was effective because it established itself as "an advocacy group that was not pro-wind at any cost." The group took a more balanced approach to the issues, which may have allowed for the state legislature to realize that the group was not one-sided, but instead represented multiple perspectives. Collaboration with groups like AWEA and UWIG was also cited several times.

In Ohio and Colorado, respondents stated that the wind working groups formed partnerships with the Governor's Energy Office that were helpful by incorporating a citizen-based support structure. Additionally, the ability of any wind working group to collaborate with the state energy office created better opportunities for wind industry participants to interact with policymakers, as one respondent indicated was the case in Oklahoma. In Alaska, the wind working group partnered with numerous state and local groups.

**In Illinois, credibility and a collaborative approach enhanced working group influence.**

WPA helped organize the first Illinois Wind Workshop in 2001, the same year Illinois received its first validated wind map. The Illinois wind working group, however, was not formally launched until 2006. It is administered by and works in conjunction with Illinois State University's Center for Renewable Energy. Four of the five interviewed stakeholders indicated that WPA's influence on the Illinois market stemmed largely from the working group being perceived as an objective source of credible information about wind-related issues. Such information has been instrumental in increasing public support for wind, particularly through materials distributed to landowners and studies regarding wind energy's effect on property values. These respondents also felt that the group influenced the adoption of supportive state and local policies through education of local government officials. Two respondents pointed to the working group's partnership with Illinois State University as a key contributor to the group's effectiveness, pointing specifically to the group's stability over the years and the added credibility from having an academic institution involved in the group's research activities and reports. Two respondents also indicated that a high degree of collaboration among the wind working group and other organizations contributed significantly to its positive influence on the market.

Respondents in most states agreed that the wind working group fostered strong partnerships and collaborated broadly with other organizations. A key finding that emerged, however, is that this collaboration may have contributed to confusion about which organization was responsible for the effort (and therefore, any impacts that may have resulted). Some respondents expressed difficulty in distinguishing between WPA/WWG influence and activities and those of individual members or partner

organizations. Others had trouble differentiating between the wind working groups' activities and those of DOE, NREL, and the experts they sent to meetings or conferences in each state. While this may partly reflect the amount of time that has passed since many activities occurred (i.e., affecting respondents recall abilities), it may also suggest that stronger branding of specific activities, events or working groups as associated with WPA could improve individuals' ability to account for the initiative's specific activities (and their subsequent impacts). On the other hand, such top-down branding may have conflicted with each wind working group's independent and collaborative sense of ownership of its efforts.

## 5.4 Characteristics of Challenging State Markets

For several of the evaluation target states, the wind working groups and other WPA state-based activities were considered by interview respondents to be a less or altogether ineffective market influence. In the utility-scale market, respondents assigned an average of 5% or less of the share of influence on wind capacity to WPA state-based activities in Colorado, Maryland, Nevada, Oregon, Washington and Wyoming (see Figure 4-1). Overall, interview respondents indicated that WPA state-based activities were more effective at influencing small-scale capacity additions than they were with utility-scale additions, although WPA's share of influence on small-scale capacity additions in each of Nevada, Oregon, and Washington was below 10%. The following recurring themes were cited by respondents in states where the wind working groups were considered less effective.

### 5.4.1 Existing Markets and Other Action Groups

WPA wind working groups were less effective in states where the market for wind power already had supportive momentum before the groups were fully active. This trend was sometimes tied to the presence of other pro-wind groups in the area, such as the case in Washington and Oregon. One respondent from a large utility-scale wind developer said that the company worked closely with Renewable Northwest Project (RNP) to promote the market in Oregon, but had little or no interaction with the Oregon wind working group. Another respondent for Washington who represented a different utility-scale developer said that the company interacted heavily with RNP and the Northwest Energy Coalition, but did not have any involvement with the Washington wind working group. Once again, it is worth noting that the focus of WPA was to target markets with good wind resource potential that still lacked significant installed wind capacity or had persistent barriers to wind development. Thus, for some states, it may not be surprising that the wind working groups in certain

**In Washington and Oregon, other advocacy groups served many working group functions.**

Neither Oregon nor Washington were priority states for WPA, as some wind development activity had begun before each state's working group formed in 2002. Respondents in both states discussed various characteristics that contributed to the groups' modest influence on the state's respective wind markets. In Washington, for example, the state failed to match the federal funds provided for working group activities, and the group was actually inactive during 2007 and 2008. One respondent thought that the working group had a "reluctance to work with the conservative landowner, rancher, or farmer community," while another alluded to early instances where the approach of the group's leadership caused it to become somewhat polarized and unable to align with other industry participants. All of the interviewees suggested that other organizations had a greater influence on the state's wind market, particularly the Renewable Northwest Project (RNP), the Northwest Energy Coalition, and Northwest SEED. Similarly, interviewed market actors in Oregon believed that these regional groups had a greater influence than WPA. One utility-scale project developer said that the company would turn to RNP first to help address project-specific barriers. In addition, several Oregon respondents had a difficult time isolating WPA or WWG-specific efforts from other organizations' activities.

states were generally viewed as less effective even though capacity was growing.

### 5.4.2 Lack of Involvement or Engagement of Some Stakeholder Groups

In at least four of the sampled target states, interview respondents indicated that state wind working groups could have been more effective if they had done a better job engaging and forming positive relationships with utility companies. In some instances, respondents indicated that the wind working groups formed "adversarial" relationships with utilities that were seen as "anti-wind" instead of confronting the issue in a mutually positive way. In one state, pro-wind stakeholders spent considerable efforts over a two- to three-year period engaging in regulatory disputes with the state's leading utility. In two other states, respondents indicated that the wind working group excluded utilities from participating in its activities, potentially due to the wind working group's "lack of trust" mentality relating to the utilities.

Other respondents believed the wind working groups took a polarizing stance that alienated those with different views, even if they were not utilities. For example, a respondent in one of the state's with a less influential WWG believed that the wind working group failed to engage the conservative rural landowner base, which could have initiated more development if provided appropriate education or connections.

### 5.4.3 Inability to Secure Additional Funding

In at least five of the sampled states, respondents indicated that limited funding prevented wind working groups from being more effective. Aside from references to the level of federal funding provided, respondents in Wyoming and Washington indicated that an inability to secure additional or matching funds from the state prevented working group activities from being more effective. In these same two states, respondents also indicated that the timing of the withdrawal of federal funding for most state-based activities occurred just as working group efforts in those states were gaining traction. A fundamental theory of the WPA initiative's design, however, was that such funding would no longer be necessary once a threshold capacity or sufficient momentum was achieved in a particular state.

**Nevada's unique geography and sociocultural factors seem to stifle utility-scale wind power.**

The Nevada wind working group formed in 2002, but was most active between 2006 and 2009. WPA categorized Nevada as a high-priority state because, despite the existence of favorable state policies (including an RPS), the state had failed to see significant increases in installed capacity. Despite such policies, utility-scale wind projects faced repeated hurdles over the evaluation period. Three of the four respondents noted that more than 80% of Nevada's landmass is government-managed, leaving little unrestricted private land on which to install wind projects. According to respondents, developing wind projects on these federal or state lands has faced opposition from wildlife and public land conservationists, hunters, and the U.S. Department of Defense (due to conflicts with military training operations). Interviewees noted that this confined environment for utility-scale wind development is augmented by the state's limited transmission system, which exists in relation to Nevada's concentrated population hubs. Respondent comments suggested that these obstacles were largely out of the working group's sphere of influence, and that it consequently had a limited effect on the state's utility-scale wind market.

### 5.4.4 Poor or Inconsistent Leadership

There was an apparent connection between the stability of wind working group leadership and membership and the perceived effectiveness of some groups. In at least two states, respondents mentioned that poor leadership prevented the groups from being more effective. Specific reasons cited include that wind working group leaders became highly polarizing and opinionated to the point that it created a counterproductive culture between the wind working group and other key market participants, primarily the utilities.

### 5.4.5 Political Barriers

Despite their best efforts, some wind working groups felt that they faced insurmountable political opposition either at the state or federal level. According to respondents, some prominent state lawmakers and politicians in Indiana were seen as outwardly opposed to investing in wind, while respondents in Nevada indicated that wind power faced barriers from both the U.S. Department of Defense and state-based land management agencies. In Idaho, some respondents perceived that the ability of utilities to "influence the politics" created another barrier.

# 6. Conclusions and Recommendations

This section provides a high-level summary of this study's key findings and subsequent recommendations for future WPA initiative design considerations.

## 6.1 Conclusions

This section discusses the key findings from each of the major sections of this report.

### 6.1.1 Impact Evaluation Key Findings

#### Policy Has Had the Greatest Single Perceived Influence on Wind Capacity Additions

Federal policies (particularly the PTC) have had the greatest overall influence on utility-scale capacity additions, followed closely by state and local policies such as renewable portfolio standards and state-level tax incentives. Respondents across all states allocated over half of the share of perceived influence on capacity additions to a combination of such policy-related factors (including neighboring states' RPSs), and in some states, they were perceived as having had over 60% of the influence. Economic factors (e.g., load growth) and technical factors (e.g., wind resource and transmission) generally received the next biggest shares of influence; however, respondents in six states perceived a greater than 10% share of influence on capacity additions as coming from WPA state-based activities. The emphasis on policies' influence was less pronounced for the small-wind market, for which sociocultural factors, WPA state-based activities, and other groups' activities were perceived to have had a greater degree of influence on capacity additions.

#### WPA State-Based Activities Have Had a Positive and Measureable Influence on Capacity Additions

Across the 36 states that had wind working groups supported by WPA, the capacity-equivalent estimate of WPA state-based activities' influence on wind power additions is approximately 2,300 MW of primarily utility-scale wind capacity. The capacity-based estimate for other WPA-supported activities' influence (e.g., rural economic development, public utility partnerships, and federal green power purchasing) is 1,050 MW. This combined total of approximately 3,375 MW is equivalent to nearly 15% of the 22.6 GW of wind capacity added in targeted states since the formation of each state's wind working group. This capacity-based estimate of WPA influence equals nearly 34% of the initiative's 10 GW objective for that capacity that would be installed in the in the U.S. by 2010.

Approximately 70% of respondents also indicated that the capacity installed in a particular state by the end of 2010 would have been lower without WPA's intervention, while 69% felt that capacity additions would have been delayed in the initiative's absence. In the context of the objective that 30 states achieve 20MW of installed capacity by 2010, WPA's influence on increasing the amount and timing of capacity installed in the states it targeted can be considered a success.

#### WPA's Influence Extends beyond Those States Targeted for Working Groups and Other State-Based Activities

For three sampled states that were not directly targeted by the initiative (Iowa, New York, and Texas), market stakeholders perceived that WPA had some influence on those state's wind power markets. The aggregate capacity-equivalent estimate of WPA influence (from both state-based and other WPA activities) is approximately 1,100 MW. This equates to nearly 8% of the wind capacity added in those non-targeted states since the formation of wind working groups in their respective neighboring states.

#### Leveraged Funds Are Important, but Not Well Tracked or Reported

Two-thirds of interview respondents familiar with their working groups' administration considered third-party funding and resources to have been very important in the wind working groups' ability to influence wind capacity additions. Detailed budget data for the working groups, however, were rarely available, and, therefore, the true extent of such leverage was impossible to quantify. Based on respondent estimates, third-party resources could represent anywhere from 20% to 95% of an individual wind working group's resource base. Notably, working groups associated with universities and non-governmental organizations (NGOs) were more likely to cite higher levels of third-party funding than those based within a state agency.

#### Positive Network Effects Arise from Internal Replication, While External Replication Has Been Limited

The interviews provided some anecdotal evidence of replication of WPA activities. Organizations in a handful of states were perceived to be carrying forward some of the working groups' activities as WPA funding has diminished, particularly NGOs focused on wind power or renewable energy. While some non-targeted states have adopted certain aspects of the WPA's state-based activities, the perceived impact from those efforts was small. In general, the most oft-cited form of replication discussed by stakeholders relates to the positive network effects stemming from WPA's state-based approach to stakeholder engagement and outreach activities. Specifically, respondents in at least seven states tied WPA's influence and effectiveness to the diverse network of individuals and organizations connected to the initiative, both within the state and nationally. In a sense, the value of the initiative to each individual participant increases as WPA's stakeholder network expands, providing access to an ever-growing cadre of knowledge, experts, technical information, best practices, and lessons learned.

### 6.1.2 Process Evaluation Key Findings

#### WPA's Effect on Wind Capacity Additions Arises from Several Indirect Market Influence Pathways

Respondent perceptions reveal several pathways through which WPA influences wind capacity additions in targeted states. The initiative's effects on sociocultural factors, other groups' activities, and state and local policies each contributes to a positive collective influence on the market. Taken on their own, the overall capacity-equivalent share of influence from WPA via its influence on any one of these individual factors might be considered as low to moderate. When considering these factors' combined influence on the market, however, the moderate-to-high influence WPA is perceived to have had on each factor suggests that a significant additive effect arises from the working groups' ability to engage a diversity of stakeholders.

#### The Initiative Plays a Vital Role as a Source of Credible and Unbiased Technical Information

WPA and the wind working groups' ability to serve as repositories for trusted technical information was seen as another key driver for successful state-based activities. At least one respondent in every state indicated that these public resources, particularly reports and webinars associated with national labs or universities, were viewed as a credible, non-biased source of information. The working groups were similarly perceived as maintaining this objectivity, particularly in comparison to industry trade groups and other advocacy-based organizations whose information is perceived as more biased.

#### Successful Working Groups Play a Key Role as Objective Facilitators of Diverse Stakeholder Interactions

Market actors indicated that much of the success of an effective wind working group has stemmed from the *diversity* of stakeholders to which the group was able to appeal, particularly when those stakeholders might not have otherwise converged. This broad reach and the inclusive nature of working group

activities is particularly beneficial to the initiative's ability to distribute the technical information for which it is considered a credible source. The capacity of a wind working group to fill this niche as the driver of network building and information sharing in a particular state depends to some degree on minimizing duplication of efforts or even competition with other wind- or renewable energy-oriented groups. In a few cases (particularly in the Northwest), wind working groups were perceived as less effective in states where highly effective wind or renewable energy advocacy groups already existed, or where significant increases in capacity were already underway.

#### Less Successful Efforts Are Characterized by Inconsistent Leadership or Funding or a Lack of Inclusiveness

A connection appears to exist between the stability of wind working group leadership and funding and the group's perceived effectiveness. High turnover of the individual responsible for coordinating a wind working group (as was the case in some state energy offices) and inconsistent or inadequate funding contributed to a lack of cohesion and momentum for some groups. Similarly, a few groups were cited for their inability (or unwillingness) to positively engage with all market stakeholders, including those whose priorities or viewpoints may differ (e.g., utilities or more conservative landowner groups).

#### Confusion About (or an Inability to Recall) Which Activities Were Tied to WPA or a State's Wind Working Group May Have Diminished the Perceived Influence of the Initiative

While partnering with other organizations, particularly those that coordinated working groups, was vital to the success of state-based activities, these close linkages appear to have caused confusion about which organization was ultimately responsible for the efforts (and any resulting impacts). Many respondents were unable to distinguish between WPA/WWG influence and activities and those of individual members or partner organizations. Others had trouble differentiating between wind working group activities and those of DOE and NREL. This confusion may arise from the amount of time that has passed since many of these activities occurred, or potentially point to inconsistent branding of specific activities or events as associated with WPA.

## 6.2 Recommendations for Future Design of DOE State Wind Deployment Activities

This section provides the evaluation team's recommendations in the context of strategic decisions currently facing WPA and the DOE.

**Recommendation 1: Leverage WPA's reputation as a provider of objective and credible technical information to address current and emerging barriers to the continued large-scale deployment of wind capacity in states where the market is already developed.**

The challenges facing the wind power market have shifted in recent years. Examples of current key issues include adequacy of transmission, siting and permitting concerns (both environmental and "not-in-my-backyard" related), integration of renewables, stalling load growth, the prevalence of inexpensive natural gas, and the expiration of the PTC. In light of these challenges, the next few years could be a critical juncture in the wind market's maturation. Rather than focusing on the 100-MW threshold in those few remaining states where barriers persist, the initiative might better facilitate large-scale capacity additions by helping to prevent or mitigate a slowdown in those states with established markets through the provision of credible and objective technical information. For example:

- Through what steps can the market best transition to a market unsupported by the PTC?
- What effect has diminished load growth (either from adoption of energy efficiency or a slowed economy) had on the trajectory of state RPS requirements? And what subsequent steps have some states (e.g., New York) taken to adjust their goals?

- What best practices exist among states that have successfully addressed complex or inconsistent permitting and siting issues?

In addition, WPA's broad stakeholder network and highly capable technical staff uniquely position the initiative to identify and help address future issues that could further inhibit growth in a contracted market. What additional issues may arise that, should the market continue to stall, would make it more difficult for the industry to recover its momentum? Some examples might include issues related to operations and maintenance of aging plants, insolvency of manufacturers or others tied to warranties or performance guarantees, or the costs and approaches for decommissioning or repowering plants that have reached the end of their useful life.

**Recommendation 2: Continue to utilize the initiative's ability to influence the market through stakeholder engagement and expand partnerships with universities and organizations perceived to contribute to WPA's objectivity and credibility.**

Throughout this report, respondents cited the initiative's role as an objective facilitator of stakeholder dialogue and engagement as a key activity in its ability to influence wind capacity additions. While not a direct advocate of specific policies, the initiative has had an indirect but undeniable influence on policy decisions. This influence arises from the wind working groups' role in connecting, educating, and empowering individual stakeholders and other groups to influence the policy-making and regulatory process. The working group's inclusive approach to stakeholder engagement has particularly contributed to this influence, and the initiative should continue to engage those organizations who may not necessarily advocate for expanding the deployment of wind capacity. These efforts may be further enhanced through additional collaboration with universities, whose involvement in wind working groups and wind-related research has added to the perceived credibility of those groups' efforts.

**Recommendation 3: Use the Program Theory and Logic Model approach to define objectives and progress indicators that better align with WPA's role as a market transformation initiative.**

As discussed in this report's methodology and as evidenced by stakeholders' difficulty in isolating the initiative's impact from its influence on other primary market factors, it is challenging to directly link WPA to specific wind capacity additions.. While its primary objectives are tied to capacity-based targets, WPA is not a "resource acquisition" initiative (i.e., it does not directly incentivize the addition of wind capacity). Rather, its role is one of market transformation, wherein the initiative strives to reduce or remove barriers to a self-sustaining market. As such, measuring WPA's progress and success would be better-suited by explicit, measureable objectives related to the specific short- and intermediate-term outcomes targeted by its activities and outputs. By using the Program Theory and Logic Model approach as a design tool for the initiative (see Section 2), WPA can more closely tie its outputs to measureable market outcomes and improve its ability to more effectively evaluate its efforts in the future.

**Recommendation 4: More frequently evaluate the initiative's impact and progress against goals and objectives and require better tracking and reporting of associated metrics.**

WPA and DOE should evaluate the initiative on a more frequent basis, particularly when such evaluation may rely on primary data collection, to better assess WPA's effectiveness—and adjust priorities and resources accordingly. The ability of market actors to recall relevant details is limited, particularly in a fast-paced market cluttered by advocacy groups and competing interests. For comparison, most utility- or regulator-run evaluations of resource acquisition or market transformation programs occur on two- to three-year cycles and represent between three to six percent of the subject program's budget (U.S. EPA 2007).

In addition to more frequent evaluations, WPA (and other similar initiatives) should require better tracking and reporting of the specific metrics required to evaluate a market transformation effort. For

example, organizations that receive WPA-funding for wind working groups or other activities can be required to track and report spending as well as leveraged funds and resources on an annual basis as a pre-condition for receipt of the next year's funds. Wind working groups might also be required to compile news coverage related to the groups' activities. This evaluation found such tracking systems to be largely absent for many of the metrics sought after. In order to ensure continuity and accountability, simple systems should be put in place that will endure through various staff and initiative changes. Such tracking systems should be designed to support the requirements of evaluators as well as WPA staff.

Other example market transformation metrics might include measurements of awareness and social acceptance (i.e., via periodic surveys of the general public), workforce development indicators (e.g., availability of and enrollment in vocational programs), or access to transmission (usually available through utility or regulator studies). Again, the specific indicators and metrics for which data should be collected will depend on the selection and prioritization of appropriate market transformation indicators by initiative staff, as well as the relative costs and benefits of collecting each type of data. As mentioned in Recommendation 3, these discussions and decisions should be integral to the initial design (and ongoing adjustment) of such initiatives, with an eye toward facilitating future evaluation efforts.

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# Appendix A. Interview Guides

## A.1 Market Actor Interview Guide (WWG States)

**Introduction**
Thank you again for taking the time to participate in our evaluation of the Wind Powering America (WPA) program.[30] As I mentioned in my previous emails, Navigant is working with Lawrence Berkeley National Laboratory and the U.S. Department of Energy to better understand the impact of WPA's state-based activities on the growth of the wind power market between 1999 and 2010. These activities include things like distributing detailed wind resource maps, an anemometer loan program, wind development guides, and various meetings, conferences and other outreach efforts of your state's Wind Working Group.

Our study approach focuses on a series of interviews with market participants in a selection of states where WPA was active. Through our initial research, we've identified you as someone who was participating in or is familiar with the wind power market in [state] during this time period; I appreciate your willingness to voluntarily participate in this effort.

Before we start the interview, I'd like to make sure that you have accessible the materials I previously emailed to you, which include a market timeline and a market influence diagram. We'll be referring to these materials during the interview.

I also want to reiterate that your responses throughout this process will be kept confidential by the study team and your comments will not be directly attributed to you without your prior consent. I expect that the interview will take anywhere between 30 and 60 minutes. That said, do you have a certain time when we need to impose a hard-stop on our conversation?

Before we begin, do you have any questions about the study, the materials I sent, or the interview process?

**Respondent Background**

1. First, could you describe your role and the timing of your involvement in the wind market in [state] since 1999?
2. [If not discussed above] How familiar are you with the past activities of Wind Powering America and [state's] wind working group? Were you involved in organizing any of those activities or did you attend any meetings, workshops or events sponsored by WPA or the work group?

**Introduction to Supporting Materials**
Before we go on, I'd like to take a moment to introduce the materials I sent you.

- The first document, the Excel spreadsheet, is a market influence worksheet we'll be using during the interview. I'll come back to it later.
- In the second document (the PPT file), the first page is a Market Influence Diagram. This flowchart shows the major categories of market factors and activities that may have affected the timing and rate of additions of wind power capacity in a particular state. The arrows between the bubbles are meant to represent relative degrees of cross-influence between those market factors. For example, several types of market activities can influence state or local policies that may, in

[30] Note that DOE's internal convention refers to Wind Powering America as an initiative rather than a program. These interview guides mistakenly used the word "program" to describe WPA, but have been left uncorrected to preserve the original language used in the interviews.

turn, have a direct effect on wind power capacity additions. **It is important to note that the current arrows and levels of influence in this diagram are hypothetical and are simply meant to illustrate potential relationships.** As part of these interviews, we plan to incorporate input from you and others involved in the market to create a more accurate picture of the relationships between factors.

- The second page lists some of the representative activities that fall under each of those categories.

- The third page is a timeline of what we considered to be some of the key activities that may have affected the wind power market in [state] over the past several years. It also includes key dates for WPA-sponsored activities, such as the formation of the state's wind working group. Below the timeline is a graph showing the annual growth in wind power capacity in [state] broken out by utility-scale and small-wind categories. For this study, we're considering small-wind (or distributed wind) to be projects of 1 MW or less in total capacity.

I'd like to draw your attention to a few key points in the graph. [Indicate in what year the WWG started and any subsequent inflection points that occur for both utility and small scale wind]. I'd like to focus our discussion on the factors that likely contributed to the growth in [state's] wind market around these times.

- **[For Alaska, Maryland, Nebraska and Ohio]** Given [state's] level of small-wind activity, I'd also like to focus in particular on those types of systems and projects.

- **[For Colorado, Idaho, Illinois, Indiana, and North Dakota]** Given that [state] has had significant levels of both utility-scale and small-wind capacity additions, I'd like to consider factors that may have affected both types of systems and projects.

- **[For Oklahoma, Oregon, Washington and Wyoming]** Given that much of [state's] wind capacity additions fall into the utility-scale wind category, I'd like to focus on those types of systems and projects.

- **[For Nevada]** Given that the state has only recently begun to add utility-scale wind, I'd like to consider factors that may have affected both types of systems and projects.

**Initial Impact Assessment**

3. Looking first at the Market Influence Diagram and the accompanying list of activities, are there any important market factors or activities we've left off that may have contributed significantly to the addition of wind power capacity in [state]?
4. How about on the timeline? Do you think any additional key market factors or activities should be shown on this graphic?
5. Considering all of these market factors and activities, which would you say had the *greatest* impact on the timing and rate of wind capacity additions in the state? [probe for details about each one and make sure they describe all relevant activities].
6. From your experience, did the Wind Working Group or WPA state-based activities have an impact on either the timing or rate of wind capacity additions during this time period? Make sure to consider both direct impacts on wind power capacity additions as well as indirect impacts, such as influencing the policies that directly impacted those capacity additions.
    a. [If yes]
        i. Can you describe the WPA and wind working group activities that influenced the addition of wind capacity? [probe to make sure they describe all relevant activities. Clarify whether each impacted the timing, rate, or both].

7. [Ask if responded "yes" that WPA/WWG had an impact] Do you think the nature or level of the wind working group and WPA's impact changed significantly over time? [Provide an example based on the state's timeline and prior responses…for example, was the wind working group and WPA's influence different before and after the passage of the state's renewable portfolio standard?]

[Complete the next two questions for each of utility and small-scale wind as required for the sampled state.]

8. Turning to the Market Influence Spreadsheet (Table 1 in the Excel document), I'd like to get your assessment of each market factors' relative impact on [state's] wind capacity additions for [utility-scale/small-scale] wind. In other words, we'd like to divide the overall influence on the state's [utility/small scale] wind market among different market factors, with each receiving between 0 and 100% of the credit for influencing the addition of wind capacity. The total for all factors will equal 100%.
    a. Note that there is also an "other factor" category for factors that do not currently appear on the list. At any time, let me know if you'd like to add additional factors to the list.
    b. [Walk respondent through Table 1, assigning a percentage for each factor and making notes on any justification they provide for each one. Add other factors/activities as needed in the rows provided. Make sure the total equals 100%. Repeat for utility and small-scale wind as required for the sampled state].
9. We're also interested in the *indirect* impact from the Wind Working Group and related WPA activities. Looking now at Table 2a in the worksheet, I'd like for you to estimate the relative level of influence that WPA or the wind working group had on each of the market factors listed. For this table, imagine that each market factor category has a pie chart where WPA and the wind working group would receive a share of the credit (between 0 and 100%) for influencing that market factor. Table 2b shows ranges you can use to describe WPA or the wind working group's share of influence for each factor.
    a. [Walk respondent through Table 2a, assigning a ranking for each factor and making notes on any justification they provide for each one. Add other factors as needed in the rows provided. For each factor that the respondent assigns as >50%, ask them to provide a specific percentage. Repeat for utility and small-scale wind as required].
10. I'd like to ask what you think would have happened in the absence of the program and the wind working group. [Ask for either/both utility and small-scale wind as appropriate]. Considering the nature and level of WPA and the wind working group's influence and the pattern of wind capacity additions over time:
    a. What do you think would change in terms of the *amount* of wind capacity added in [state] without WPA and the wind working group? Would you say that there would be the same level of capacity in 2010, 25 percent less, 50 percent less, 75 percent less, or no wind capacity in [state]?
    b. What about the *timing* of wind capacity additions? Without WPA and the wind working group, would you say that wind capacity additions would have been delayed 1-2 years, 3-5 years, more than 5 years, or not delayed?

**Process Questions**

Now I'd like to turn to some detailed questions about the wind working group and WPA activities in [state].

[If respondent said **WWG/WPA had an impact, ask questions 11-15**]

11. What characteristics or activities of the [state] wind working group contributed to its effectiveness in influencing the market for wind power?
12. To what degree did the wind working group form alliances or partnerships, or simply collaborate, with other organizations with similar goals? Can you name a few of the key organizations that the wind working group worked with? [Probe…universities?]
    a. How important was this collaboration to the success of the wind working group?
13. Are there any characteristics of the wind working group that prevented it from having a greater (or earlier) impact than it did at any point between [year] and 2010?
14. How important was your involvement in or exposure to wind working group and WPA activities in your decisions and actions that supported [state's] wind power market? [e.g., developing a project, supporting RPS legislation, changing wind permitting or siting laws]
15. I'd like to revisit which wind working group or WPA-funded activities were particularly impactful in terms of promoting or supporting the wind power market in [state]. I'm going to read a short list of the activities and potential outcomes from WPA and the wind working group. For each, please tell me if it was very important, somewhat important, or not at all important in the wind working group's impact on the state's wind market. If you're unfamiliar with the role of a particular activity, please say "unfamiliar."
    a. Supporting an anemometer loan program that allows participants to borrow equipment to measure wind resources and determine wind potential in selected areas.
    b. Supporting a Wind for Schools program that sought to increase the visibility of small-scale wind turbines and improve the availability of a wind-educated workforce.
    c. Increasing the general public's support for (or reducing resistance to) wind turbines and wind farms by increasing awareness, knowledge and appreciation of wind power's benefits.
    d. Encouraging and enabling wind working group members, project developers, and land owners to initiate wind power projects or installations.
    e. Developing and disseminating targeted technical information such as detailed wind resource maps, a small-wind development guides, or economic and financial analysis tools.
    f. Building networks and improving information sharing among stakeholders—including policy makers, regulators and developers—through meetings, workshops and annual award and networking events.
    g. Developing or lobbying for state and local policies or regulations to support wind power, including permitting and siting ordinances, transmission and interconnection regulations, or renewable portfolio standards.

[If respondent said **WWG/WPA had no impact, ask questions 16-18**]

16. Earlier you said that the wind working group and WPA had limited or no impact on wind capacity additions in [state]; however, I'd like to briefly revisit which, if any, of their activities were impactful in terms of at least promoting or supporting the state's wind power market. I'm going to read a short list of the activities and potential outcomes from WPA and the wind working group. For each, please tell me if it was very important, somewhat important, or not at all important in the wind working group's impact on the state's wind market. If you're unfamiliar with the role of a particular activity, please say "unfamiliar."

a. Supporting an anemometer loan program that allows participants to borrow equipment to measure wind resources and determine wind potential in selected areas.

b. Supporting a Wind for Schools program that sought to increase the visibility of small-scale wind turbines and improve the availability of a wind-educated workforce.

c. Increasing the general public's support for (or reducing resistance to) wind turbines and wind farms by increasing awareness, knowledge and appreciation of wind power's benefits.

d. Encouraging and enabling wind working group members, project developers, and land owners to initiate wind power projects or installations.

e. Developing and disseminating targeted technical information such as detailed wind resource maps, a small-wind development guides, or economic and financial analysis tools.

f. Building networks and improving information sharing among stakeholders—including policy makers, regulators and developers—through meetings, workshops and annual award and networking events.

g. Developing or lobbying for state and local policies or regulations to support wind power, including permitting and siting ordinances, transmission and interconnection regulations, or renewable portfolio standards.

17. Are there any characteristics of the wind working group or WPA activities that prevented them from having a greater (or earlier) impact than they did at any point between [year] and 2010? Why do feel that those activities had so little impact?

18. Were these issues controllable, and was there anything the wind working group did to attempt to mitigate them?

**Secondary Impact**

Now I'd like to ask about other impacts the wind working group and WPA activities may have had in [state].

19. In addition to WPA's state-based activities, such as the wind working group, the program also supported three other programs. I'm going to read a brief description of each program, and would like for you to indicate if you consider it to have had a very significant, somewhat significant, or insignificant impact on the addition of wind capacity in [state]. Again, if you're unfamiliar with the role of a particular program, please say "unfamiliar."

    a. The Wind Energy for Rural Economic Development program, which sought to promote the positive economic impacts that wind development and equipment manufacturing and installation could have in rural areas through jobs, property taxes, and landowner revenues. An example would be providing communities access to software that helps to model potential jobs and other local economic impacts of wind development.

    b. A Public Utility Partnership Program through which WPA works with cooperative and municipal utilities and organizations like the American Public Power Administration (APPA) to address technical and economic barriers to wind power development. An example would be providing access to tools or experts who can help a utility understand the wind resource potential in their territory or determining the cost-per-kWh for a specific wind project.

    c. The Federal Wind Power or "Greening Federal Loads" Program, which includes efforts to aggregate the energy load of federal facilities (including the Department of Defense) and purchase renewable energy or green tags to serve that load.

20. The federal budget available to distribute among that state wind working groups was limited each year. We're interested in understanding how the [state] wind working group was able to leverage those funds or other resources, for example, by garnering additional funding from state or local agencies or finding financial or in-kind support from member or partner organizations.
    a. Are you aware of and can you describe the types of financial or other support the [state] wind working group relied on to deliver or expand their primary activities? [probe if needed, examples might include state or local government funding, grants, or contributions from developers; this could include funds as well as staff time;
        [If yes…]
        i. How were these funds and other resources used to support the group's activities?
        ii. If other funds were leveraged…
            1. Approximately what percent of the total budget for the working group activities supported did those funds represent?
            2. What was the timing of those additional funds? Were they contributed at the working group's initiation, or later on in its operations?
    b. How important was financial and in-kind support from third parties to the wind working group's ability to impact wind capacity additions in [state]. Would you say very important, somewhat important, somewhat unimportant, or not at all important?
    c. How much less of an impact do you think the wind working group would have had if it had been unable to secure additional funds or in-kind support beyond its federal funding? Compared to the impact we estimated earlier, would it have achieved 25 percent of that impact, 50 percent, 75 percent, the same level of impact, or no impact at all?
21. As shown on the Market Influence Diagram, WPA and the wind working group may have had some influence on other organizations seeking to support the wind market in [state]. We're interested in how the wind working group and WPA worked with these other organizations.
    a. First, I'd like for you to describe the **timing** of the wind working group's founding and the ramp-up of its activities compared to the other organizations that it worked with. Did WPA funding and the wind working group initiate new efforts to support wind in [state], or did they help push forward efforts that were already underway or being led by other organizations? [If necessary, probe on different activities.]
    b. Can you think of any instances where other organizations in [state] adopted the activities or tactics of the wind working group? [probe about specifics]
22. What about in neighboring states? Can you think of any instances where organizations in surrounding states adopted the activities or tactics of the wind working group or instances where policies supported by the [state] wind working group were subsequently adopted in neighboring states that did not have their own working group? [probe about specific states]
23. To the best of your knowledge, as federal funds for the state wind working groups have been decreased or discontinued, have other organizations funded or independently carried forward any of the wind working group's former activities? [probe for details]

**Revisiting Impact Assessment**

Thank you for your time so far; we're almost done. Before we wrap up I'd like to give you the opportunity to revisit the impact and influence numbers you provided earlier based on our discussion. [Repeat for utility/small-scale wind as appropriate.]

24. Turning back to Table 1 on the Market Impact Worksheet…

a. Are there any factors or activities you would like to add to the list that impacted the rate or timing of wind capacity additions in [state]?

b. And would you like to revise any of the numbers representing each factor or activity's share of the direct impact on wind capacity additions?

25. For Table 2a…

    a. Would you like to revise any of the numbers representing WPA and the wind working group's level of influence on each listed factor or activity?

**Conclusion**

Thank you for taking the time to work through these questions with me. As discussed in our earlier emails, in the coming weeks we'll be emailing you a summary of the rankings and comments we receive from other respondents in your state. These responses will be kept anonymous – no one will know who else has contributed. At that point we'll ask you to consider others' responses and input and again reconsider your quantitative rankings in the Market Influence Spreadsheet. Our goal is to reach some consensus about the interactions and influences of the market factors we discussed.

26. Before we finish, is there anything else you'd like to add about Wind Powering America, the wind working group, or the growth of the wind market in [state]?

[end interview]

## A.2 Market Actor Interview Guide (Non-WWG States)

**Introduction**
Thank you again for taking the time to participate in our evaluation of the Wind Powering America (WPA) program. As I mentioned in my previous emails, Navigant is working with Lawrence Berkeley National Laboratory and the U.S. Department of Energy to better understand the impact of WPA's state-based activities on the growth of the wind power market between 1999 and 2010. These activities include things like distributing detailed wind resource maps, an anemometer loan program, wind development guides, and various meetings, conferences and other outreach efforts of states' Wind Working Groups.

Our study approach focuses on a series of interviews with market participants in a selection of states, some where WPA was active and some where the program was less active. [State] was not specifically targeted by these activities and did not have its own wind working group, but we're interested in uncovering any effects the program's activities in neighboring states may have had there. Through our initial research, we've identified you as someone who was participating in or is familiar with the wind power market in [state] during this time period; I appreciate your willingness to voluntarily participate in this effort.

Before we start the interview, I'd like to make sure that you have accessible the materials I previously emailed to you, which include a market timeline and a market influence diagram. We'll be referring to these materials during the interview.

I also want to reiterate that your responses throughout this process will be kept confidential by the study team and your comments will not be directly attributed to you without your prior consent. I expect that the interview will take anywhere between 30 and 45 minutes. That said, do you have a certain time when we need to impose a hard-stop on our conversation?
Before we begin, do you have any questions about the study, the materials I sent, or the interview process?

**Respondent Background**

1. First, could you describe your role and the timing of your involvement in the wind market in [state] since 1999?
2. [If not discussed above] How familiar are you with the past activities of Wind Powering America or the wind working groups in adjacent states? As a reminder, adjacent states with wind working groups include:

- **[Iowa]:** Illinois, Missouri, Nebraska, South Dakota, and Wisconsin
- **[New York]:** Connecticut, Massachusetts, New Jersey, and Pennsylvania
- **[Texas]:** Arkansas, New Mexico, and Oklahoma

    a. [If yes] Were you involved in organizing any of those activities or did you attend any meetings, workshops or events sponsored by WPA or the work groups?

**Introduction to Supporting Materials**
Before we go on, I'd like to take a moment to introduce the materials I sent you.

- The first document, the Excel spreadsheet, is a market influence worksheet we'll be using during the interview. I'll come back to it later.

- In the second document (the PDF file), the first page is a Market Influence Diagram. This flowchart shows the major categories of market factors and activities that may have affected the timing and rate of additions of wind power capacity in a particular state. The arrows between the bubbles are meant to represent relative degrees of cross-influence between those market factors.

For example, several types of market activities can influence state or local policies that may, in turn, have a direct effect on wind power capacity additions. **It is important to note that the current arrows and levels of influence in this diagram are hypothetical and are simply meant to illustrate potential relationships.** As part of these interviews, we plan to incorporate input from you and others involved in the market to create a more accurate picture of the relationships between factors.

- The second page lists some of the representative activities that fall under each of those categories.

- The third page is a timeline of what we considered to be some of the key activities that may have affected the wind power market in [state] over the past several years. Below the timeline is a graph showing the annual growth in wind power capacity in [state] broken out by utility-scale and small-wind categories. For this study, we're considering small-wind (or distributed wind) to be projects of 1 MW or less in total capacity.

I'd like to draw your attention to a few key points in the graph. [Indicate inflection points that occur for both utility and small scale wind]. I'd like to focus our discussion on the factors that likely contributed to the growth in [state's] wind market around these times. Given that [state] has had significant levels of both utility-scale and small-wind capacity additions, I'd like to consider factors that may have affected both types of systems and projects.

**Initial Impact Assessment**

3. Looking first at the Market Influence Diagram and the accompanying list of activities, are there any important market factors or activities we've left off that may have contributed significantly to the addition of wind power capacity in [state]?
4. How about on the timeline? Do you think any additional key market factors or activities should be shown on this graphic?
5. Considering all of these market factors and activities, which would you say had the *greatest* impact on the timing and rate of wind capacity additions in the state? [probe for details about each one and make sure they describe all relevant activities].
6. From your experience, did any policies, factors or activities in neighboring states have an impact on either the timing or rate of wind capacity additions in [state] during this time period? Make sure to consider both direct impacts on wind power capacity additions as well as indirect impacts, such as influencing the policies that directly impacted those capacity additions.
    a. [If yes]
        i. Can you describe those factors or activities? [probe about specific states; make sure they describe all relevant activities. Clarify whether each impacted the timing, rate, or both].
7. From your experience, did Wind Powering America or activities associated with wind working groups in neighboring states have an impact on either the timing or rate of wind capacity additions in [state] during this time period? Again, please also consider indirect impacts, such as influencing policies that directly impacted capacity additions in [state].
    a. [If yes]
        i. Can you describe those activities? [probe about specific states; make sure they describe all relevant activities. Clarify whether each impacted the timing, rate, or both].

[Complete the next two questions for each of utility and small-scale wind based on respondent's familiarity with each market.]

8. Turning to the Market Influence Spreadsheet (Table 1 in the Excel document), I'd like to get your assessment of each market factors' relative impact on [state's] wind capacity additions for [utility-scale/small-scale] wind. In other words, we'd like to divide the overall influence on the state's [utility/small scale] wind market among different market factors, with each receiving between 0 and 100% of the credit for influencing the addition of wind capacity. The total for all factors will equal 100%.

    a. Note that there is also an "other factor" category for factors that do not currently appear on the list. At any time, let me know if you'd like to add additional factors to the list.

    b. [Walk respondent through Table 1, assigning a percentage for each factor and making notes on any justification they provide for each one. Add other factors/activities as needed in the rows provided. Make sure the total equals 100%. Repeat for utility and small-scale wind as required for the sampled state].

9. We're also interested in the *indirect* impact from WPA activities and the influence of neighboring state's wind working groups. Looking now at Table 2a in the worksheet, I'd like for you to estimate the relative level of influence that WPA or the wind working groups had on each of the market factors listed. For this table, imagine that each market factor category has a pie chart where WPA and the wind working group would receive a share of the credit (between 0 and 100%) for influencing that market factor. Table 2b shows ranges you can use to describe WPA or the wind working group's share of influence for each factor.

    a. [Walk respondent through Table 2a, assigning a ranking for each factor and making notes on any justification they provide for each one. Add other factors as needed in the rows provided. For each factor that the respondent assigns as >50%, ask them to provide a specific percentage. Repeat for utility and small-scale wind as required].

**Process Questions**

Now I'd like to turn to some detailed questions about WPA activities in [state] and the wind working groups in neighboring states.

[If respondent said **WWG/WPA had an impact, ask question 15**]

10. I'd like to revisit which wind working group or WPA-funded activities were impactful in terms of influencing the wind power market in [state]. I'm going to read a short list of the activities and potential outcomes from WPA and the wind working groups. For each, please tell me if it was very important, somewhat important, somewhat unimportant, or not at all important in influencing the state's wind market. If you're unfamiliar with the role of a particular activity, please say "unfamiliar." [If any importance, probe about specific states.]

    a. Supporting anemometer loan programs that allow participants to borrow equipment to measure wind resources and determine wind potential in selected areas.

    b. Supporting Wind for Schools programs that sought to increase the visibility of small-scale wind turbines and improve the availability of a wind-educated workforce.

    c. Increasing the general public's support for (or reducing resistance to) wind turbines and wind farms by increasing awareness, knowledge and appreciation of wind power's benefits.

    d. Encouraging and enabling wind working group members, project developers, and land owners to initiate wind power projects or installations.

    e. Developing and disseminating targeted technical information such as detailed wind resource maps, a small-wind development guides, or economic and financial analysis tools.

f. Building networks and improving information sharing among stakeholders—including policy makers, regulators and developers—through meetings, workshops and annual award and networking events.

g. Developing or lobbying for state and local policies or regulations to support wind power, including permitting and siting ordinances, transmission and interconnection regulations, or renewable portfolio standards.

[If respondent said **WWG/WPA had no impact, ask question 16**]

11. You said that WPA and the wind working groups had limited or no impact on wind capacity additions in [state]; however, I'd like to briefly revisit which, if any, of their activities were impactful in terms of at least influencing the state's wind power market. I'm going to read a short list of the activities and potential outcomes from WPA and neighboring states' wind working groups. For each, please tell me if it was very important, somewhat important, somewhat unimportant, or not at all important in influencing the state's wind market. If you're unfamiliar with the role of a particular activity, please say "unfamiliar." [If any importance, probe about specific states.]

    h. Supporting anemometer loan programs that allow participants to borrow equipment to measure wind resources and determine wind potential in selected areas.

    i. Supporting Wind for Schools programs that sought to increase the visibility of small-scale wind turbines and improve the availability of a wind-educated workforce.

    j. Increasing the general public's support for (or reducing resistance to) wind turbines and wind farms by increasing awareness, knowledge and appreciation of wind power's benefits.

    k. Encouraging and enabling wind working group members, project developers, and land owners to initiate wind power projects or installations.

    l. Developing and disseminating targeted technical information such as detailed wind resource maps, a small-wind development guides, or economic and financial analysis tools.

    m. Building networks and improving information sharing among stakeholders—including policy makers, regulators and developers—through meetings, workshops and annual award and networking events.

    n. Developing or lobbying for state and local policies or regulations to support wind power, including permitting and siting ordinances, transmission and interconnection regulations, or renewable portfolio standards.

**Secondary Impact**

12. In addition to WPA's state-based activities, such as the wind working groups, the program also supported three other initiatives. I'm going to read a brief description of each initiative, and would like for you to indicate if you consider it to have had a very significant, somewhat significant, somewhat insignificant, or insignificant impact on the addition of wind capacity in [state]. Again, if you're unfamiliar with the role of a particular program, please say "unfamiliar."

    a. The Wind Energy for Rural Economic Development program, which sought to promote the positive economic impacts that wind development and equipment manufacturing and installation could have in rural areas through jobs, property taxes, and landowner revenues. An example would be providing communities access to software that helps to model potential jobs and other local economic impacts of wind development.

b. A Public Utility Partnership Program through which WPA works with cooperative and municipal utilities and organizations like the American Public Power Administration (APPA) to address technical and economic barriers to wind power development. An example would be providing access to tools or experts who can help a utility understand the wind resource potential in their territory or determining the cost-per-kWh for a specific wind project.

c. The Federal Wind Power or "Greening Federal Loads" Program, which includes efforts to aggregate the energy load of federal facilities (including the Department of Defense) and purchase renewable energy or green tags to serve that load.

13. Can you think of any instances where organizations in [state] adopted the activities or tactics of a wind working group in a neighboring state? [probe about specific activities and states]

**Revisiting Impact Assessment**

Thank you for your time so far; we're almost done. Before we wrap up I'd like to give you the opportunity to revisit the impact and influence numbers you provided earlier based on our discussion. [Repeat for utility/small-scale wind as appropriate.]

14. Turning back to Table 1 on the Market Impact Worksheet…

    a. Are there any factors or activities you would like to add to the list that impacted the rate or timing of wind capacity additions in [state]?

    b. And would you like to revise any of the numbers representing each factor or activity's share of the direct impact on wind capacity additions?

15. For Table 2a…

    a. Would you like to revise any of the numbers representing WPA and the wind working group's level of influence on each listed factor or activity?

**Conclusion**

Thank you for taking the time to work through these questions with me. As discussed in our earlier emails, in the coming weeks we'll be emailing you a summary of the rankings and comments we receive from other respondents in your state. These responses will be kept anonymous – no one will know who else has contributed. At that point we'll ask you to consider others' responses and input and again reconsider your quantitative rankings in the Market Influence Spreadsheet. Our goal is to reach some consensus about the interactions and influences of the market factors we discussed.

16. Before we finish, is there anything else you'd like to add about Wind Powering America, the wind working groups, or the growth of the wind market in [state]?

[end interview]

# Appendix B. Model Input Data and Summary Output Tables

This appendix includes key data inputs and summary output tables that were not included in the main body of the report.

**Table B-1. Target-State Estimated Influence Expected Values and 90% Confidence Interval Ranges by State and Respondent ID: Utility-Scale Wind**

| State - Respondent | State-Based Activities (Utility) | | | Other WPA Activities (Utility) | | |
|---|---|---|---|---|---|---|
| | Low | Expected | High | Low | Expected | High |
| Alaska - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Alaska - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Alaska - C | N/A | N/A | N/A | N/A | N/A | N/A |
| Alaska - D | N/A | N/A | N/A | N/A | N/A | N/A |
| Alaska - E | N/A | N/A | N/A | N/A | N/A | N/A |
| Colorado - A | 0% | 5% | 10% | 0% | 0% | 10% |
| Colorado - B | 0% | 0% | 5% | 0% | 0% | 5% |
| Colorado - C | 4% | 5% | 10% | 4% | 5% | 10% |
| Colorado - D | 3% | 5% | 10% | 0% | 1% | 3% |
| Colorado - E | N/A | N/A | N/A | N/A | N/A | N/A |
| Idaho - A | 2% | 5% | 15% | 1% | 2% | 5% |
| Idaho - B | 5% | 10% | 20% | 3% | 6% | 12% |
| Idaho - C | 0% | 3% | 8% | 0% | 2% | 7% |
| Idaho - D | 20% | 25% | 50% | 0% | 0% | 5% |
| Idaho - E | N/A | N/A | N/A | N/A | N/A | N/A |
| Illinois - A | 5% | 5% | 10% | 0% | 0% | 6% |
| Illinois - B | 0% | 0% | 10% | 0% | 0% | 10% |
| Illinois - C | 3% | 5% | 10% | 3% | 5% | 7% |
| Illinois - D | 10% | 15% | 25% | 2% | 5% | 10% |
| Illinois - E | N/A | N/A | N/A | N/A | N/A | N/A |
| Indiana - A | 10% | 15% | 20% | 0% | 0% | 8% |
| Indiana - C | 0% | 5% | 10% | 0% | 0% | 5% |
| Indiana - D | N/A | N/A | N/A | N/A | N/A | N/A |
| Maryland - A | 0% | 0% | 5% | 0% | 0% | 5% |
| Maryland - B | 0% | 0% | 0% | 0% | 0% | 0% |
| Maryland - C | N/A | N/A | N/A | N/A | N/A | N/A |
| Maryland - D | N/A | N/A | N/A | N/A | N/A | N/A |
| Nebraska - A | 10% | 20% | 30% | 15% | 20% | 25% |
| Nebraska - B | 9% | 10% | 25% | 9% | 10% | 40% |
| Nebraska - C | 0% | 0% | 5% | 0% | 0% | 5% |
| Nebraska - D | 20% | 25% | 80% | 3% | 5% | 65% |
| Nebraska - E | 0% | 1% | 6% | 0% | 0% | 5% |
| Nevada - A | 0% | 0% | 5% | 0% | 0% | 5% |
| Nevada - B | 0% | 4% | 4% | 0% | 4% | 4% |

| State - Respondent | State-Based Activities (Utility) | | | Other WPA Activities (Utility) | | |
|---|---|---|---|---|---|---|
| | Low | Expected | High | Low | Expected | High |
| Nevada - C | N/A | N/A | N/A | N/A | N/A | N/A |
| Nevada - D | N/A | N/A | N/A | N/A | N/A | N/A |
| Nevada - E | 0% | 5% | 10% | 0% | 2% | 7% |
| Nevada - F | 0% | 0% | 2% | 0% | 0% | 0% |
| North Dakota - A | 20% | 20% | 30% | 10% | 20% | 20% |
| North Dakota - B | 15% | 20% | 25% | 1% | 3% | 5% |
| North Dakota - C | 0% | 0% | 0% | 0% | 0% | 0% |
| North Dakota - D | 10% | 30% | 30% | 0% | 0% | 10% |
| North Dakota - E | 5% | 5% | 20% | 0% | 0% | 10% |
| North Dakota - F | 0% | 5% | 18% | 0% | 0% | 10% |
| Ohio - A | 20% | 25% | 30% | 0% | 5% | 10% |
| Ohio - B | 10% | 10% | 20% | 5% | 5% | 15% |
| Ohio - C | N/A | N/A | N/A | N/A | N/A | N/A |
| Ohio - D | N/A | N/A | N/A | N/A | N/A | N/A |
| Oklahoma - A | 0% | 5% | 50% | 0% | 0% | 40% |
| Oklahoma - B | 10% | 10% | 25% | 0% | 0% | 5% |
| Oklahoma - C | 6% | 7% | 9% | 0% | 0% | 5% |
| Oklahoma - D | 25% | 45% | 70% | 0% | 5% | 20% |
| Oklahoma - E | N/A | N/A | N/A | N/A | N/A | N/A |
| Oklahoma - F | N/A | N/A | N/A | N/A | N/A | N/A |
| Oregon - A | 0% | 5% | 10% | 0% | 5% | 10% |
| Oregon - B | 0% | 0% | 5% | 0% | 0% | 5% |
| Oregon - C | 0% | 0% | 10% | 0% | 0% | 10% |
| Oregon - D | 0% | 0% | 5% | 0% | 5% | 15% |
| Oregon - E | N/A | N/A | N/A | N/A | N/A | N/A |
| Washington - A | 2% | 5% | 7% | 0% | 0% | 3% |
| Washington - B | 2% | 5% | 6% | 2% | 5% | 8% |
| Washington - C | N/A | N/A | N/A | N/A | N/A | N/A |
| Washington - D | N/A | N/A | N/A | N/A | N/A | N/A |
| Wyoming - A | 1% | 5% | 10% | 0% | 1% | 5% |
| Wyoming - B | 0% | 2% | 7% | 0% | 3% | 8% |
| Wyoming - C | 0% | 0% | 10% | 0% | 0% | 10% |
| Wyoming - D | 5% | 5% | 15% | 0% | 0% | 10% |
| Wyoming - E | 0% | 0% | 10% | 2% | 5% | 15% |

Note: N/A indicates respondent gave no estimates for this market.
Source: Navigant analysis

**Table B-2. Target-State Estimated Influence Expected Values and 90% Confidence Interval Ranges by State and Respondent ID: Small-Wind Market**

| State - Respondent | State-Based Activities (Small) | | | Other WPA Activities (Small) | | |
|---|---|---|---|---|---|---|
| | Low | Expected | High | Low | Expected | High |
| Alaska - A | 3% | 3% | 5% | 5% | 5% | 10% |
| Alaska - B | 70% | 75% | 90% | 3% | 5% | 10% |
| Alaska - C | 10% | 15% | 20% | 0% | 3% | 8% |
| Alaska - D | 10% | 15% | 40% | 3% | 5% | 15% |
| Alaska - E | 13% | 15% | 40% | 4% | 5% | 6% |
| Colorado - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Colorado - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Colorado - C | 20% | 50% | 60% | 4% | 5% | 10% |
| Colorado - D | 10% | 20% | 30% | 3% | 5% | 10% |
| Colorado - E | 5% | 25% | 35% | 0% | 5% | 15% |
| Idaho - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Idaho - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Idaho - C | 3% | 8% | 13% | 5% | 10% | 15% |
| Idaho - D | 20% | 25% | 50% | 0% | 0% | 5% |
| Idaho - E | 1% | 5% | 10% | 1% | 5% | 10% |
| Illinois - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Illinois - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Illinois - C | 3% | 5% | 7% | 3% | 5% | 12% |
| Illinois - D | 10% | 15% | 20% | 2% | 5% | 10% |
| Illinois - E | 5% | 7% | 8% | 5% | 7% | 8% |
| Indiana - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Indiana - C | 0% | 5% | 10% | 0% | 0% | 5% |
| Indiana - D | 15% | 20% | 40% | 0% | 0% | 15% |
| Maryland - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Maryland - B | 10% | 13% | 20% | 0% | 0% | 0% |
| Maryland - C | 5% | 10% | 20% | 0% | 5% | 15% |
| Maryland - D | 10% | 30% | 40% | 3% | 5% | 10% |
| Nebraska - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Nebraska - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Nebraska - C | 25% | 30% | 35% | 0% | 0% | 5% |
| Nebraska - D | 20% | 30% | 75% | 8% | 10% | 70% |
| Nebraska - E | 45% | 50% | 55% | 0% | 0% | 5% |
| Nevada - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Nevada - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Nevada - C | 15% | 20% | 25% | 6% | 8% | 10% |
| Nevada - D | 0% | 3% | 10% | 0% | 10% | 10% |
| Nevada - E | 0% | 0% | 5% | 0% | 0% | 5% |
| Nevada - F | 3% | 3% | 5% | 0% | 0% | 0% |
| North Dakota - A | N/A | N/A | N/A | N/A | N/A | N/A |

| State - Respondent | State-Based Activities (Small) | | | Other WPA Activities (Small) | | |
|---|---|---|---|---|---|---|
| | Low | Expected | High | Low | Expected | High |
| North Dakota - B | N/A | N/A | N/A | N/A | N/A | N/A |
| North Dakota - C | N/A | N/A | N/A | N/A | N/A | N/A |
| North Dakota - D | 5% | 10% | 15% | 0% | 0% | 10% |
| North Dakota - E | 15% | 20% | 30% | 0% | 5% | 10% |
| North Dakota - F | 5% | 10% | 20% | 0% | 0% | 10% |
| Ohio - A | 30% | 35% | 40% | 0% | 5% | 10% |
| Ohio - B | 10% | 10% | 20% | 5% | 5% | 15% |
| Ohio - C | 10% | 15% | 25% | 5% | 8% | 15% |
| Ohio - D | 10% | 10% | 15% | 5% | 10% | 10% |
| Oklahoma - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Oklahoma - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Oklahoma - C | N/A | N/A | N/A | N/A | N/A | N/A |
| Oklahoma - D | 0% | 10% | 20% | 0% | 5% | 20% |
| Oklahoma - E | 0% | 5% | 5% | 0% | 15% | 15% |
| Oklahoma - F | 10% | 15% | 30% | 15% | 20% | 40% |
| Oregon - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Oregon - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Oregon - C | 5% | 10% | 20% | 5% | 5% | 10% |
| Oregon - D | 0% | 10% | 15% | 0% | 10% | 20% |
| Oregon - E | 1% | 10% | 20% | 0% | 5% | 7% |
| Washington - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Washington - B | 2% | 5% | 10% | 2% | 5% | 8% |
| Washington - C | 5% | 10% | 20% | 0% | 0% | 0% |
| Washington - D | 5% | 10% | 20% | 2% | 2% | 15% |
| Wyoming - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Wyoming - B | N/A | N/A | N/A | N/A | N/A | N/A |
| Wyoming - C | N/A | N/A | N/A | N/A | N/A | N/A |
| Wyoming - D | 20% | 25% | 30% | 0% | 0% | 10% |
| Wyoming - E | 5% | 10% | 25% | 5% | 5% | 25% |

Note: N/A indicates respondent gave no estimates for this market.
Source: Navigant analysis

**Table B-3. Non-Target-State Estimated Influence Expected Values and 90% Confidence Interval Ranges by State and Respondent ID: Utility-Scale Wind**

| State - Respondent | State-Based Activities (Utility) | | | Other WPA Activities (Utility) | | |
|---|---|---|---|---|---|---|
| | Low | Expected | High | Low | Expected | High |
| Iowa - A | 5% | 6% | 10% | 0% | 0% | 10% |
| Iowa - B | 0% | 0% | 10% | 1% | 3% | 4% |
| Iowa - C | 0% | 5% | 10% | 5% | 5% | 10% |
| Iowa - D | N/A | N/A | N/A | N/A | N/A | N/A |
| New York - A | 3% | 5% | 13% | 0% | 5% | 10% |
| New York - B | 0% | 0% | 3% | 0% | 1% | 5% |
| New York - C | 0% | 0% | 10% | 0% | 0% | 10% |
| New York - D | 0% | 0% | 20% | 0% | 0% | 5% |
| New York - E | N/A | N/A | N/A | N/A | N/A | N/A |
| Texas - A | 0% | 3% | 8% | 0% | 0% | 5% |
| Texas - B | 3% | 5% | 10% | 3% | 3% | 5% |
| Texas - C | 2% | 3% | 3% | 3% | 3% | 5% |

Note: N/A indicates respondent gave no estimates for this market.
Source: Navigant analysis

**Table B-4. Non-Target-State Estimated Influence Expected Values and 90% Confidence Interval Ranges by State and Respondent ID: Small-Wind**

| State - Respondent | State-Based Activities (Small) | | | Other WPA Activities (Small) | | |
|---|---|---|---|---|---|---|
| | Low | Expected | High | Low | Expected | High |
| Iowa - A | N/A | N/A | N/A | N/A | N/A | N/A |
| Iowa - B | 4% | 5% | 8% | 5% | 8% | 10% |
| Iowa - C | 0% | 0% | 5% | 0% | 0% | 5% |
| Iowa - D | 5% | 10% | 20% | 0% | 0% | 5% |
| New York - A | N/A | N/A | N/A | N/A | N/A | N/A |
| New York - B | N/A | N/A | N/A | N/A | N/A | N/A |
| New York - C | 0% | 0% | 10% | 0% | 0% | 10% |
| New York - D | 10% | 10% | 25% | 0% | 0% | 5% |
| New York - E | 1% | 4% | 10% | 1% | 4% | 10% |
| Texas - A | 20% | 25% | 30% | 0% | 0% | 5% |
| Texas - B | 20% | 25% | 30% | 5% | 5% | 10% |
| Texas - C | 4% | 5% | 6% | 3% | 3% | 5% |

Note: N/A indicates respondent gave no estimates for this market.
Source: Navigant analysis

**Table B-5. Annual Incremental Utility-Scale Wind Capacity Additions by State (MW)**

| Category | WWG Start | State | pre-2000 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WPA-targeted | 2000 | ND | 0 | 0 | 0 | 4 | 62 | 0 | 32 | 81 | 167 | 370 | 488 | 221 | 21 |
| | 2001 | ID | 0 | 0 | 0 | 0 | 0 | 0 | 75 | 0 | 0 | 0 | 71 | 206 | 265 |
| | 2001 | OK | 0 | 0 | 0 | 0 | 176 | 0 | 298 | 60 | 155 | 19 | 323 | 451 | 525 |
| | 2001 | AZ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 65 | 11 |
| | 2001 | MT | 0 | 0 | 0 | 0 | 1 | 0 | 136 | 9 | 7 | 119 | 104 | 11 | 0 |
| | 2001 | NM | 1 | 0 | 0 | 0 | 205 | 60 | 140 | 90 | 0 | 2 | 100 | 102 | 50 |
| | 2001 | UT | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 19 | 204 | 0 | 102 |
| | 2002 | NV | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2002 | OR | 25 | 0 | 132 | 62 | 41 | 3 | 75 | 101 | 447 | 182 | 691 | 346 | 409 |
| | 2002 | WA | 0 | 0 | 180 | 48 | 16 | 0 | 149 | 428 | 345 | 212 | 474 | 256 | 468 |
| | 2002 | HI | 2 | 0 | 0 | 7 | 0 | 0 | 0 | 34 | 21 | 0 | 0 | 0 | 28 |
| | 2002 | MI | 1 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 142 | 0 | 26 | 213 |
| | 2002 | NC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2002 | VA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2003 | AK | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | 2 | 2 | 3 |
| | 2003 | CO | 22 | 0 | 40 | 0 | 162 | 8 | 0 | 60 | 776 | 1 | 177 | 54 | 506 |
| | 2003 | OH | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 2 | 103 |
| | 2003 | SD | 0 | 0 | 3 | 0 | 41 | 0 | 0 | 0 | 54 | 89 | 126 | 396 | 75 |
| | 2004 | KY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2004 | PE | 0 | 10 | 24 | 0 | 95 | 0 | 0 | 50 | 115 | 67 | 388 | 0 | 41 |
| | 2004 | TN | 0 | 2 | 0 | 0 | 0 | 27 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2005 | IN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 131 | 905 | 303 | 1 |
| | 2005 | MD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 50 |
| | 2005 | GA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2005 | MA | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 9 | 3 | 30 |
| | 2005 | WV | 0 | 0 | 0 | 66 | 0 | 0 | 0 | 0 | 80 | 184 | 0 | 101 | 134 |
| | 2006 | IL | 0 | 0 | 0 | 0 | 50 | 1 | 56 | 0 | 592 | 216 | 632 | 497 | 697 |
| | 2006 | NJ | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2007 | NE | 3 | 0 | 0 | 11 | 0 | 0 | 59 | 0 | 0 | 45 | 36 | 60 | 125 |
| | 2007 | W | 73 | 18 | 50 | 0 | 144 | 0 | 4 | 0 | 0 | 388 | 423 | 313 | 0 |
| | 2007 | CT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2007 | MO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 62 | 101 | 146 | 149 | 2 |
| | 2007 | WI | 23 | 0 | 30 | 0 | 0 | 0 | 0 | 0 | 0 | 396 | 0 | 20 | 163 |
| | 2008 | AR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2008 | KS | 2 | 0 | 112 | 0 | 0 | 0 | 150 | 101 | 0 | 557 | 100 | 53 | 200 |
| | 2008 | ME | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 33 | 5 | 128 | 91 | 131 |
| Non-WPA progressive | | CA | 1616 | 0 | 67 | 140 | 202 | 70 | 54 | 227 | 63 | 98 | 261 | 455 | 664 |
| | | IA | 242 | 0 | 82 | 98 | 49 | 162 | 202 | 96 | 341 | 1518 | 813 | 71 | 647 |
| | | MN | 273 | 18 | 29 | 18 | 221 | 42 | 145 | 150 | 404 | 453 | 57 | 395 | 513 |
| | | NY | 0 | 18 | 30 | 0 | 0 | 0 | 137 | 185 | 55 | 407 | 443 | 0 | 129 |
| | | TX | 184 | 0 | 912 | 0 | 195 | 0 | 702 | 744 | 1618 | 2759 | 2291 | 686 | 304 |
| Non-WPA low-wind | | AL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | DE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| | | FL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | LA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | MS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | NH. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 24 | 0 | 0 | 0 |
| | | RI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 2 | 0 | 0 |
| | | SC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | VT | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 40 |

Note: Shading indicates years exposed to WWG in each state.
Source: WPA 2012, AWEA 2013

## Table B-6. Annual Cumulative Utility-Scale Wind Capacity by State (MW)

| Category | WWG Start | State | pre-2000 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WPA-targeted | 2000 | ND | 0 | 0 | 0 | 5 | 66 | 66 | 98 | 178 | 345 | 714 | 1203 | 1424 | 1445 |
| | 2001 | ID | 0 | 0 | 0 | 0 | 0 | 0 | 75 | 75 | 75 | 76 | 147 | 353 | 618 |
| | 2001 | OK | 0 | 0 | 0 | 0 | 176 | 176 | 475 | 535 | 689 | 708 | 1031 | 1482 | 2007 |
| | 2001 | AZ | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 128 | 139 |
| | 2001 | MT | 0 | 0 | 0 | 0 | 1 | 1 | 137 | 146 | 153 | 271 | 375 | 386 | 386 |
| | 2001 | NM | 1 | 1 | 1 | 1 | 206 | 266 | 406 | 496 | 496 | 497 | 597 | 700 | 750 |
| | 2001 | UT | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 20 | 223 | 223 | 325 |
| | 2002 | NV | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2002 | OR | 25 | 25 | 157 | 218 | 259 | 263 | 338 | 438 | 885 | 1067 | 1758 | 2104 | 2513 |
| | 2002 | WA | 0 | 0 | 180 | 228 | 244 | 244 | 393 | 821 | 1166 | 1378 | 1852 | 2108 | 2576 |
| | 2002 | HI | 2 | 2 | 2 | 9 | 9 | 9 | 9 | 42 | 63 | 63 | 63 | 63 | 92 |
| | 2002 | MI | 1 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 144 | 144 | 170 | 383 |
| | 2002 | NC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2002 | VA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2003 | AK | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 5 | 5 | 7 | 8 | 10 | 13 |
| | 2003 | CO | 22 | 22 | 61 | 61 | 223 | 231 | 231 | 291 | 1067 | 1068 | 1244 | 1299 | 1805 |
| | 2003 | OH | 0 | 0 | 0 | 0 | 4 | 7 | 7 | 7 | 7 | 7 | 7 | 10 | 112 |
| | 2003 | SD | 0 | 0 | 3 | 3 | 44 | 44 | 44 | 44 | 98 | 187 | 313 | 709 | 784 |
| | 2004 | KY | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2004 | PE | 0 | 11 | 35 | 35 | 129 | 129 | 129 | 179 | 294 | 361 | 748 | 748 | 789 |
| | 2004 | TN | 0 | 2 | 2 | 2 | 2 | 29 | 29 | 29 | 29 | 29 | 29 | 29 | 29 |
| | 2005 | IN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 131 | 1036 | 1339 | 1340 |
| | 2005 | MD | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 70 | 120 |
| | 2005 | GA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2005 | MA | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 4 | 5 | 6 | 15 | 18 | 47 |
| | 2005 | WV | 0 | 0 | 0 | 66 | 66 | 66 | 66 | 66 | 146 | 330 | 330 | 431 | 564 |
| | 2006 | IL | 0 | 0 | 0 | 0 | 50 | 51 | 107 | 107 | 699 | 915 | 1547 | 2045 | 2742 |
| | 2006 | NJ | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | 2007 | NE | 3 | 3 | 3 | 14 | 14 | 14 | 73 | 73 | 73 | 118 | 154 | 214 | 339 |
| | 2007 | W | 73 | 91 | 141 | 141 | 285 | 285 | 288 | 288 | 288 | 676 | 1099 | 1412 | 1412 |
| | 2007 | CT | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2007 | MO | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 62 | 163 | 309 | 457 | 459 |
| | 2007 | WI | 23 | 23 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 449 | 449 | 469 | 631 |
| | 2008 | AR | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | 2008 | KS | 2 | 2 | 114 | 114 | 114 | 114 | 264 | 364 | 364 | 921 | 1021 | 1074 | 1274 |
| | 2008 | ME | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 42 | 47 | 175 | 266 | 397 |
| Non-WPA progressive | | CA | 1616 | 1616 | 1683 | 1823 | 2025 | 2095 | 2149 | 2376 | 2439 | 2537 | 2798 | 3253 | 3917 |
| | | IA | 242 | 242 | 324 | 423 | 472 | 634 | 836 | 932 | 1273 | 2791 | 3604 | 3675 | 4322 |
| | | MN | 273 | 291 | 320 | 338 | 558 | 600 | 745 | 896 | 1300 | 1753 | 1810 | 2205 | 2718 |
| | | NY | 0 | 18 | 48 | 48 | 48 | 48 | 186 | 370 | 425 | 832 | 1274 | 1274 | 1403 |
| | | TX | 184 | 184 | 1096 | 1096 | 1290 | 1290 | 1992 | 2736 | 4353 | 7113 | 9403 | 10089 | 10394 |
| Non-WPA low-wind | | AL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | DE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 2 |
| | | FL | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | LA | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | MS | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | NH. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 25 | 25 | 25 | 26 |
| | | RI | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 2 | 2 | 2 |
| | | SC | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | VT | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 46 |

Note: Shading indicates years exposed to WWG in each state.
Source: WPA 2012, AWEA 2013

**Table B-7. Baseline Capacity Values Used in Influence Calculations: Capacity Installed through 2011 that was Exposed to WPA Influence**

| State | Utility-Scale (MW) | Small-Wind (MW) |
|---|---|---|
| Alaska | N/A | 10.7 |
| Colorado | 1,743 | 2.5 |
| Idaho | 618 | 2.2 |
| Illinois | 2,635 | 7.4 |
| Indiana | 1,340 | 4.1 |
| Maryland | 120 | 1.3 |
| Nebraska | 266 | 1.6 |
| Nevada | 0 | 5.2 |
| North Dakota | 1,444 | 1.9 |
| Ohio | 112 | 10.9 |
| Oklahoma | 2,007 | 1.2 |
| Oregon | 2,356 | 1.6 |
| Washington | 2,396 | 2.4 |
| Wyoming | 1,124 | 2.6 |
| **Non-target States:** | | |
| Iowa | 3,688 | 27.5 |
| New York | 1,355 | 4.6 |
| Texas | 10,210 | 9.4 |

Note: Capacity values are from the year each state's wind working group was formed through the end of 2011. For non-target states, the start year was the average year that working groups were started in adjacent states. This evaluation defines "utility-scale wind" as installed projects greater than 1 MW and "small-wind" as projects of 1 MW or less.
Source: Utility-scale wind data (WPA 2012); Small-wind data (eFormative Options 2012) and Navigant analysis

**Table B-8. State-level Influence Estimates and 90% Confidence Intervals: Other WPA Activities in Sampled States**

| State | Utility-Scale Capacity Estimate Range (MW) | | | Small-Wind Capacity Estimate Range (MW) | | |
|---|---|---|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound | Lower Bound | Expected Value | Upper Bound |
| Alaska | 0 | 0 | 0 | 0.5 | 0.6 | 0.8 |
| Colorado | 35 | 54 | 77 | 0.1 | 0.2 | 0.2 |
| Idaho | 15 | 22 | 29 | 0.1 | 0.1 | 0.2 |
| Illinois | 72 | 104 | 144 | 0.4 | 0.5 | 0.6 |
| Indiana | 7 | 28 | 57 | 0.0 | 0.1 | 0.3 |
| Maryland | 0 | 1 | 2 | 0.0 | 0.1 | 0.1 |
| Nebraska | 23 | 35 | 51 | 0.1 | 0.2 | 0.3 |
| Nevada | 0 | 0 | 0 | 0.1 | 0.2 | 0.3 |
| North Dakota | 52 | 71 | 90 | 0.0 | 0.1 | 0.1 |
| Ohio | 5 | 7 | 11 | 0.7 | 0.8 | 1.0 |
| Oklahoma | 52 | 118 | 223 | 0.1 | 0.2 | 0.2 |
| Oregon | 57 | 98 | 142 | 0.1 | 0.1 | 0.1 |
| Washington | 45 | 72 | 101 | 0.1 | 0.1 | 0.1 |
| Wyoming | 27 | 44 | 64 | 0.1 | 0.2 | 0.3 |
| **Total** | **389** | **655** | **990** | **2.4** | **3.4** | **4.6** |

Source: Navigant analysis

**Table B-9. Non-Target State Influence Estimates and 90% Confidence Intervals: Other WPA Activities**

| State | Utility-Scale Capacity Estimate Range (MW) | | | Small-Wind Capacity Estimate Range (MW) | | |
|---|---|---|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound | Lower Bound | Expected Value | Upper Bound |
| Iowa | 107 | 152 | 215 | 0.7 | 1.0 | 1.3 |
| New York | 22 | 40 | 61 | 0.1 | 0.2 | 0.2 |
| Texas | 239 | 301 | 390 | 0.3 | 0.4 | 0.5 |
| **Total** | **368** | **494** | **666** | **1.1** | **1.5** | **2.0** |

Source: Navigant analysis

**Table B-10. WPA Influence Estimates and 90% Confidence Intervals Based on Capacity Installed Through 2012: All WPA-Targeted States**

| Market / Activity Category | Capacity Impacts (MW) | | |
|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound |
| ***Utility-Scale Market*** | ***3,893*** | ***5,115*** | ***6,731*** |
| State-Based Activities | 2,680 | 3,326 | 4,152 |
| Other WPA Activities | 1,212 | 1,789 | 2,579 |
| ***Small-Wind Market*** | ***22.8*** | ***24.6*** | ***26.5*** |
| State-Based Activities | 17.0 | 18.1 | 19.4 |
| Other WPA Activities | 5.8 | 6.5 | 7.1 |
| **Total: All Markets and WPA Activities** | **3,915** | **5,139** | **6,758** |

Notes: Small-wind estimates are through 2011, as 2012 data were unavailable at the time of publication.
Source: Navigant analysis

**Table B-11. Capacity-Based Estimates of WPA Influence as a Percent of Overall Wind Capacity Additions Through 2012: All WPA-Targeted States**

| Market / Activity Category | Estimate's Share of Overall Capacity Installed | | | Capacity Added (MW) |
|---|---|---|---|---|
| | Lower Bound | Expected Value | Upper Bound | |
| ***Utility-Scale Market*** | ***17.3%*** | ***22.7%*** | ***29.9%*** | 30,475 |
| State-Based Activities | 11.9% | 14.8% | 18.4% | |
| Other WPA Activities | 5.4% | 7.9% | 11.4% | |
| ***Small-Wind Market*** | ***21.6%*** | ***23.3%*** | ***25.1%*** | 105.61 |
| State-Based Activities | 16.1% | 17.2% | 18.4% | |
| Other WPA Activities | 5.5% | 6.1% | 6.7% | |
| **Total: All Markets and WPA Activities** | **17.3%** | **22.7%** | **29.8%** | |

Source: Navigant analysis

# Appendix C. Overview of Relevant Federal Policies

This appendix provides an introduction to the federal policies mentioned by respondents over the course of this evaluation that were perceived to have had a significant influence on the addition of either utility-scale or small-wind capacity.

## C.1 Renewable Electricity Production Tax Credit (PTC)

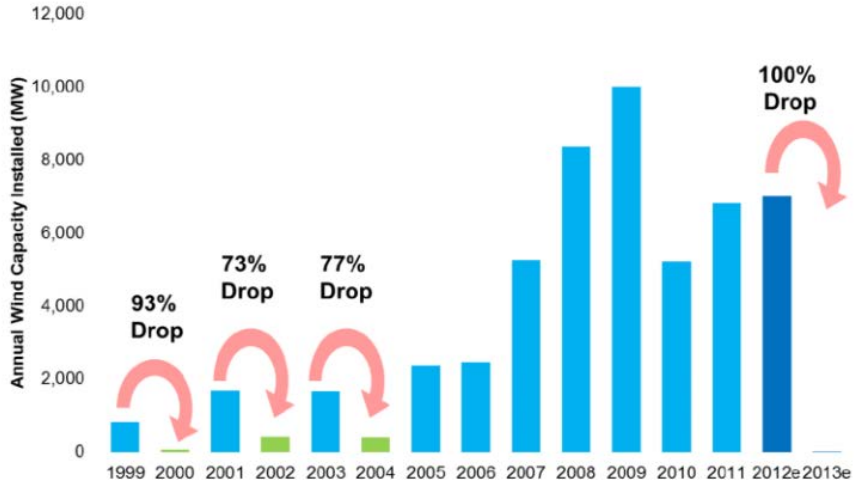
The Renewable Electricity Production Tax Credit is a per-kilowatt-hour (kWh) tax credit for electricity generated by qualified energy resources and sold by the taxpayer to an unrelated person during the taxable year (DSIRE 2012). Furthermore, certain limitations exist on the use of the PTC in combination with other public-sector incentives, including grants, tax-exempt bonds, subsidized energy financing, and other federal tax credits (Bolinger et al. 2009). The PTC is currently available for wind turbines placed in service by December 31, 2012. The PTC is equal to 2.1 cents per kWh in 2009 and is adjusted for inflation. Developers can receive the PTC if the project was placed in service in 2008 or 2009, or if construction ended before 2010 and facilities are placed in service by 2013. (Summit Blue Consulting 2010). Potential expiration of the PTC is soon enough that new projects are not certain to complete construction in time to meet the deadline on December 31, 2013 (Salmon et al. 2011).

Since its enactment in 1992, the PTC has expired and been extended numerous times because of the uncertainty due to the federal policy-making process. As originally enacted by the Energy Policy Act (EPAct) of 1992, the PTC applied to wind and had an expiration date of July 1999. It was subsequently extended through the end of 2001 by the Ticket to Work and Work Incentives Improvement Act of 1999. The PTC expired again at the end of 2001, but was then extended again in March 2002 as part of the Job Creation and Worker Assistance Act. The PTC then expired yet again at the end of 2003 and was not renewed until October 2004, as part of the Working Families Tax Relief Act, which extended the credit through December 31, 2005.

The Energy Policy Act of 2005 modified the credit and extended it through December 31, 2007. In December 2006, the PTC was extended for yet another year—through December 31, 2008—by the Tax Relief and Health Care Act. The PTC was continuously available from 2005 through 2008 and was extended through 2009 as a result of the Emergency Economic Stabilization Act of 2008. Most recently, the PTC was revised in February 2009 to: (1) extend the in-service deadline for most eligible technologies (including wind) by three years; and (2) allow facilities that qualify for the PTC to opt instead to take the Federal Business Energy Investment Tax Credit (ITC) or equivalent cash grant from the U.S. Department of the Treasury.

The short-term and uncertain nature of the policy has resulted in a boom-and-bust development cycle. This has made it difficult for developers, manufacturers, and others to plan for the future of their businesses. As shown in Figure C-1, the federal PTC has had a profound effect on the annual installation of wind capacity. In addition, the rush of development that occurs leading up to a PTC expiration deadline can result in lower quality installations (Stern et al. 2009).

**Figure C-1. Historic Influence of PTC Expiration on Annual Wind Installation**




Source: AWEA 2012a

## C.2 MACRS Depreciation and the Bonus Depreciation

Two types of accelerated deprecation regulations have impacted the addition of U.S. wind capacity.

### C.2.1 MACRS Depreciation

Since 1986, the federal Modified Accelerated Cost-Recovery System (MACRS) has allowed businesses to recover investments in certain property through depreciation deductions. The MACRS establishes a set of class lives for various types of property, ranging from three to 50 years, over which the property may be depreciated. The federal Energy Policy Act of 2005 (EPAct 2005) classified fuel cells, micro-turbines, and solar hybrid lighting technologies as five-year property as well by adding them to § 48(a)(3)(A). This section was further expanded in October 2008 by the addition of geothermal heat pumps, combined heat and power (CHP), and small-scale wind power under the Energy Improvement and Extension Act of 2008.

### C.2.2 Bonus Depreciation

The federal Economic Stimulus Act of 2008, enacted in February 2008, included a 50% first-year bonus depreciation provision for eligible renewable energy systems acquired and placed in service in 2008. This provision was extended (retroactively for the entire 2009 tax year) under the same terms by the American Recovery and Reinvestment Act of 2009 (ARRA). Bonus depreciation was renewed again in September 2010 (retroactively for the entire 2010 tax year) by the Small Business Jobs Act of 2010. In December 2010 the provision for bonus depreciation was amended and extended yet again by the Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010. Under these amendments, eligible property placed in service after September 8, 2010, and before January 1, 2012, qualifies for 100% first-year bonus depreciation. For 2012, bonus depreciation is still available; however, the allowable deduction reverts from 100% to 50% of the eligible basis.

To qualify for bonus depreciation, a project must satisfy these criteria:

- The property must have a recovery period of 20 years or less under normal federal tax depreciation rules.
- The original use of the property must commence with the taxpayer claiming the deduction.
- The property generally must have been acquired during the period from 2008–2012.

- The property must have been placed in service during the period from 2008–2012.

If property meets these requirements, the owner is entitled to deduct a significant portion of the adjusted basis of the property during the tax year the property is first placed in service. As noted above, for property acquired and placed in service after September 8, 2010, and before January 1, 2012, the allowable first-year deduction is 100% of the adjusted basis (i.e., the property is fully depreciated and additional deductions under MACRS cannot be claimed). For property placed in service from 2008–2012, for which the placed in service date does not fall within this window, the allowable first-year deduction is 50% of the adjusted basis. In the case of a 50% first-year deduction, the remaining 50% of the adjusted basis of the property is depreciated over the ordinary MACRS depreciation schedule. The bonus depreciation rules do not override the depreciation limit applicable to projects qualifying for the federal business energy tax credit. Before calculating depreciation for such a project, including any bonus depreciation, the adjusted basis of the project must be reduced by one-half of the amount of the energy credit for which the project qualifies.

## C.3 Extension of the ITC to Small-Scale Wind Power

In October 2008, the ITC was expanded significantly by the Energy Improvement and Extension Act. This law both extended the duration of the existing credits for solar energy, fuel cells, and micro-turbines through December 31, 2016, and established new credits for small-wind-energy systems, geothermal heat pumps, and CHP systems. Further changes included: allowing utilities to use the credits and allowing taxpayers to take the credit against the Alternative Minimum Tax, subject to certain limitations. The credit was further expanded by ARRA (ARRA 2009). In addition, taxpayers now have the choice to take the ITC instead of the PTC for new renewable energy installations.

The ITC for small-wind turbines is equal to 30% of expenditures, with no maximum credit for small-wind turbines placed in service after December 31, 2008. Eligible small-wind property includes wind turbines up to 100 kW in capacity. The maximum credit was $4,000 for eligible property placed in service after October 3, 2008, and before January 1, 2009. ARRA removed the $4,000 maximum credit limit for small-wind turbines. In addition, ARRA allows wind energy systems of all sizes (not only systems of 100 kW or less) to qualify for the 30% ITC through the wind energy PTC in-service deadline of December 31, 2012.

Over a large range of project costs and capacity factors presented, the PTC provides more value than the ITC in about two-thirds of all cases analyzed. Intuitively, projects with higher capacity factors and lower installed costs favor the PTC over the ITC (i.e., a higher capacity factor means that more PTCs are generated, while lower installed costs mean that the value of those PTCs will add up to a higher percentage of installed costs). Under most capacity factor assumptions, projects that cost $1,500/kW or less are likely to receive more value from the PTC, while projects that cost more than $2,500/kW are likely to be better off with the ITC. In between these two cost extremes, capacity factor is a more important determinant.

## C.4 American Recovery and Reinvestment Act of 2009

On February 13, 2009, Congress passed a stimulus package bill known as the American Recovery and Reinvestment Act of 2009, which President Obama signed into law four days later. Of the $787 billion package, more than $40 billion in spending is appropriated for clean energy initiatives. New and modified tax incentives targeting clean energy are estimated to cost an additional $20 billion.

ARRA contained a number of provisions that directly impact how renewable power projects are financed in the United States. The PTC for wind was extended once again through 2012. Also, PTC-qualified wind facilities installed in 2009-2012 are now allowed to elect a 30% ITC in lieu of the PTC. If the ITC

is chosen, the election is irrevocable and requires the depreciable basis of the property to be reduced by one-half the amount of the ITC. In addition, a new cash grant program was created to cover up to 30% of the cost basis of qualified renewable energy projects that are placed in service in 2009-2010 (or that commence construction during 2009-2010 and are placed in service prior to 2013). Projects that elect the ITC can also utilize subsidized energy financing, such as tax-exempt bonds or low-interest loan programs, without suffering a corresponding tax credit. This provision also applies to the new cash grant option.

ARRA also extended 50% bonus depreciation to qualified renewable energy projects acquired and placed in service in 2009. The carryback of net operating losses was extended from two to five years for small businesses (i.e., those with average annual gross receipts of $15 million or less over the most recent three-year period). The maximum dollar caps on the ITC for residential and commercial small-wind power were eliminated, so these wind projects are now eligible for the full 30%. The loan guarantee program was expanded to cover commercial projects and was appropriated an additional $6 billion to reduce the cost of providing the guarantee. Lastly, $1.6 billion in New Clean Renewable Energy Bonds (CREBs) were added for eligible technologies owned by governmental or tribal entities, municipal utilities, and cooperatives.

## C.5 Farm Bills

Several respondents mentioned the importance of various provisions of the U.S. Farm Bills, each described below.

### C.5.1 2002 Farm Bill

The Renewable Energy Systems and Energy Efficiency Improvements Program was created by the U.S. Department of Agriculture (USDA) pursuant to Section 9006 of the federal Farm Security and Rural Investment Act of 2002 (Young 2008). The purpose of the program is to assist eligible farmers, ranchers, and rural small businesses in purchasing renewable energy systems, such as wind energy systems and anaerobic digesters (Young 2008). Funding in the amount of $23 million per year was appropriated for each fiscal year (FY) from FY 2003-2007. In March 2008, the USDA announced that it would accept $220.9 million in applications for grants, loan guarantees, and loan/grant combination packages under the Renewable Energy Systems and Energy Efficiency Improvements Program.

### C.5.2 2008 Farm Bill

The Food, Conservation, and Energy Act of 2008, enacted by Congress in May 2008, converted the federal Renewable Energy Systems and Energy Efficiency Improvements Program into the Rural Energy for America Program (REAP) (Young 2008). Similar to its predecessor, REAP promotes energy efficiency and renewable energy for agricultural producers and rural small businesses through the use of (1) grants and loan guarantees for energy efficiency improvements and renewable energy systems, and (2) grants for energy audits and renewable energy development assistance. Congress has allocated funding for the new program in the following amounts: $55 million for FY 2009, $60 million for FY 2010, $70 million for FY 2011, and $70 million for FY 2012.

Of the total REAP funding available, approximately 88% is dedicated to competitive grants and loan guarantees for energy efficiency improvements and renewable energy systems. These incentives are available to agricultural producers and rural small businesses to purchase renewable energy systems (including systems that may be used to produce and sell electricity) and to make energy efficiency improvements. Eligible renewable energy projects include wind, solar, biomass and geothermal, as well as hydrogen derived from biomass or water using wind, solar or geothermal energy sources. These grants are limited to 25% of a proposed project's cost, and a loan guarantee may not exceed $25 million. The

combined amount of a grant and loan guarantee may not exceed 75% of the project's cost. In general, a minimum of 20% of the funds available for these incentives will be dedicated to grants of $20,000 or less.

## C.6 CREBs Funding

The federal Energy Policy Act of 2005 established Clean Energy Renewable Bonds as a financing mechanism for public-sector renewable energy projects. Clean renewable energy bonds (CREBs) may be used by certain entities—primarily in the public sector—to finance renewable energy projects. The list of qualifying technologies is generally the same as that used for the federal PTC. CREBs may be issued by electric cooperatives, government entities (states, cities, counties, territories, Indian tribal governments or any political subdivision thereof), and by certain lenders. CREBs differ from traditional tax-exempt bonds in that the tax credits issued through CREBs are treated as taxable income for the bondholder. The tax credit may be taken each year the bondholder has a tax liability as long as the credit amount does not exceed the limits established by the federal Energy Policy Act of 2005.

The original legislation allocated $800 million of tax credit bonds to be issued between January 1, 2006, and December 31, 2007. Following the enactment of the federal Tax Relief and Health Care Act of 2006, the Internal Revenue Service (IRS) made an additional $400 million in CREBs financing available for 2008 through Notice 2007-26. In November 2006, the IRS announced that the original $800 million allocation had been reserved for a total of 610 projects. The additional $400 million (plus surrendered volume from the previous allocation) was allocated to 312 projects in February 2008. Of the $1.2 billion total of tax-credit bond volume cap allocated to fund renewable energy projects, state and local government borrowers were limited to $750 million of the volume cap, with the rest reserved for qualified municipal or cooperative electric companies.

The Energy Improvement and Extension Act of 2008 allocated $800 million for new Clean Renewable Energy Bonds. In February 2009, ARRA allocated an additional $1.6 billion for New CREBs (after 2008), for a total New CREB allocation of $2.4 billion. The Energy Improvement and Extension Act of 2008 also extended the deadline for previously reserved allocations ("Old CREBs") until December 31, 2009, and addressed several provisions in the existing law that previously limited the usefulness of the program for some projects. In October 2009, the U.S. Department of the Treasury announced the allocation of $2.2 billion in new CREBs for 805 projects across the country.

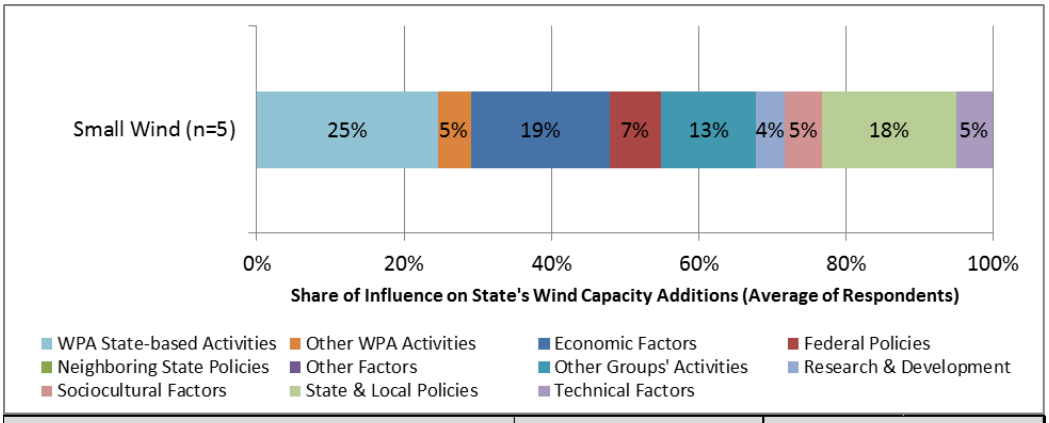
In March 2010 Congress enacted H.R. 2847 permitting New CREB issuers to make an irrevocable election to receive a direct payment—a refundable tax credit—from the U.S. Department of the Treasury equivalent to and in lieu of the amount of the non-refundable tax credit which would otherwise be provided to the bondholder. This option only applies to New CREBs issued after the March 18, 2010 enactment of the law. A new solicitation (IRS Announcement 2010-54) was issued in September 2010 for roughly $191 million in unallocated New CREB bond volume available only to electric cooperatives.

Participation in the program is limited by the volume of bonds allocated by Congress for the program. Participants must first apply to the IRS for a CREBs allocation, and then issue the bonds within a specified time period. The New CREBs allocation totaling $2.4 billion does not have a defined expiration date under the law; however, the recent IRS solicitations for new applications require the bonds to be issued within three years after the applicant receives notification of an approved allocation. Public power providers, governmental bodies, and electric cooperatives are each reserved an equal share (33.3%) of the New CREBs allocation. The tax credit rate is set daily by the U.S. Treasury Department. Under past allocations, the credit could be taken quarterly on a dollar-for-dollar basis to offset the tax liability of the bondholder. However, under the New CREBs allocation, the credit has been reduced to 70% of what it would have been otherwise.

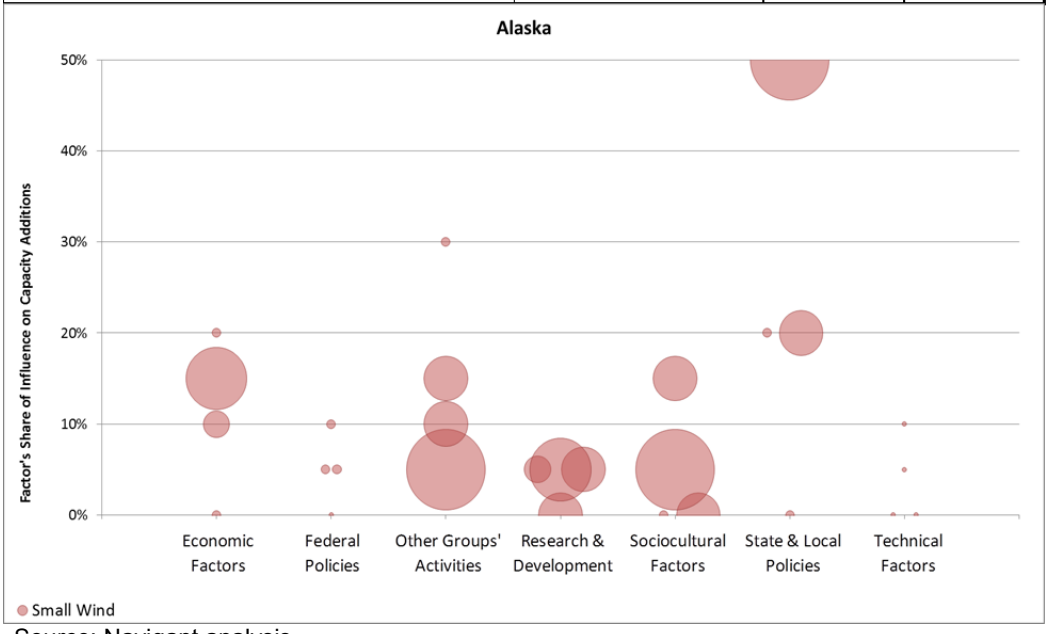
# Appendix D. State Wind Market Development Case Studies

## D.1 Alaska

**Figure D-1. Alaska: WPA Influence Summary Dashboard**

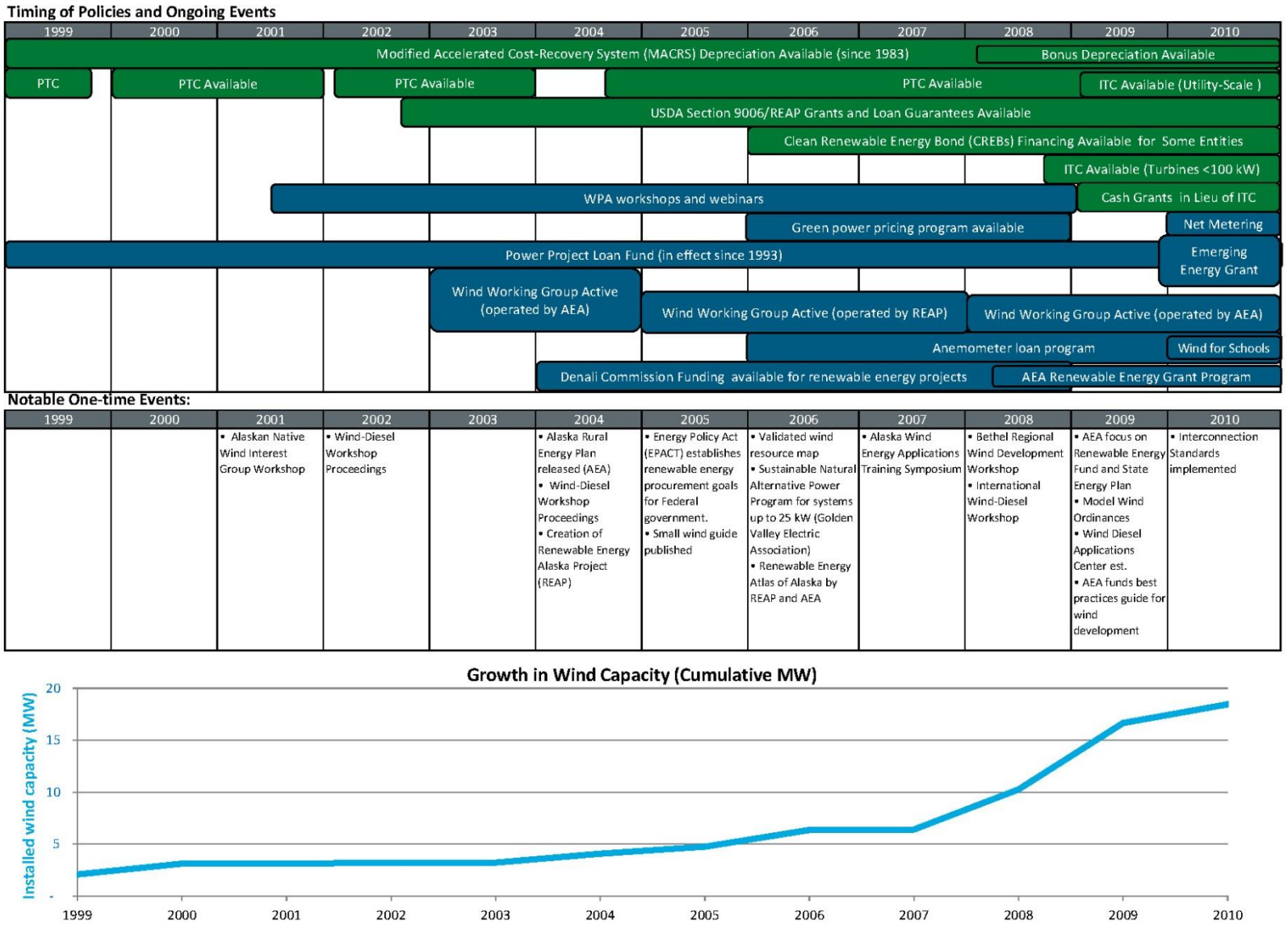



| Alaska | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 0 | 0 | 0 |
| State-based Activities | 0 | 0 | 0 |
| Other WPA Activities | 0 | 0 | 0 |
| **Small-Wind** | 3.6 | 3.2 | 4.1 |
| State-based Activities | 3.0 | 2.7 | 3.4 |
| Other WPA Activities | 0.6 | 0.5 | 0.8 |
| **Total** | **3.6** | **3.2** | **4.1** |
| *Total Capacity Additions, Post-WWG through 2011* | *10.7* | *10.7* | *10.7* |
| *WPA Influence as % of Total* | *34%* | *30%* | *39%* |




Source: Navigant analysis

## Figure D-2. Alaska Wind Market Timeline and Wind Capacity Additions (1999-2010)




Source: Navigant analysis

### D.1.1 State Overview

Alaska power production and distribution is unique in the United States due to its size and rural character, which presents extra challenges as well as opportunities. Alaska uses the second most energy per capita of all the United States. Alaska also has some of the highest energy costs in the country. This makes sustainable energy development particularly important in Alaska. In 1993, the Power Project Loan Fund came into effect in Alaska, in which local governments and utilities are eligible to receive loans for the development or upgrade of small-scale power production, conservation, or bulk fuel storage facilities. Interest rates for these loans were determined in order to allow projects to be financially feasible. Largely as a result of this program, by 1999, Alaska already had 2 megawatts (MW) of wind capacity.

In 1999, Alaska had 21 investor owned utilities and 53 public or cooperative utilities, making up 8.3% and 91.7% of retail sales, respectively (EIA 2001). The electric energy production in Alaska in 1999 was predominantly from gas (EIA 2001). At this time, gas prices had risen consistently through the 1990s to 159.3 cents per million BTU. Typical utility customers paid nearly 11.16 cents per kilowatt-hour (EIA 2001). Alaska's electricity generation mix is given in Table D-1 below.

**Table D-1. Share of Alaska's Electricity Generation by Fuel Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Gas | 61.7% |
| Petroleum | 15.1% |
| Hydroelectric | 14.1% |
| Coal | 9.2% |

Source: EIA 2001

Alaska has a good wind resource, with several areas of Class 4, 5, 6, and 7 wind on the southwest coastal areas of the state. As shown in Figure D-2, the total wind capacity in 1999 was about 2 MW, with one additional megawatt added by 2000. Generation was constant until 2004, after which wind market growth steadily increased. This capacity growth follows the initiation of WPA and wind working group activity, which started in 2003. By 2010, Alaska had nearly 19 MW of wind with more large-scale projects under development.

### D.1.2 Development of State Wind Market

In the 1980s, the state provided grants for approximately 139 small-wind turbines. A year later, there were only a few working and by the early 1990s not one of them remained in service. This effort was dubbed a disaster and left a big black eye for wind. As a result, stakeholders involved in the industry since the 1980s reported that Alaska had considerable policy and investment resistance to wind energy prior to the arrival of the WPA in the state.

The bulk of Alaska's wind projects until very recently were all micro-grids to serve villages, primarily on islands, with wind/diesel hybrid systems with wind turbines of 1.5 MW or less in size. These remote villages are entirely dependent on diesel for electricity production. This equates to power that costs as much as 65¢/kilowatt-hour (kWh) delivered. The state of Alaska became interested in wind energy as an alternative to diesel in order to improve quality and lower cost of electrical generation in rural villages throughout Alaska. Notably, WPA state-based activities included the development of a wind diesel conference. This conference continues today as the premiere international event on the topic and Alaska today is a world leader in wind/diesel hybrid technologies.

In 2004, the Alaska Rural Energy Plan was released by the Alaska Energy Authority (AEA), which had a focus on wind/diesel hybrid system development (MAFA 2004). Also in 2004, the Renewable Energy Alaska Project (REAP)—a statewide coalition of energy stakeholders—was formed (REAP 2012). Interviewed stakeholders stressed that these two organizations and their activities were critical to the addition of wind capacity in Alaska, and that the funding and other support that allowed for the REAP's creation was garnered through the efforts of the WWG. The AEA was also an active participant in the WWG.

State and federal funding were seen as very important to the development of wind in Alaska. The state, through various means, and the federal government through the U.S. Department of Agriculture (USDA) Rural Utilities Service (RUS) grants and the Denali Commission's Energy Program Funding (between 2004 and 2008), were key factors in the adoption of wind energy in Alaska.[31] The Denali Commission's funding, in particular, enabled the first five wind projects in the state to happen (2 MW to 5 MW on timeline). Alaska Energy Authority passed the Renewable Energy Grant Fund policy in 2008, in which about $50 million per year is available to utilities, independent power producers (IPPs), local governments, and private developers to fund renewable energy projects (AEA 2011). About half of the fund is reserved for small-wind projects, which created a market for private developers. REAP was reported to have written this legislation, gotten it introduced, and gotten a ten-year extension. Without WPA and their support, which enabled the creation of REAP, many of these state pro-wind policies may have never been created.

Respondents to this study were provided with a comprehensive list of all factors that contributed to wind capacity additions. Of all the factors, interviewed wind energy stakeholders considered WPA state-based activities to have had the greatest influence on wind capacity additions between 1999 and 2010. In particular, stakeholders pointed out that the WWG quarterly and annual meetings at different sites around the state provided an arena where information was shared in a non-competitive way.

Economic factors and state and local policies were other drivers of wind capacity additions. Increasing retail electricity prices and diesel fuel costs were contributing factors to the expansion of wind energy. Other groups' activities were also reported to be important in the wind energy development during this time, although to a much lesser extent. Stakeholders put little emphasis on federal policies, technical factors, and research and development (R&D) efforts as factors that directly influenced wind capacity additions.

Stakeholders indicated that the expertise that WPA brought to Alaska was invaluable for demonstrating the viability of wind in Alaska. The education, networking, coalition building, convening, and facilitating efforts WPA led in the beginning stages of their WWG activities were also critical to advancing wind in Alaska. The WPA was reported to have made inroads to state and federal agencies, which helped with the launch of geothermal, solar, and energy storage projects as well.

Table D-2 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

### D.1.3 Summary of Wind Powering America Activities and Influence

Alaska was a priority state for WPA for the small-wind market. As shown in the timeline, WPA activity started in Alaska in 2001 with workshops and webinars, which were ongoing through 2008. Wind

[31] RUS (Rural Utilities Service) high energy cost grant program (USDA) originated by Senator Ted Stevens in 2002-2003. Made federal grant funds available for projects (offers financial assistance to provide or improve energy generation, transmission, and distribution facilities serving rural communities with home energy costs exceeding 275% of the national average).

Powering America formed the WWG in Alaska in 2003, and operated it as part of the Alaska Energy Authority. With the help of the WWG and other WPA state-based activities, REAP was established in 2005 and took over the management of the WWG. A small-wind power guide for Alaska was published in 2005. The anemometer loan program was started and the validated wind resource map was published in 2006. In 2009, AEA funded a best practices guide for wind development. The Wind for Schools program was started in 2010. The WWG and other WPA state-based activities were reported to have made tremendous progress in Alaska, laying the groundwork for large wind projects which are just coming online today. The 4.5 MW Kodiak wind project, which came online in July 2009, was reported to have originated its planning in 2004 with WPA resources. Similarly, the 17.6 MW Fire Island Wind project set to come online in 2013, can trace its roots back to REAP and the activities of the WPA in Alaska for more than the last ten years. These projects illustrate that in terms of MW additions influenced by WPA state-based activities, returns on investment will be realized for many years to come.

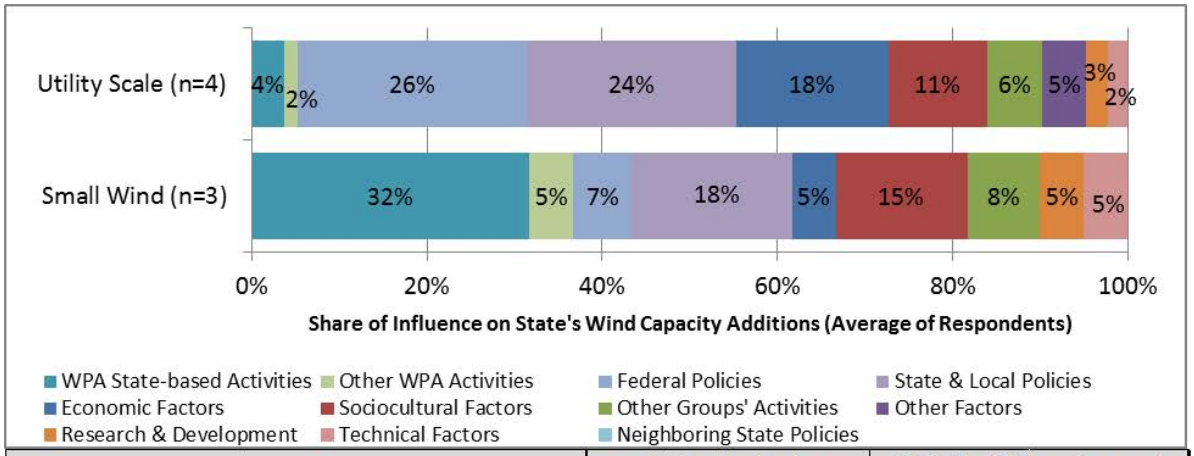
**Table D-2. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Alaska**

| Market Factor | Share of Influence on Installed Capacity[1] | Capacity Equivalent (MW) | Activities Mentioned in Supporting Comments |
|---|---|---|---|
| WPA State-Based Activities[2] | 25% | 2.62 | Regular WWG meetings, dissemination and sharing of information, education on wind's economic benefits, wind for schools, Wind Diesel Conference, wind resource map, access to national experts, anemometer loan program |
| Other WPA Activities | 5% | 0.48 | Public power partnerships |
| Other Groups' Activities | 13% | 1.36 | Renewable Energy Alaska Program (REAP), Alaska Energy Authority, Alaska Center for Energy and Power, Alaska Village Electric Cooperative, Alaska Wind-Diesel Applications Center |
| State & Local Policies | 18% | 1.95 | Net metering, renewable energy grant fund |
| Neighboring State Policies | 0% | - | N/A |
| Federal Policies | 7% | 0.74 | Clean Renewable Energy Bonds (CREBs), Rural Utilities Service (RUS) high energy cost grant program (USDA), ITC, Denali Commission Funding |
| Economic Factors | 19% | 2.01 | Retail electricity prices, diesel fuel costs. |
| Sociocultural Factors | 5% | 0.53 | Economic impact to local communities |
| Research & Development | 4% | 0.43 | Denali Commission funded an early demonstration project, NREL's village power program |
| Technical Factors | 5% | 0.53 | Wind resource |
| **Total** | **100%** | **10.66** | |

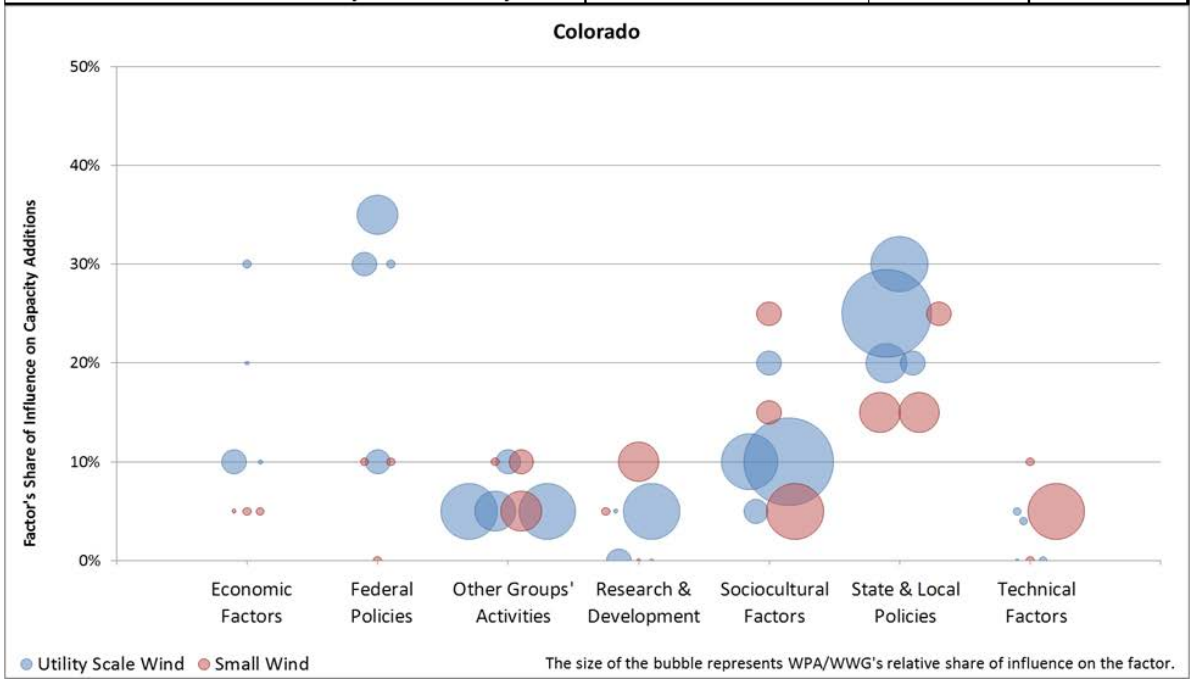
[1] Percentages based on simple averages of respondent estimates (n=5).
[2] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.2 Colorado

**Figure D-3. Colorado: WPA Influence Summary Dashboard**




| Colorado | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 136 | 95 | 183 |
| State-based Activities | 82 | 60 | 106 |
| Other WPA Activities | 54 | 35 | 77 |
| **Small-Wind** | 0.9 | 0.6 | 1.1 |
| State-based Activities | 0.7 | 0.5 | 0.8 |
| Other WPA Activities | 0.2 | 0.1 | 0.2 |
| **Total** | **137** | **96** | **184** |
| *Total Capacity Additions, Post-WWG through 2011* | *1,746* | *1,746* | *1,746* |
| *WPA Influence as % of Total* | *8%* | *5%* | *11%* |




Source: Navigant analysis

## Figure D-4. Colorado Wind Market Timeline and Wind Capacity Additions (1999-2010)

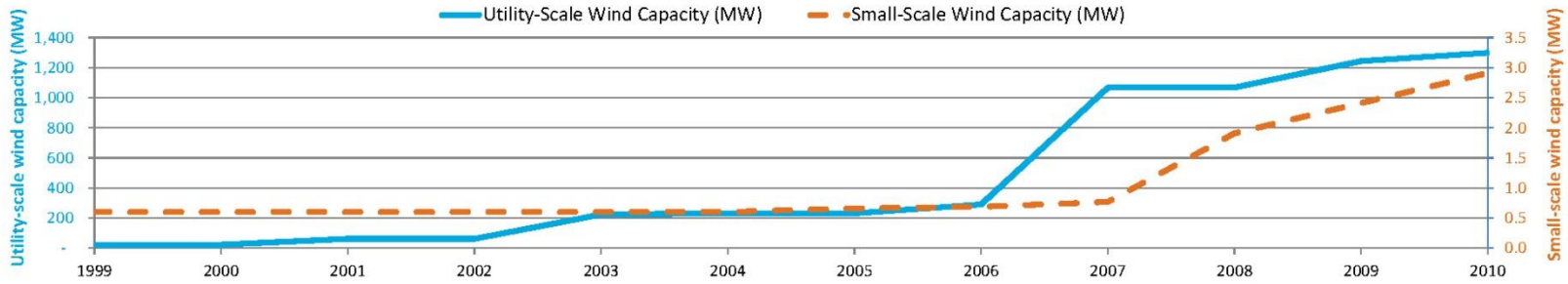
**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Green power pricing programs available | | | | | | | | | | | |
| | | | Industry Workshops and presentations by NREL, Governor's Energy Office, US DOE | | | | | | Anemometer Loan Program | | |
| | | | | | Western Governor's Association active in promoting clean energy | | | | | | |
| | | | | | | Net Metering available | | State Incentives available for small wind | | | |
| | | | | | | Wind-related webinars, workshops, tribal meetings sponsored by WPA | | | | | |
| | | | | | | Wind Working Group Active | | | | Wind Working Group Active | |
| | | | | | | | | Renewable Portfolio Standard (RPS) in effect | | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | • CO PUC orders Xcel to engage in "good faith negotiations" to add wind plant to integrated resource plan | • Xcel Energy introduces voluntary green power purchasing program | • Colorado's first utility-scale wind farm active in Lamar County | • WPA distributes validated wind resource map for Colorado<br>• Renewable Portfolio Standard approved by popular vote | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government<br>• WPA holds State Wind Summit | • WPA publishes small-wind development guide for Colorado<br>•Interconnection standards adopted<br>• Governor Ritter elected | • RPS expanded to rural electric co-ops<br>• Green power options required for large munis<br>• Colorado Clean Energy Authority created<br>• Transmission legislation expanded | • UWIG holds two technical workshops in Colorado<br>• Western Area Power Administration (WAPA) webinar series | • Sales tax exemption for renewable equipment in effect | • Governor's Energy Office releases Transmission and Renewables report and Renewable Energy Development Infrastructure report |

**Growth in Utility-Scale and Distributed-Scale Wind Capacity (Cumulative MW)**




Source: Navigant analysis

### D.2.1 State Overview

In 1999, Colorado's electricity was supplied by two investor-owned utilities (IOUs), 57 publicly owned or cooperative utilities, and one federal utility. Investor-owned utilities accounted for 61.3% of retail sales while public or cooperative utilities and federal utilities accounted for 38.5% and 0.2%, respectively (Energy Information Administration [EIA] 2001).[32] Public Service Company of Colorado was the largest utility in the state, representing 77% of the state's retail electricity sales. As shown in Table D-3, more than 80% of Colorado's electricity was generated from coal, with 12.6% generated from natural gas (EIA 2001).

**Table D-3. Share of Colorado's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 83.2% |
| Natural Gas | 12.6% |
| Petroleum | 0.1% |
| Hydroelectric | 4.0% |

Source: EIA 2001

Between 1999 and 2010, Colorado's wind capacity increased from 22 MW to 1,299 MW. As shown in Figure D-4, Colorado had little utility-scale wind capacity until 2003, when the 162-MW Colorado Green wind farm came online. By 2006, utility-scale wind capacity had increased to 291 MW before a major increase to 1,067 MW in 2007. Colorado also had very little small-scale wind capacity until 2008, when it more than doubled from 0.8 MW to 1.9 MW. Small-scale wind development continued to grow steadily, and by 2010 the state had 2.9 MW of small-scale wind capacity.

The timing of several state, local, and federal policies appear to correspond to wind development in Colorado. For example, in 2001, the Colorado Public Utilities Commission (CPUC) ordered Xcel Energy to engage in negotiations to add a wind plant to the utility's integrated resource plan (IRP) as a substitute for new gas-fired generation. In 2004, Colorado became the first state to approve an RPS by public ballot initiative. The RPS had previously been voted down by the legislature for three consecutive years (in 2002, 2003 and 2004) before being put to a public vote. The original legislation called for 10% renewable power by 2015. In 2007, the RPS expanded to include a 10% requirement for electric cooperatives and 20% for IOUs by 2020, increasing again in 2010 to a 30% IOU requirement by 2020. Notable increases in Colorado's wind capacity coincide with the evolution of the RPS in the state. Mandatory green power pricing requirements for large municipal utilities in 2007 and the American Recovery and Reinvestment Act of 2009 (ARRA) Federal Business Energy Investment Tax Credit (ITC) Cash Grant in 2009 also coincide with spikes in wind capacity. Sales tax exemptions for renewable equipment were also put into effect in 2009.

### D.2.2 Development of State Wind Market

#### Utility-Scale Market

Four stakeholders in the utility-scale wind market in Colorado cited a combination of primarily state and federal policies as having the greatest influence on driving wind project development from 1999 to 2010. All four respondents specifically identified the state RPS, the Production Tax Credit (PTC), and decisions made by the CPUC as the factors with the most significant influence. These CPUC decisions were especially influential for early wind project developments. At least two of the four respondents

[32] Retail energy sales in 1999 totaled 40.6 million MWh (EIA 2001).

noted the strong political support for developing renewables by Governor Ritter, who served from 2006 to 2011, as having a direct influence on wind development activity. Pushing the "new energy economy" in his platform, stakeholders stated that the governor redirected the focus of the Governor's Energy Office (GEO) toward renewable energy, prioritized wind energy development, and worked to appoint pro-wind commissioners to the CPUC.

Economic and sociocultural factors were also viewed as significant, but lesser, factors in the utility-scale market's development. Two respondents specifically mentioned the importance of increasingly competitive costs for wind power in the context of rising natural gas prices. Another stressed the importance of Colorado's foundation of public support for wind power, as evidenced by the popular passage of the RPS in 2004. While their influence was considered less significant, WPA state-based activities were also viewed as contributing to the market's development.

Table D-4 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

The three stakeholders discussing the small-scale wind market in Colorado generally cited a combination of WPA state-based activities and state and local policy as primary drivers of the market's development. Two of the three respondents specifically pointed to the anemometer loan program and the Wind for Schools program as significant contributors. From a policy perspective, the respondents each offered different examples, such as net metering programs put in place in 2005 and state incentives for small-wind projects available beginning in 2007. As with utility-scale wind, two of the stakeholders also expressed the importance of strong political advocacy of renewable energy in Colorado as contributing to investments in small-scale wind systems, particularly noting Governor Ritter's support and the access to communication channels between legislators and the WPA that the GEO made possible. Similarly, two respondents also rated sociocultural factors as an important driver on the state's small-wind market.

### D.2.3 Summary of Wind Powering America Activities and Influence

The Colorado WWG formed in 2003, and was most active between 2006 and 2009. WPA did not categorize Colorado as a high-priority state because it had already made significant progress against the initiative's initial outreach goals. It had already implemented more than 100 MW of wind capacity by 2005, and had made significant strides in fostering and enabling a political and social environment within which the wind industry could thrive. In addition to helping build support for the establishment of the RPS, the WWG distributed a validated wind resource map in January 2004, which stakeholders cited as helping to establish wind power's credibility in the state. The WWG provided community outreach support for and education on wind energy development in Colorado through their involvement in meetings, workshops, state summits, and conferences. The WPA State Summit in 2005 and the Wind for Schools Summit held in 2007 and again in 2011, serve as examples of the activities the WWG supported to build interest in wind power across the state. The WWG also published a small-wind development guide for Colorado in 2006. In the words of one respondent, the WPA played a critical role in "demystifying wind energy" through public outreach and education in Colorado.

Several of the stakeholders' comments indicated that the WPA served as a credible, unbiased, third-party resource for information. As one respondent pointed out, this may have been aided in part by the close proximity of and working group members' relationships with the U.S. Department of Energy (DOE) and the National Renewable Energy Laboratory (NREL), both of which have offices in Golden, Colorado. Another respondent cited the "20% Wind Energy by 2030" report as an example of the WPA providing credible national-level data to feed the momentum for wind power as well as serving to draw developers to Colorado. Two interviewees further expressed that the wind working group played an essential role in

bringing together diverse stakeholders with the common interest of exploring and understanding how wind energy could benefit the state and their business. The group was cited for its collaboration with other wind industry interest groups, including the GEO, Utility Wind Integration Group (UWIG), American Wind Energy Association (AWEA), and Western Resource Advocates.

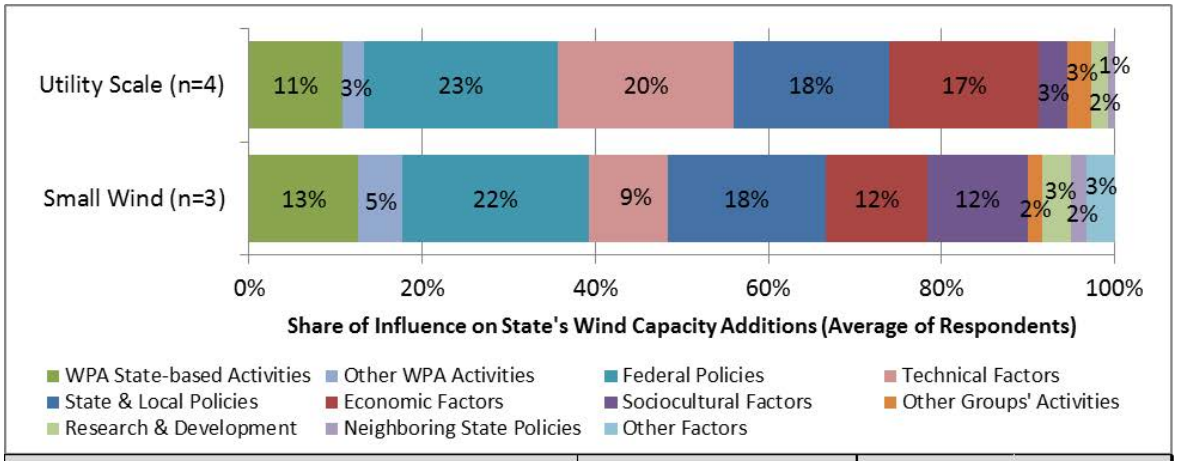
**Table D-4. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Colorado**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 4% | 32% | 65 | 0.78 | **Utility-Scale:** Wind resource maps, anemometer loan program, technical information, WPA conferences and WWG meetings, role as objective third-party information source, landowner and policy maker education, wind for schools **Small-Wind:** Anemometer loan program, model interconnection standards, model wind ordinances, video on small-wind installations, wind application center, meetings and conferences, wind for schools program |
| Other WPA Activities | 2% | 5% | 26 | 0.12 | **Utility-Scale:** "20% Wind Energy by 2030" report, Federal wind power program **Small-Wind:** "20% Wind Energy by 2030" report |
| Other Groups' Activities | 6% | 8% | 109 | 0.21 | **Utility-Scale:** UWIG, NREL, NOAA, Interwest Energy Alliance, Western Resource Advocates (WRA), AWEA, Independent Power Producers Association, Governor's Energy Office, Interstate Renewable Energy Council (IREC) **Small-Wind:** Interwest Energy Alliance, WRA, AWEA, Governor's Energy Office, IREC |
| State & Local Policies | 24% | 18% | 414 | 0.45 | **Utility-Scale:** RPS, Governor Ritter's appointments to the Public Utility Commission and their subsequent decisions, transmission legislation in 2007-2009, creation of Clean Energy Development Authority **Small-Wind:** Net metering, interconnection standards, small-wind incentives |
| Neighboring State Policies | 0% | 0% | - | - | **Utility-Scale:** N/A **Small-Wind:** N/A |
| Federal Policies | 26% | 7% | 458 | 0.17 | **Utility-Scale:** PTC, ITC cash grant **Small-Wind:** ITC and cash grant |
| Economic Factors | 18% | 5% | 305 | 0.12 | **Utility-Scale:** High natural gas prices, wind's LCOE, customer demand (Xcel's Windsource) **Small-Wind:** N/A |
| Sociocultural Factors | 11% | 15% | 196 | 0.37 | **Utility-Scale:** Strong foundation of public support **Small-Wind:** Public support |
| Research & Development | 3% | 5% | 44 | 0.12 | **Utility-Scale:** Proximity to NREL **Small-Wind:** Proximity to NREL |
| Technical Factors | 2% | 5% | 39 | 0.12 | **Utility-Scale:** Wind resource, access to transmission **Small-Wind:** Wind resource |
| Regulatory advocacy | 5% | 0% | 87 | - | **Utility-Scale:** Groups that helped to get the RPS passed **Small-Wind:** N/A |
| **Total** | **100%** | **100%** | **1,743** | **2.48** | |

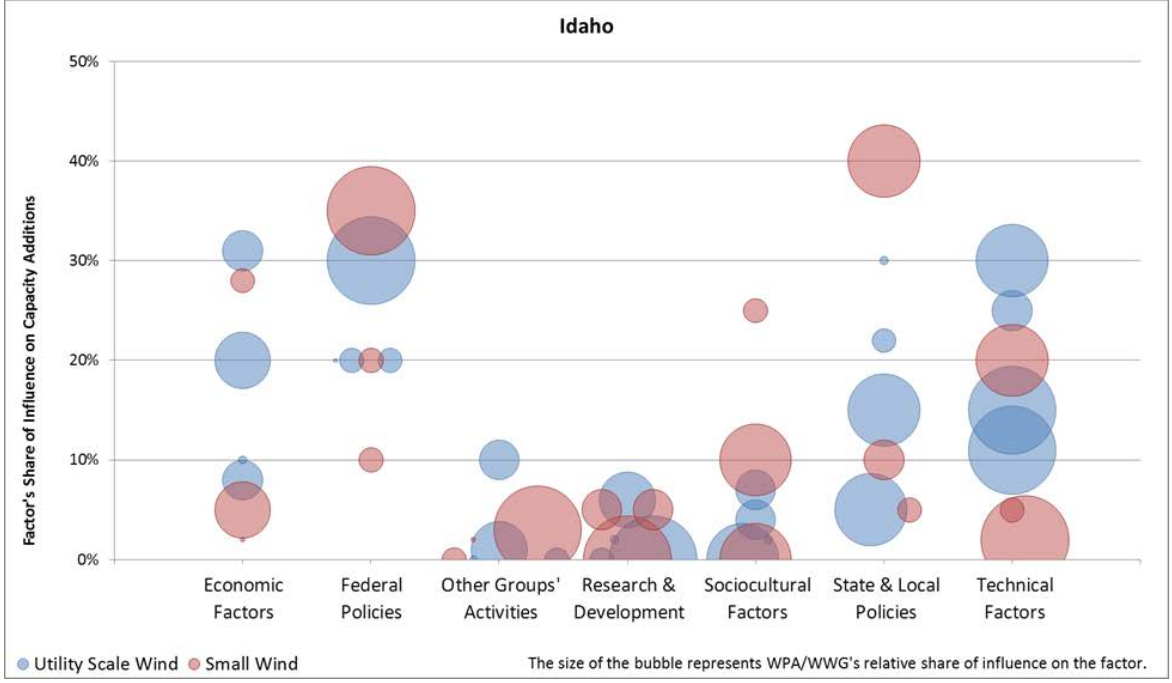
[a] Percentages based on simple averages of utility-scale (n=4) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.3 Idaho

**Figure D-5. Idaho: WPA Influence Summary Dashboard**




| Idaho | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 104 | 80 | 135 |
| State-based Activities | 82 | 65 | 105 |
| Other WPA Activities | 22 | 15 | 29 |
| **Small-Wind** | 0.5 | 0.3 | 0.6 |
| State-based Activities | 0.3 | 0.3 | 0.4 |
| Other WPA Activities | 0.1 | 0.1 | 0.2 |
| **Total** | **105** | **81** | **135** |
| *Total Capacity Additions, Post-WWG through 2011* | *620* | *620* | *620* |
| *WPA Influence as % of Total* | *17%* | *13%* | *22%* |




Source: Navigant analysis

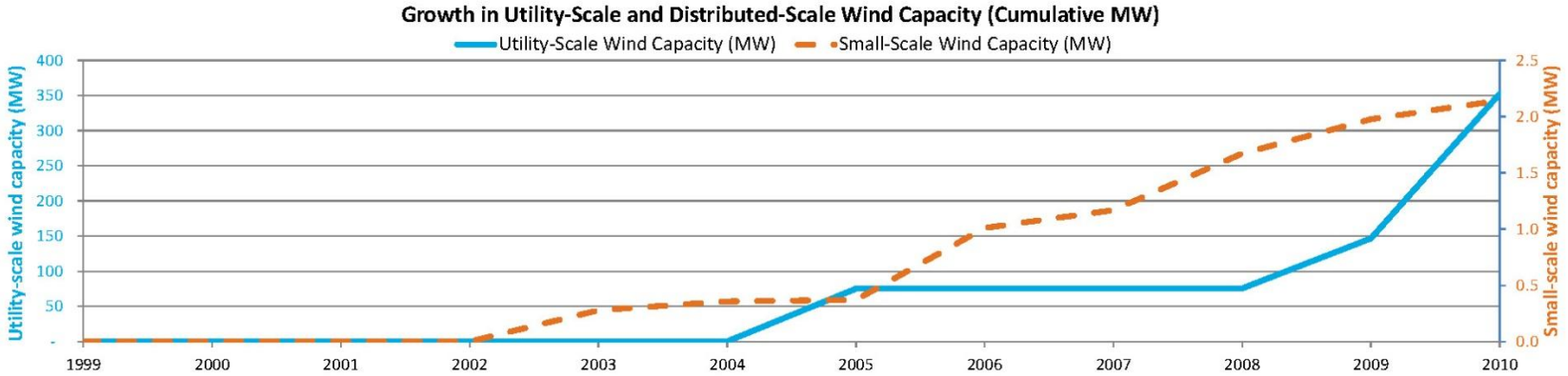
## Figure D-6. Idaho Wind Market Timeline and Wind Capacity Additions (1999-2010)

**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Low -Interest Energy Loan Program available since 1993 | | | | | | State Sales Tax Exemption for Alternative Electricity-Producing Equipment | | | | | |
| | | Anemometer Loan Program | | | | | | Wind for Schools | | | |
| | | Wind Working Group Active | | | | | | | | | WWG Active |
| | | Green power pricing program available | | | | | Net Metering in effect for Idaho Power, Avista Utilities, and Rocky Mountain Power | | | | |
| | | | Net Metering in effect for Idaho Power | | | | | Property Tax Exemption for Wind and Geothermal Energy | | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • Residential Alternative Energy Tax Deduction available since 1976. | | • (Oct) Idaho Wind Workshop. | • Validated wind resource map. | • Interconnection standards (Avista and Idaho Power). | | • Energy Policy Act establishes renewable energy procurement goals for Federal government • Renewable Energy Project Bond Program. • Idaho Power petitions to suspend PURPA projects over avoided-cost rates | | • Interconnection Standards • State-wide guidelines. • Harvesting Clean Energy Conference. • Property Tax Exemption for Wind and Geothermal Energy Producers enacted. | • PUC resolves avoided-cost rate issue • Idaho Legislature passes HCR 054 to encourage wind development on state lands. • Model Ordinance for wind. | | |




Source: Navigant analysis

### D.3.1 State Overview

In 1999, the State of Idaho decided not to pursue deregulation after a legislative committee concluded that a competitive market would increase electric prices (EIA 2012). Idaho remains as a relatively low-cost state for electricity as a result of abundant hydroelectric resources. At the time, Idaho customers were served by four investor-owned utilities and 27 public or co-operative utilities, representing 88.2% and 11.8% of 1999 retail sales, respectively (EIA 2001).[33] The largest of these was Idaho Power Company, which individually accounted for about 59.9% of the state's retail electricity sales. As shown in Table D-5, 93.5% of Idaho's electricity came from hydropower in 1999 (EIA 2001).

**Table D-5. Share of Idaho's Electricity Generation by Source in 1999**

| Resource | Percentage of Idaho Generation Profile in 1999 |
|---|---|
| Hydroelectric | 93.5% |
| Wood | 3.3% |
| Natural Gas | 2.3% |
| Other | 0.6% |
| Coal | 0.4% |

Source: EIA 2001

As shown in Figure D-6, Idaho had little installed wind capacity until 2005, when the 10.5-MW Fossil Gulch and 64.5-MW Wolverine Creek wind farms were completed. In 2005, Idaho Power filed a petition to suspend Public Utility Regulatory Policies Act (PURPA) claims in Idaho until the avoided-cost rate calculation for renewables, particularly wind, was modified. These issues weren't resolved by the Idaho Public Utilities Commission until January of 2008. As a result, installed wind capacity essentially remained stagnant until 2009. That year, however, two wind farms with a combined 71 MW of capacity were installed. Three more wind farms were completed in 2010, adding another 206 MW to Idaho's installed capacity total. Figure D-6 also shows a possible connection between these capacity increases and the incidence of state and local policies intended to support the renewable energy and wind market. While Idaho does not have an RPS, the state did enact the Renewable Energy Project Bond Program in 2005. This program allows independent developers of in-state renewable energy projects to request financing from the Idaho Energy Resources Authority. Through this program, financing opportunities were extended to plants that did not meet PURPA's Qualifying Facility requirements. Idaho also adopted a Sales Tax Exemption for Alternative Electricity-Producing Equipment in 2005, which applies to facilities with capacities of at least 25 kilowatts. After two PURPA-based wind farms were installed in 2005, the Idaho Public Utilities Commission (PUC) decreased the wind plant capacity eligibility cap from 10 MW to 100 kW. This cap was subsequently lifted back to 10 MW in 2007, the same year that Idaho enacted a property tax exemption for commercial wind. In addition, the Idaho legislature passed House Concurrent Resolution 054 in 2008, which encourages wind development on state endowment lands. This was the same year that Congress passed a new USDA Farm Bill, which extended the Section 9006 Renewable Energy and Energy Efficiency Improvement Program from the 2002 Farm Bill.

### D.3.2 Development of State Wind Market

#### Utility-Scale Market

On average, the four stakeholders interviewed about Idaho's utility-scale wind market perceived that federal policies had the greatest singular influence on wind capacity additions from 1999 to 2010.

[33] Retail energy sales in 1999 totaled 21.8 million MWh (EIA 2001).

Respondents mentioned the PTC, ITC, and the USDA Farm Bills (in 2002 and 2008) and their associated grant and loan guarantee programs as key policies. Technical factors had a slightly lower average level of influence as these federal policies. This included the quality of the state's wind resource, particularly in relation to its proximity to accessible transmission and roads.

Three of the four respondents considered state and local policies—particularly the way the state administered PURPA—to have also played a key role in supporting Idaho's utility-scale wind market. Since wind energy was competing against cheap electricity generated from hydropower, PURPA was instrumental in getting utilities to sign power purchase agreements (PPAs) with wind developers. Idaho's treatment of PURPA saw some changes during this time frame, particularly in 2005 when the wind eligibility cap decreased from 10 MW to 100 kW and again in 2007 when that cap was reinstated to 10 MW. In addition, Idaho Power filed a petition in 2005 to suspend all PURPA projects until the avoided-cost rate calculation was changed. The Idaho PUC finally resolved this issue in January 2008 with a compromise between Idaho Power's proposed new calculation and wind advocates' view that the calculation should remain the same. These timing of these PURPA-related changes correspond to both the stagnant years of 2005-2008 and the 277-MW increase in installed wind capacity in 2009-2010. Sociocultural factors, research and development, and organizations that may have supported the wind market, including WPA and the state's WWG, were perceived to have had a lesser influence than the above key factors.

Table D-6 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Stakeholders interviewed about the state's small-wind market showed greater diversity in their perception of which factors were most influential on the market's development. One respondent each allocated the largest share of influence to either one of state policies (i.e., net metering), federal policies, or sociocultural factors. However, on average these three respondents considered federal and state and local policies to have had the most influence in small-scale wind development. In particular, the timing of the Section 9006 Renewable Energy and Energy Efficiency Improvement Program from the USDA Farm Bill of 2002 appears to correspond to the initial uptick in small-wind capacity additions in the state. Idaho had no small-wind capacity until 2003, when the first 300 kW were added. From then until 2010, an average of 300 kW of small-wind capacity was added each year. In terms of supportive states policies, two of the three respondents mentioned net metering rules and associated interconnection guidelines from each of the three largest IOUs as having a positive influence. Net metering was first enacted by Idaho Power in 2002, then by Avista Utilities and Rocky Mountain Power in 2006.

Beyond supportive policies, one stakeholder in particular (a small-wind developer) perceived economic and sociocultural factors to have had a significant influence on the timing and rate of small-wind capacity additions. In addition, all three stakeholders noted that WPA and the Idaho wind working group had a meaningful influence on the state's small-wind market through a variety of activities, which are discussed more below.

### D.3.3 Summary of Wind Powering America Activities and Influence

WPA launched a wind working group in Idaho in 2001, and it has been administered by Boise State University's Wind Application Center since 2002. In addition to regular workshops and exhibits, the working group supports an active Wind for Schools program. Idaho's anemometer loan program initially began as a collaboration between WPA, the Idaho Department of Water Resources Energy Division, and

Idaho National Lab (INL) in 2001. Boise State's Wind Application Center became an official partner in the anemometer program in 2008, analyzing and posting data on INL's website.

Three of the five respondents mentioned the importance of WPA and the wind working group's provision of wind resource maps and administering the anemometer loan program as a significant part of the initiative's influence. Two different respondents described the wind working group as a "catalyst" in moving the market forward, particularly in their efforts to get diverse stakeholders to the table and by influencing other factors (e.g., policy) via their general education efforts and research and development activities. Another respondent believed that the wind working group's activities also helped increase investor awareness and confidence in the state's wind power potential by demonstrating Idaho's wind resources.

From a process perspective, three respondents each mentioned the importance of the working group's ability to pull stakeholders together in an open forum setting to discuss key issues, particularly policy. One respondent mentioned that the open-door policy of the working group provided industry stakeholders with an opportunity to discuss these issues and agree on ideas that individual members could then cohesively argue to the PUC.

Conversely, two respondents mentioned that the state's wind working group had an adversarial relationship with Idaho Power, the state's largest utility. This was particularly apparent from 2005 to 2007, when the utility and members of the working group submitted opposing positions to the Idaho PUC on the issue of how to calculate the avoided-cost rate. Some stakeholders believe that the wind working group could have been more effective overall if it had a better relationship with Idaho Power. Another respondent mentioned that the departure or shifting of staff at the Office of Energy Resources contributed to a lack of continuity in the working group's activities that may have caused at least his own organization to participate less. Finally, one respondent pointed to the limitations placed on the wind working group and WPA (i.e., in terms of direct policy advocacy) as a constraint on its overall effectiveness.

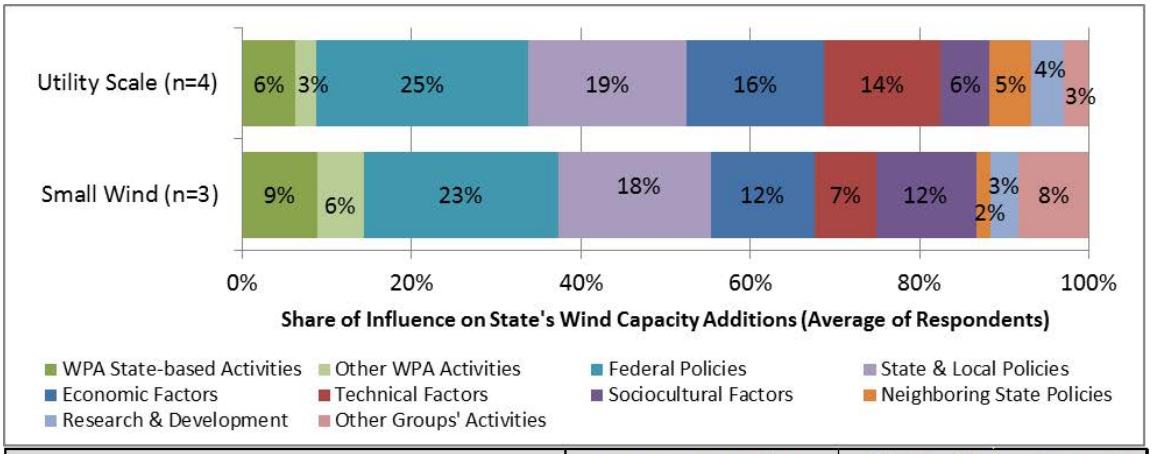
**Table D-6. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Idaho**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 11% | 13% | 66 | 0.28 | **Utility-Scale:** Education and outreach on wind power's economic benefits, wind resource maps, anemometer loan program<br>**Small-Wind:** Anemometer loan program, wind resource maps, wind for schools, education and outreach |
| Other WPA Activities | 3% | 5% | 15 | 0.11 | **Utility-Scale:** Rural economic development<br>**Small-Wind:** Rural economic development |
| Other Groups' Activities | 3% | 2% | 17 | 0.04 | **Utility-Scale:** AWEA, state energy office<br>**Small-Wind:** State energy office (for a while) |
| State & Local Policies | 18% | 18% | 111 | 0.41 | **Utility-Scale:** State utility commissions administration of PURPA, siting and permitting ordinances<br>**Small-Wind:** Net metering, interconnection standards |
| Neighboring State Policies | 1% | 2% | 5 | 0.04 | **Utility-Scale:** Generated interest<br>**Small-Wind:** Generated interest |
| Federal Policies | 23% | 22% | 139 | 0.49 | **Utility-Scale:** PTC, Farm Bills<br>**Small-Wind:** ITC, REAP grants |
| Economic Factors | 17% | 12% | 107 | 0.26 | **Utility-Scale:** Access to capital and investor interest, PURPA rates were a driving factor<br>**Small-Wind:** Off grid systems primarily |
| Sociocultural Factors | 3% | 12% | 20 | 0.26 | **Utility-Scale:** Public support due to environmental and energy security concerns<br>**Small-Wind:** Desire for energy independence or self-reliance, environmental reasons |
| Research & Development | 2% | 3% | 12 | 0.07 | **Utility-Scale:** Pilot and demonstration projects, improvements to wind's LCOE<br>**Small-Wind:** N/A |
| Technical Factors | 20% | 9% | 125 | 0.20 | **Utility-Scale:** Wind resource, access to transmission<br>**Small-Wind:** Technology has improved since 2004 |
| Desire to self-generate | 0% | 3% | - | 0.07 | **Small-Wind:** Desire for self-reliance |
| **Total** | **100%** | **100%** | **618** | **2.24** | |

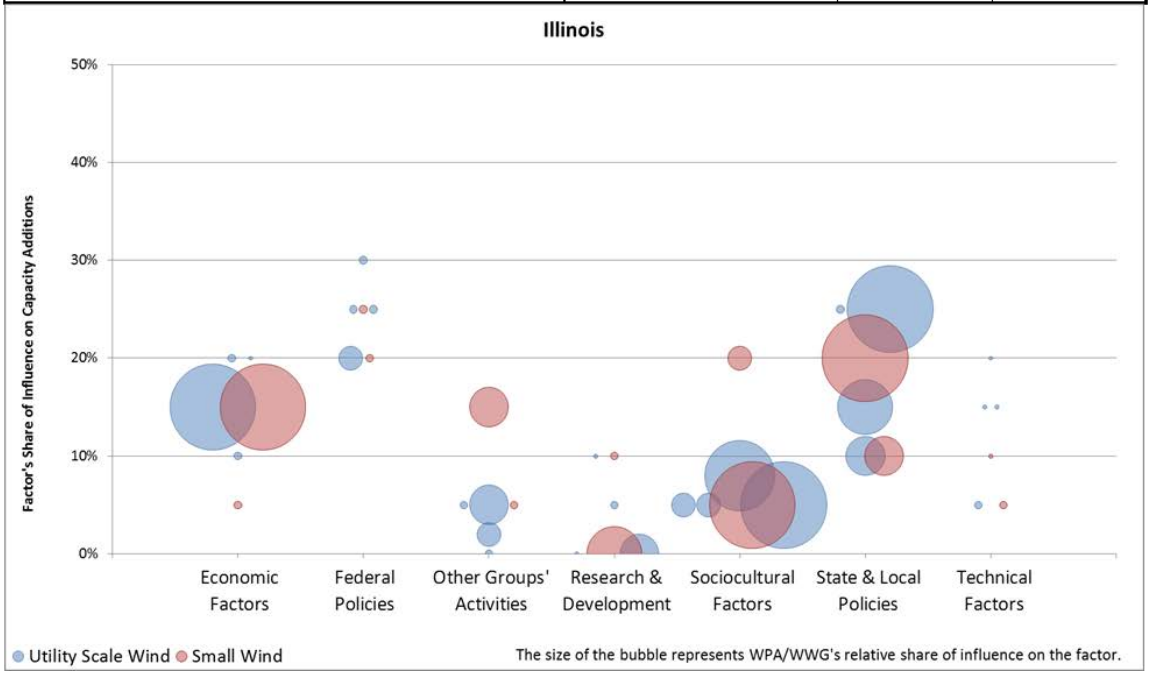
[a] Percentages based on simple averages of utility-scale (n=4) and small-wind (n=2) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.4 Illinois

**Figure D-7. Illinois: WPA Influence Summary Dashboard**




| Illinois | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 318 | 243 | 405 |
| State-based Activities | 214 | 171 | 261 |
| Other WPA Activities | 104 | 72 | 144 |
| **Small-Wind** | 1.1 | 0.9 | 1.3 |
| State-based Activities | 0.7 | 0.6 | 0.7 |
| Other WPA Activities | 0.5 | 0.4 | 0.6 |
| **Total** | **215** | **172** | **262** |
| *Total Capacity Additions, Post-WWG through 2011* | *2,642* | *2,642* | *2,642* |
| *WPA Influence as % of Total* | *8%* | *7%* | *10%* |




Source: Navigant analysis

**Figure D-8. Illinois Wind Market Timeline and Wind Capacity Additions (1999-2010)**

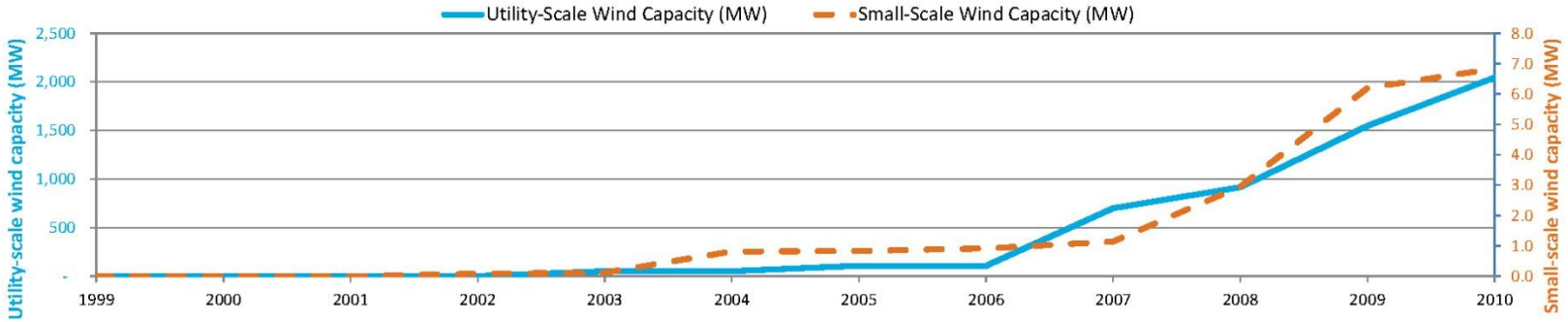
**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | | PTC Available | | | ITC Available (Utility-Scale ) | |
| | | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Renewable Energy Resources Trust Fund Enacted in 1997 (grants, loans, incentives, including Solar and Wind Energy Rebate Program) | | | | | | | | | | Green Energy Loans | |
| State Incentives available for small wind | | | | | | | | | Commercial Property Tax Incentive | | |
| | | | Green power pricing program available | | | | | | Net Metering programs available | | |
| | | | | | | | | WWG Active (Administered by Illinois State University) | | | |
| | | | | | | | | Annual WWG-sponsored Advancing Wind Power in Illinois | | | |
| | | | | | | | | County wind turbine ordinances | | RPS in effect (2% 2009, 4% 2010) | |
| | | | | | | | | | Annual WWG-Sponsored Siting, Zoning, and Taxing Wind Farms in Illinois Conference | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • Enterprise Zone Act signed into law, making tax credits and deductions available to wind farms in Enterprise Zones. | | • (Nov) Illinois Wind Workshop. | • Validated wind resource map published. | | | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government. | | • Commercial Wind Energy Property Valuation law passed. • County wind turbine ordinances. | • RPS Expanded to include ARES. • State Green Building Standards in effect. • Interconnection standards adopted. | • Statewide Renewable Energy Setback Standards. • WPA State Summit. • High-Impact Business Sales Tax Exemption. | |

**Growth in Utility-Scale and Distributed-Scale Wind Capacity (Cumulative MW)**




Source: Navigant analysis

### D.4.1 State Overview

In 1997, the State of Illinois passed the Electric Service Customer Choice and Rate Relief Act of 1997. The bill called for some commercial and industrial customers to be given the choice of electricity suppliers by 1999, and for all customers, including residential, to be given the choice by 2002. In addition, the bill called for a 15% rate decrease in 1998 and another 5% rate decrease in 2002. At the time, Illinois customers were served by 9 investor-owned utilities and 68 public or co-operative utilities, representing 92.4% and 7.6% of 1999 retail sales, respectively (EIA 2001).[34] The largest of these was Commonwealth Edison, which individually accounted for about 63% of the state's retail electricity sales. As shown in Table D-7, the majority of this electricity came from nuclear and coal-fired generation (EIA 2001).

**Table D-7. Share of Illinois's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Nuclear | 50.02% |
| Coal | 45.95% |
| Natural Gas | 3.06% |
| Other Biomass | 0.43% |
| Petroleum | 0.25% |
| Other Gases | 0.20% |
| Hydroelectric | 0.09% |
| Other | 0.01% |

Source: EIA 2001

As shown in Figure D-8, Illinois had little installed wind capacity until 2003, when the 50-MW Mendota Hills wind farm was completed in Lee County. Installed wind capacity increased to 107 MW by 2006, which was followed by a major boom in capacity. From 2007 to 2010, installed wind capacity climbed to 2,045 MW, including 8.2 MW of small-scale wind.

Figure D-8 also suggests a possible connection between these capacity increases and the incidence of state and local policies intended to support the renewable energy and wind market. According to one interviewed stakeholder, disputes about how to assess property taxes on the earliest utility-scale wind projects led to the adoption of clear rules that helped developers to better plan subsequent projects. The state enacted an RPS in August 2007, setting incremental goals for investor-owned electric utilities to acquire a percentage of their retail electricity sales from renewable sources. The goals began at 2% renewables by 2009, with an eventual target of 25% by 2026. Notably, these targets include a requirement that 75% of the annual target come from wind. Smaller targets also exist for solar and distributed generation beginning in 2013 and 2014, respectively.

Many wind projects were developed in one of the state's designated enterprise zones, geographic areas targeted for development and investment through favorable tax policies (e.g., sales tax abatement), and other incentives.[35] In 2009, the state passed legislation that labeled wind farms as High Impact Businesses that could receive such sales tax abatement even if they were not in an enterprise zone. Net metering and interconnection rules were also passed in August 2007. The legislation required investor-owned utilities to begin offering net metering by April 1, 2008, for renewable energy systems, including wind turbines, up to 40 kW in capacity.[36] The original legislation also established a four-tiered

[34] Retail energy sales in 1999 totaled 132.2 million MWh (EIA 2001).
[35] The Enterprise Zone Program was passed into law in 1982. See http://www.ieza.org for more information.
[36] More recent legislation in 2011 increased this system capacity limit to 2 MW.

system for interconnection requests for distributed generation facilities up to 10 MW in capacity. Project size and other technical factors determine the level of review required. Interconnection standards for projects over 10 MW were established in March 2010.

### D.4.2 Development of State Wind Market

#### Utility-Scale Market

All four stakeholders interviewed about the Illinois utility-scale wind market perceived that the federal PTC had either the greatest singular influence on wind capacity additions from 1999 to 2010, or that it was equally as important as state and local policies. Two of these respondents also mentioned the availability of the ITC for utility-scale wind as having played a role for some projects. Beyond these federal tax credits, state and local policies—particularly the RPS—also played a key role in supporting the utility-scale wind market in Illinois. The Illinois Power Agency enacted the RPS in 2007, and its compliance targets began in 2009. Again, the targets required that 75% of the renewable energy purchased come from wind resources. For investor-owned utilities, renewable energy must be located in-state in order to be eligible, unless there are insufficient cost-effective in-state resources. In addition, three of the four respondents mentioned the favorable tax policies in Illinois' enterprise zones as encouraging wind development. Two respondents further noted the importance of the siting and permitting ordinances that individual counties began enacting in 2007. Similarly, two stakeholders also commented that renewable portfolio standards in neighboring states like Iowa may also have contributed to capacity additions and overall interest in wind in Illinois. These comments illustrate that Illinois' wind market likely benefitted from the adoption of several supportive policies beginning in 2007. Between 2008 and 2010, Illinois added an average of nearly 500 MW of utility-scale wind per year.

Based on stakeholder responses, economic and technical factors had a similar average level of influence as state and local policies. This included electricity demand and utilities' willingness to sign PPAs (likely tied closely to the state's RPS requirement), as well as the quality of the state's wind resource and access to transmission. In particular, transmission lines from coal plants in remote parts of the state to the major load center of Chicago pass through areas with good wind resources. Sociocultural factors, research and development, and other organizations (e.g., Wind on the Wires, the Illinois Wind Energy Association, and the Great Lakes Wind Network) that may have supported the wind market were perceived to have had a lesser influence than the above key factors. Two stakeholders noted that Illinois' landowner base was generally interested in and supportive of wind energy.

Table D-8 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Similar to the utility-scale wind market, all three stakeholders commenting on Illinois's small-wind market considered federal and state policies to have had the most influence on small-scale wind development. In particular, the availability of the federal ITC for small-wind power starting in 2008, and the cash grant option in 2009, appears to correspond to small-wind capacity additions in the state. Small-wind capacity grew from just over 1 MW at the end of 2007 to more than 6 MW at the end of 2009. In terms of supportive states policies, small-scale wind has also benefitted from a combination of the RPS, interconnection, net metering (enacted in August 2007), and a rebate program from the Illinois Energy Office. The state of Illinois has offered a rebate program for small-wind systems sized up to 100 kW since 1997, although one stakeholder reported that the program is generally oversubscribed due to its popularity.

Beyond supportive policies, a combination of economic and sociocultural factors had a significant, but lesser, influence on the timing and rate of small-wind capacity additions. As one interview respondent noted, many individuals who install small-wind systems do so to either seek relief from rising retail electricity prices or to simply reduce their reliance on their utility. All three stakeholders noted that other organizations, including WPA and the Illinois wind working group, had a significant (but lesser) influence on the state's small-wind market through a variety of activities that are discussed more below.

### D.4.3 Summary of Wind Powering America Activities and Influence

WPA provided Illinois with its first validated wind map in 2001, and a small-wind power guide in 2005. The initiative also helped organize an initial Illinois Wind Workshop in 2001. The Illinois wind working group, however, was not formally launched until 2006. It is administered by and works in conjunction with Illinois State University's Center for Renewable Energy. In addition to regular conferences, events, and workshops, the working group supports an active Wind for Schools program that is funded by a grant from the Illinois Department of Commerce and Economic Opportunity. Western Illinois University administers a separate anemometer loan program that is supported by the Illinois Clean Energy Foundation.

Four of the five interviewed stakeholders indicated that WPA and the wind working group's positive influence on the Illinois wind market stemmed largely from their role as an objective source of credible information about wind and the issues that surround it. WPA and the working group have been instrumental in increasing public support for wind, particularly through materials distributed to landowners and studies regarding wind energy's effect on property values. They have similarly informed state and local policymakers and were believed by at least four of the five respondents to have influenced the passing of supportive state and local policies, particularly through their education of local government officials. According to one respondent, the wind working group's annual conferences have also played a role in helping developers to find investors for their projects and gain more visibility with (and interest from) the utilities that would eventually sign power purchase agreements for their projects. However, another respondent felt the working group's role in such relationship building for specific projects was overstated.

From a process perspective, two of the five respondents pointed to the working group's partnership with Illinois State University as a key characteristic contributing to the group's effectiveness. Specifically, these respondents pointed to the stability of the group over the years and the added credibility provided by having an academic institution involved in some of the research activities and reports associated with the group. Two other respondents pointed generally to the abundance and topical diversity of the information the working group provided to market stakeholders, particularly farmers, landowners and school districts. Another respondent mentioned the importance of the group's non-exclusionary approach to its meetings and conferences, citing the attendance of both executives from multimillion-dollar companies and town trustees and farmers at the same meeting.

Two of the five stakeholders also indicated that a high degree of collaboration among the wind working group and other organizations contributed significantly to the influence that the group had. In particular, the coordinators at Illinois State University mentioned Wind on the Wires and the Illinois Wind Energy Association as key allies and strong advocates for the state's wind market. However, another respondent who provided a more regional perspective suggested that the working group could have collaborated more broadly across state lines and that its insular focus on developing the wind industry in the state (rather than the region) may have slowed the industry's overall growth.

Other respondents had mixed views on whether the wind working group could have done anything better than it had. In addition to the above comment on broader collaboration, another stakeholder thought that the wind working group could have played a bigger role in developing and advocating for specific policies. (WPA specifically designed the working group approach to share policy best practices, but stop

short of advocacy.) Another commented on the negative impact of resource constraints (i.e., funding) on the group's ability to conduct additional research, specifically calling attention to county officials' current interest in decommissioning studies.

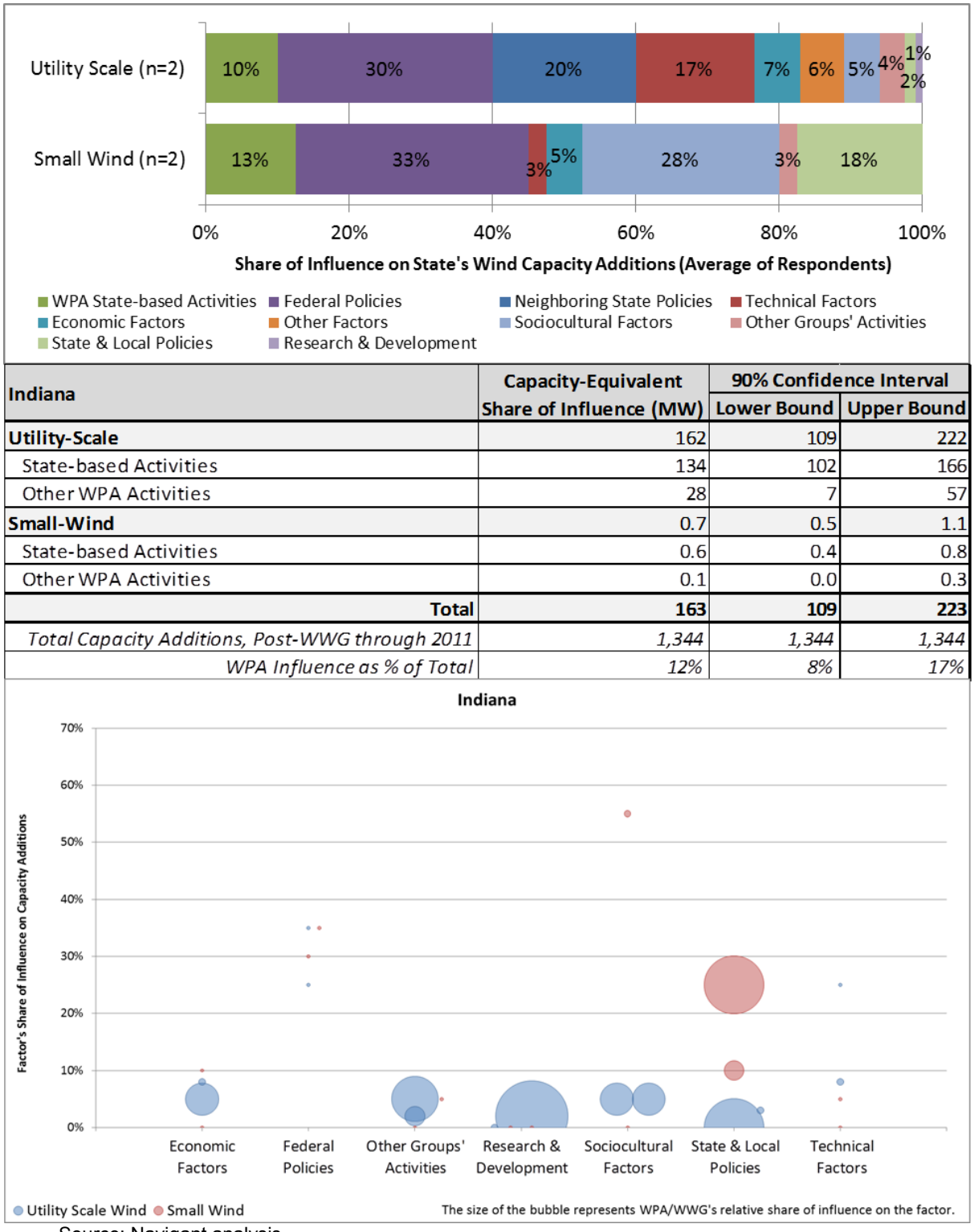
**Table D-8. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Illinois**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 6% | 9% | 165 | 0.65 | **Utility-Scale:** WWG, events (Advancing Wind Power Conference and the Siting, Zoning and Taxing Conference), landowner forums and education, published materials, economic impact modeling<br>**Small-Wind:** Wind for Schools program; WWG meetings; Siting, Zoning and Taxing Conference; wind resource map |
| Other WPA Activities | 3% | 6% | 66 | 0.41 | **Utility-Scale:** Federal wind power program, rural economic development, "20% Wind Energy by 2030" report<br>**Small-Wind:** "20% Wind Energy by 2030" report, rural economic development |
| Other Groups' Activities | 3% | 8% | 79 | 0.62 | **Utility-Scale:** Wind for Illinois (i.e., Illinois Wind Energy Association), Wind on the Wires, AWEA, Illinois Energy Office, NWCC, UWIG, Windustry<br>**Small-Wind:** Illinois Energy Office, Windustry, SWCC, Illinois Clean Energy Community Foundation |
| State & Local Policies | 19% | 18% | 494 | 1.33 | **Utility-Scale:** RPS (including in-state preference), property tax laws Enterprise Zones and High Impact Business designation), siting and permitting regulations<br>**Small-Wind:** RPS, siting and permitting ordinances, small-wind incentives and rebates, net metering, interconnection standards, public benefits fund |
| Neighboring State Policies | 5% | 2% | 132 | 0.12 | **Utility-Scale:** RPSs in neighboring states (particularly Iowa)<br>**Small-Wind:** N/A |
| Federal Policies | 25% | 23% | 659 | 1.70 | **Utility-Scale:** PTC, ITC and cash grant<br>**Small-Wind:** ITC and cash grant, Farm Bill, ARRA funding |
| Economic Factors | 16% | 12% | 428 | 0.91 | **Utility-Scale:** Wholesale electricity prices, electricity demand, utilities' willingness to sign PPAs, competing sources' LCOE<br>**Small-Wind:** Retail electricity rates, desire to lower bills, availability of skilled labor |
| Sociocultural Factors | 6% | 12% | 152 | 0.87 | **Utility-Scale:** Willing landowner base<br>**Small-Wind:** Environmental awareness, desire to be energy independent |
| Research & Development | 4% | 3% | 99 | 0.25 | **Utility-Scale:** New wind turbines improving accessible resource<br>**Small-Wind:** Private sector R&D |
| Technical Factors | 14% | 7% | 362 | 0.53 | **Utility-Scale:** Wind resource, geography and transmission<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **2,635** | **7.39** | |

[a] Percentages based on simple averages of utility-scale (n=4) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.5 Indiana

**Figure D-9. Indiana: WPA Influence Summary Dashboard**




| Indiana | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 162 | 109 | 222 |
| State-based Activities | 134 | 102 | 166 |
| Other WPA Activities | 28 | 7 | 57 |
| **Small-Wind** | 0.7 | 0.5 | 1.1 |
| State-based Activities | 0.6 | 0.4 | 0.8 |
| Other WPA Activities | 0.1 | 0.0 | 0.3 |
| **Total** | **163** | **109** | **223** |
| *Total Capacity Additions, Post-WWG through 2011* | *1,344* | *1,344* | *1,344* |
| *WPA Influence as % of Total* | *12%* | *8%* | *17%* |




Source: Navigant analysis

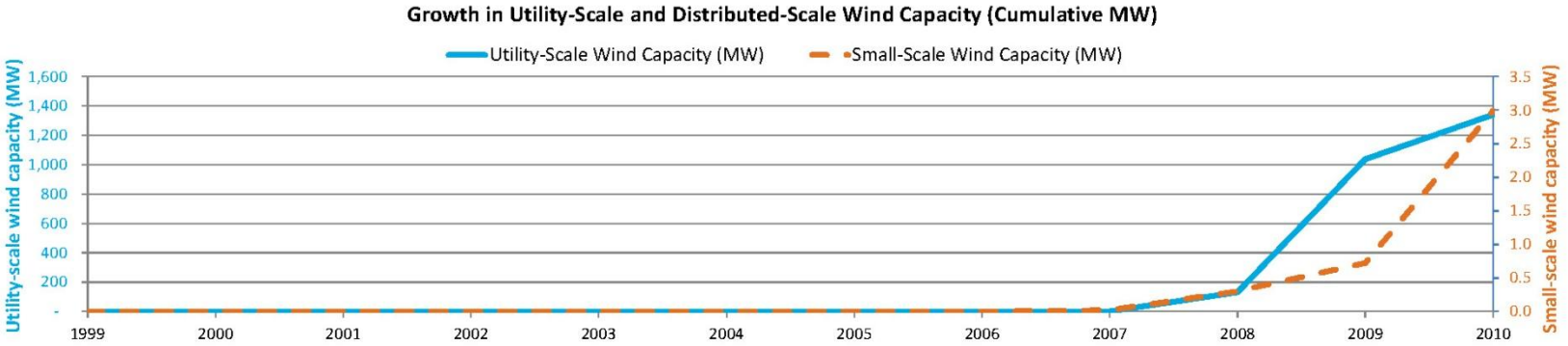
**Figure D-10. Indiana Wind Market Timeline and Wind Capacity Additions (1999-2010)**

**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Green power pricing programs | | | | | | Net metering programs available | | | | | |
| | | | | | | Wind Working Group Active (quarterly meetings) | | | Annual Indiana Wind Conference | | |
| | | | | | | | County wind turbine ordinances established for about 12 counties | | | | |
| | | | | | | | | Small wind eligible for state grant program | | | |
| | | | | | | | WPA workshops and webinars | | | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | • Energy Policy Act establishes renewable energy procurement goals for Federal government<br>• Small wind guide published<br>• Interconnection standards established<br>• State Tall Towers Study with wind maps | | | • Energy Efficient State Building Initiative | • Utility incentives for wind (IP&L)<br>• Sales and use tax exemption clarified for wind turbines | • Rate Renewable Energy Production (IP&L)<br>• Property tax exemptions |




Source: Navigant analysis

### D.5.1 State Overview

In 1997, the Indiana Legislature instructed the State to investigate electric market restructuring; however, the state has maintained conventional regulatory oversight (EIA 2012). The Indiana Utility Regulatory Commission (IURC) oversees the state's utility rates and services, while the state's Office of Energy and Defense Development (OED) administers the state's energy policy. In 1999, a total of 122 utilities served Indiana's 2.8 million customers. Seven were investor-owned and 115 were public or co-operative utilities representing 82% and 18% of 1999 retail sales, respectively. The largest of these utilities was PSI Energy, Inc., which accounted for about 27% of the state's megawatt-hours sold. As shown in Table D-9, the majority of Indiana's electricity came from coal-fired generation in 1999 (EIA 2001).

**Table D-9. Share of Indiana's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 94.6% |
| Natural Gas | 4.2% |
| Petroleum | 0.8% |
| Hydroelectric | 0.3% |
| Other | 0.1% |

Source: EIA 2001

In 2006, OED began implementing its strategic energy plan, Hoosier Homegrown Energy (Indiana OED 2012a). The plan's goals include:

1. Trade current energy imports for future Indiana economic growth
2. Produce electricity, natural gas, and transportation fuels from clean coal and bioenergy
3. Improve energy efficiency and infrastructure

Indiana did not have an RPS during the evaluation period; however, in May of 2011 it enacted a voluntary RPS of 10% by 2025 (DSIRE 2012). As shown in Figure D-10, Indiana had virtually no installed wind capacity until after 2007. From 2007 through 2010, total installed wind capacity increased from zero to 1,339 MW, including 4 MW of small-wind capacity. After an initial 130 MW were added in 2008, utility-scale capacity jumped to more than 1,000 MW by the end of 2009. After 2009, utility-scale capacity continued to increase, but at a more gradual pace, with 300 MW added in 2010.

Small-scale wind capacity gradually increased from 2007 to 2009, and then sharply increased by roughly 2.5 MW between 2009 and 2010. The policies and events timeline shown in Figure D-10 provides some insight on factors that may have influenced these increases. The state began offering grants for renewable energy systems (including small-wind power) in 2007, shortly before small-wind capacity began to climb (National Governors Association 2010). In addition, several key events took place in 2009 that coincide with an increase in small-wind capacity: the federal government designated ARRA financial support for wind projects in the form of cash grants in lieu of the ITC; the state enacted a sales and use tax exemption for wind; and Indiana's fourth-largest utility, IP&L, began offering incentives for small-scale renewable energy systems (including wind).

### D.5.2 Development of State Wind Market

#### Utility-Scale Market

The three interviewed stakeholders that discussed the Indiana utility-scale wind market reported that federal policies, specifically the PTC, had the greatest influence on wind capacity additions from 1999 to 2010.

Similarly, all three pointed to neighboring state policies as playing a critical role in driving demand for Indiana's wind resources. As mentioned earlier, Indiana did not have an RPS during the evaluation period; however, demand from nearby markets allowed the state to export wind power to other states. These respondents noted that much of the utility-scale wind developed between 2007 and 2010 was driven by demand from purchasers in these nearby markets, such as Duke Energy, AEP Appalachian Power, and Ameren Illinois. Other states' RPS goals played a key role in driving this demand.

These three respondents also pointed to a combination of technical factors as a key contributor to Indiana's utility-scale market. Specifically, Indiana's favorable wind resource and access to both the Midwest Independent System Operator (MISO) and PJM markets provided good opportunities to export wind power, particularly to East Coast markets with a demand for renewable power. One respondent noted concerted efforts by MISO operators to encourage developers to move projects "as far east as possible" to get the best rates and lowest grid connection costs. In addition, one stakeholder suggested that some utilities may have pursued wind power as a risk mitigation tactic to hedge against a potential federal RPS or future carbon mandates. Beyond these policy and technical factors, stakeholders perceived the WPA's state-based activities as having a significant, but lesser, influence on utility-scale wind capacity in Indiana. Section D.5.3 presents a detailed assessment of WPA's activities and influence.

Stakeholders perceived economic factors, sociocultural factors, other group activities, and state and local policies as having minimal influence on utility-scale wind capacity between 1999 and 2010. Interviewees tied economic factors such as electricity demand and utility interest in power purchase agreements to the technical factors mentioned earlier. They perceived sociocultural factors such as public acceptance, community support, economic development goals, and environmental impact issues as having lesser influence, and described the efforts of the State Energy Office and AWEA as somewhat ineffective in influencing policy. One stakeholder noted that the state did a good job of "staying out of the way to let the communities decide whether to pursue wind." On the other hand, two of the three respondents noted that many state lawmakers and politicians had a "distaste for wind" and were generally unsupportive of the market, resulting in a difficult business climate for wind developers.

Table D-10 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

As with the utility-scale wind market, the two small-wind interview respondents considered federal policies as having had the greatest influence on small-wind capacity additions from 1999 to 2010. In particular, the availability of the federal ITC for small-wind power starting in 2008, and the cash grant option in 2009, appears to correspond to small-wind capacity additions in the state. As mentioned earlier, small-scale wind capacity increased by roughly 2.5 MW between 2009 and 2010. In addition to the ITC, one stakeholder described the Clean Renewable Energy Bonds (CREBs) program as a primary driver of small-wind installations, especially for schools and other public entities. The federal government authorized the CREBs program in 2008.

Unlike with utility-scale wind, sociocultural factors (e.g., environmental drivers, public acceptance) appear to have had a more significant influence on small-wind capacity. One stakeholder stated that the WWG successfully influenced such sociocultural factors by educating schools, farmers, and other community members, while the other simply attributed a share of small-wind capacity to "people wanting to be green." Respondents also perceived state and local policies as having a strong influence on small-wind capacity. Specifically, the state's net metering policy, enacted in 2004, played a key role in moving small-wind projects forward. One stakeholder specifically noted that the lack of a mandatory state RPS negatively affected the market.

Stakeholders perceived economic factors and other group activities as having minimal influence on small-scale wind capacity between 1999 and 2010. According to one, even with the ITC, the return on investment in small-scale wind was relatively low with a long payback period. These challenging economics may have contributed to what one interviewee described as the state administration's lack of political support for small-scale wind, a position against which advocacy groups made little progress.

### D.5.3 Summary of Wind Powering America Activities and Influence

The WPA designated Indiana as a high-priority state and coordinated with the state's OED to create the Indiana Wind Working Group (IWWG) in 2005. The IWWG held quarterly meetings from 2005 through 2010, and coordinated an annual meeting, WIndiana, each year between 2008 and 2011 (Indiana OED 2012b). WPA provided wind resource maps each year beginning in 2005 through 2008, and published a small-wind power guide in 2005. The IWWG was most active between 2006 and 2008, when it offered ongoing workshops, webinars, and exhibits. Indiana did not have a Wind for Schools or Anemometer Loan Program.

Three of the four interviewed stakeholders perceived the WPA and IWWG's efforts to measure wind resources and coordinate experts through meetings and annual conferences as the activity that had the greatest influence on Indiana's wind markets. In particular, two stakeholders felt that these meetings helped bring key players into the discussion, such as representatives from the business and manufacturing community. These meetings helped connect local companies with wind developers, further enhancing the perception that wind power could provide economic benefits to the state. Similarly, another respondent discussed the WWG's success at encouraging landowner acceptance of wind power by highlighting the economic benefits and dispelling common myths surrounding wind power. Two respondents also commented that the WPA and IWWG informed state and local policy by influencing a 2011 increase in the state's net-metering policy.

From a process perspective, two respondents each generally discussed the WWG's inclusiveness of a diverse set of stakeholders as a contributing factor to the group's success. In particular, the group sought to include developers, manufacturers, utilities, academics, and legal professionals in their efforts. One respondent suggested that this dynamic make-up of the group and the influence of some involved individuals (particularly from academia and law) lent it additional credibility. Conversely, one respondent also pointed out that this inclusiveness (i.e., of the utilities) may have backfired to some degree in that some perceived the utilities as having ultimately blocked the adoption of the state RPS that other members of the WWG worked to support.

In terms of barriers, three of the four respondents again pointed to the state's political environment as a daunting and potentially insurmountable hurdle for some of the WWG's efforts. Two of these respondents specifically pointed out the state's reliance on coal-fired electricity generation, suggesting that conventionally low power prices and the influence of the coal industry contributed both economically and politically to these barriers.

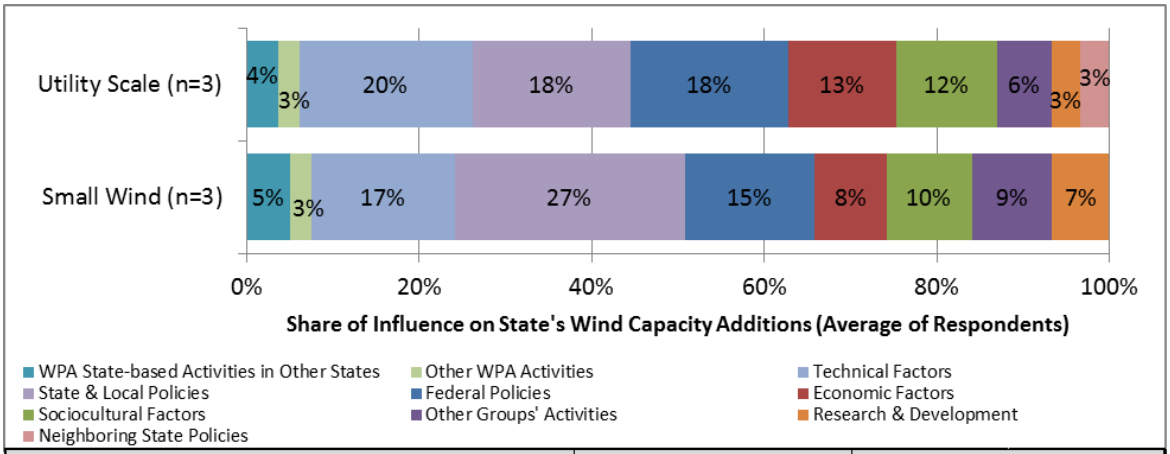
**Table D-10. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Indiana**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 10% | 13% | 134 | 0.51 | **Utility-Scale:** Anemometer loan program, tall towers study, WWG meetings<br>**Small-Wind:** Public outreach and education, particularly about net metering; opportunities for networking |
| Other WPA Activities | 0% | 0% | - | - | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Other Groups' Activities | 4% | 3% | 47 | 0.10 | **Utility-Scale:** State Energy Office, AWEA<br>**Small-Wind:** State Energy Office, AWEA, Windustry |
| State & Local Policies | 2% | 18% | 20 | 0.72 | **Utility-Scale:** Siting and permitting, interconnection standards, state sales tax exemption<br>**Small-Wind:** Utility policies and incentives, net metering |
| Neighboring State Policies | 20% | 0% | 268 | - | **Utility-Scale:** Access to PJM market and RPSs in other states<br>**Small-Wind:** N/A |
| Federal Policies | 30% | 33% | 402 | 1.34 | **Utility-Scale:** PTC, ITC<br>**Small-Wind:** ITC cash grant, CREBs |
| Economic Factors | 7% | 5% | 87 | 0.21 | **Utility-Scale:** The competing energy sources LCOE; utilities' willingness to sign PPAs (e.g., Duke and IPL)<br>**Small-Wind:** Electricity prices |
| Sociocultural Factors | 5% | 28% | 67 | 1.13 | **Utility-Scale:** Local support in rural areas and among landowners<br>**Small-Wind:** Environmental awareness |
| Research & Development | 1% | 0% | 13 | - | **Utility-Scale:** Improvements in wind reliability and cost<br>**Small-Wind:** N/A |
| Technical Factors | 17% | 3% | 221 | 0.10 | **Utility-Scale:** Wind resources, access to transmission (and PJM market)<br>**Small-Wind:** Wind resource |
| Risk Mitigation | 6% | 0% | 80 | - | **Utility-Scale:** Local utilities were hedging against a potential federal RPS or carbon mandates<br>**Small-Wind:** N/A |
| **Total** | **100%** | **100%** | **1,340** | **4.12** | |

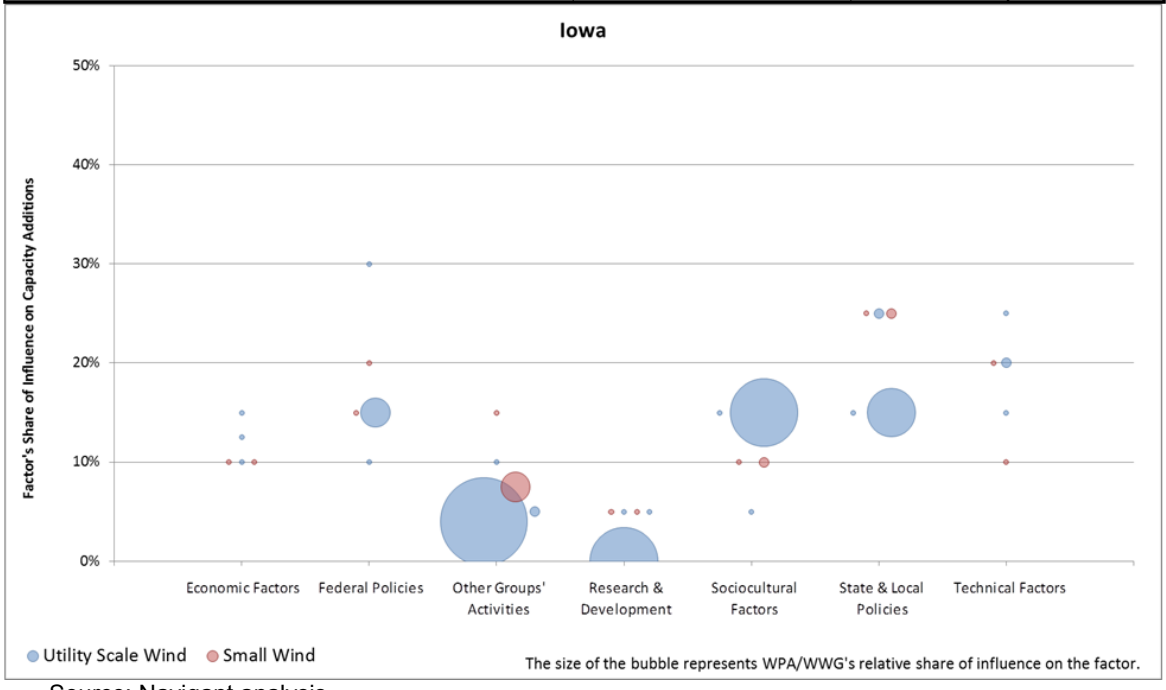
[a] Percentages based on simple averages of utility-scale (n=2) and small-wind (n=2) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.6 Iowa (Non-Targeted State)

**Figure D-11. Iowa: WPA Influence Summary Dashboard**




| Iowa | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 375 | 257 | 524 |
| State-based Activities | 207 | 139 | 286 |
| Other WPA Activities | 168 | 118 | 238 |
| **Small-Wind** | 2.7 | 2.0 | 3.6 |
| State-based Activities | 1.7 | 1.3 | 2.3 |
| Other WPA Activities | 1.0 | 0.7 | 1.3 |
| **Total** | **377** | **259** | **528** |
| *Total Capacity Additions, 2000 through 2011* | *4,107* | *4,107* | *4,107* |
| *WPA Influence as % of Total* | *9%* | *6%* | *13%* |




Source: Navigant analysis

## Figure D-12. Iowa Wind Market Timeline and Wind Capacity Additions (1999-2010)

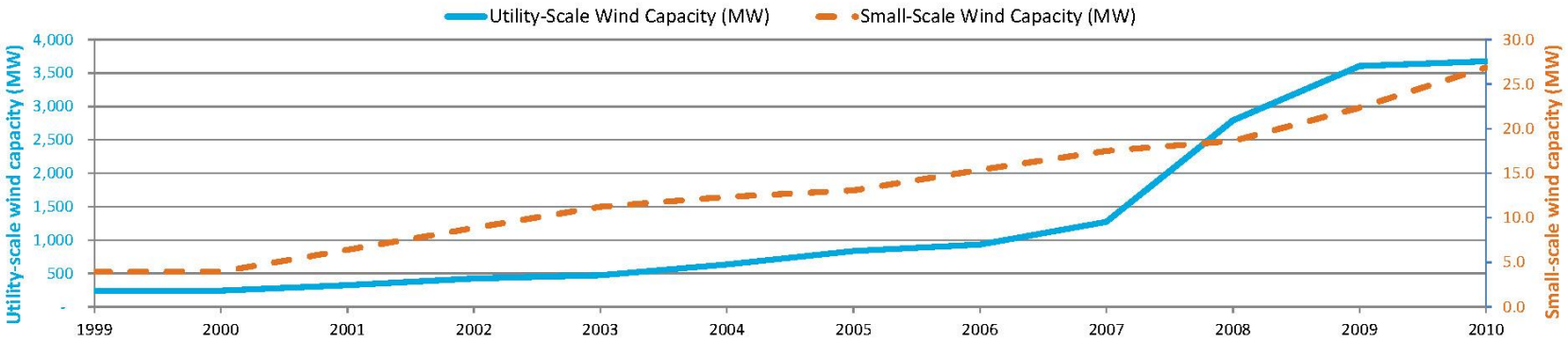
**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | | |
| | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Alternative Energy Law (1983) | Secondary and voluntary goal of 1,000 MW by 2010 | | | | | | | | | | |
| Sales Tax Exemption, Special Property Tax Assessment (increasing from 0% property tax 1st year), and Revolving Loan Program (50% financed cost) in effect | | | | | | | | | Energy Replacement Generation tax exemption | | |
| Iowa Renewable Energy Association found in 1992 (member-based nonprofit offering workshops, demonstrations, monthly newsletter since 2008, updated website) | | | | | | | | | | | |
| Net Metering and state incentives for small wind available | | | | | | | | | Utility incentives for small wind | | |
| | Green power pricing programs available | | | | | | County wind turbine ordinances developed for 5 counties | | | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • Iowa met its renewables requirement of 105 MW in 1999 (1983 Alternative Energy Law). • Property tax exemptions available since 1978. | • Governor's task force recommends voluntary goal of 1,000 MW by 2010. | • Green power options required for utilities • Advanced ratemaking principles created for utility-owned wind generation. | | • Iowa Utilities Board allows waivers of plant siting rules for wind farms. | | • Energy Policy Act (EPACT) establishes renewable energy goals for Federal government. • Creation of 1.0¢/kWh and 1.5¢/kWh PTC programs. | | • (May) Iowa Office of Energy Independence created (released Energy Independence plans in 2007 and 2008). | • Renewable energy rebates created (Farmers Electric Co-op small wind ITC). | • Small Wind Innovation Zone program and Model Ordinance created to promote small wind | • Interconnection Standards • Residential, Business and Farm Renewable Energy Rebates offered by Alliant Energy (wind PTC $0.25/kWh for first year). |

**Growth in Utility-Scale and Distributed-Scale Wind Capacity (Cumulative MW)**




Source: Navigant analysis

### D.6.1 State Overview

Legislation to restructure Iowa's electricity market was proposed in 1999 and 2000, but it died when the Iowa legislature failed to act on it before the legislative session ended. No further restructuring legislation has been introduced. In 1999, the Iowa Utilities Board approved MidAmerican Energy's retail choice pilot program in Council Bluffs; however, the pilot was terminated in mid-2000. At the time, customers in Iowa were served by four investor-owned utilities and 181 public or co-operative utilities, representing 76.2% and 23.8%% of 1999 retail sales, respectively (EIA 2001).[37] The largest of these were MidAmerican Energy Company and IES Utilities, which accounted for 37% and 27% of the state's retail electricity sales, respectively. As shown in Table D-11, 85.4% of Iowa's electricity came from coal in 1999 (EIA 2001).

**Table D-11. Share of Iowa's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 85.4% |
| Nuclear | 9.4% |
| Hydroelectric | 2.4% |
| Natural Gas | 1.3% |
| Wind | 0.8% |
| Petroleum | 0.4% |
| Biomass (Excluding Wood) | 0.2% |

Source: EIA 2001

As shown in Figure D-12, Iowa already had 242 MW of installed wind capacity by the end of 1999. The majority of this capacity was installed in 1999—41.25 MW at Cerro Gordo, 108.75 MW at Storm Lake I, and 79.5 MW at Storm Lake II. Between 2001 and 2010, an average of 343 MW of wind was installed each year. Most notably, 21 projects with a cumulative capacity of 1,518 MW were installed in 2008.

Figure D-12 also shows a potential connection between these capacity increases and the incidence of numerous state and local policies intended to support the renewable energy and wind market. Iowa enacted an Alternative Energy Production law in 1983, which was clarified in 1991 to require MidAmerican Energy and Alliant Energy Interstate Power and Light to own or contract for a combined total of 105 MW of renewable energy. The utilities met this requirement in 1999, but in 2001 the governor of Iowa added a voluntary goal of 1,000 MW of wind by 2010. Also in 2001, the state legislature enacted Code § 476.53, which gave the Iowa Utilities Board (IUB) advanced ratemaking decision authority for new electric generation, including utility-owned wind plants. Starting in 2004, all Iowa electric utilities were required to offer a green power purchase program under HF 577.

Iowa has had a net metering policy in place since 1984; the policy applies to renewable energy systems up to 500 kW, but is only available to customers of MidAmerican Energy and Alliant Energy Interstate Power and Light. Interconnection standards for distributed generation up to 10 MW were adopted in May 2010.

[37] Retail energy sales in 1999 totaled 38.0 million MWh (EIA 2001).

### D.6.2 Development of State Wind Market

#### Utility-Scale Market

Two of the three stakeholders interviewed about Iowa's utility-scale wind market perceived that the state's wind resource was the factor with the single greatest influence on the state's wind capacity additions from 1999 to 2010. As a result, technical factors had the greatest average share of influence across all three respondents. Respondents viewed the federal PTC and state and local policies as having had the next highest average shares of influence on the utility-scale wind market in Iowa. As noted above, Iowa adopted one of the nation's first renewable portfolio standards in 1983, and the state's lawmakers and governors have continued to provide consistent political support to the wind market. This includes supportive tax policies for wind, such as a sales tax exemption for wind energy equipment adopted in 1993.

All three respondents also mentioned some combination of economic and sociocultural factors as having a significant (but lesser) influence than policy-related factors. One respondent partly categorized the advanced ratemaking authority granted to the IUB in 2001 as an economic factor. As noted above, this authority enabled Iowa's investor-owned utilities to own wind power generation assets and acquire advanced approval from the IUB to include the costs of those plants in their future rate base. This served to reduce the utilities' uncertainty, thereby helping to mitigate the risk of developing projects. In addition, the state's access to the MISO provided access to sell wind in other states that also had RPSs (e.g., Minnesota).

Public support and the absence of organized opposition for wind have also contributed to Iowa's large installed wind capacity. In Iowa, many landowners have essentially viewed wind as a crop that can be harvested for profit. Interview respondents perceived research and development and organizations that may have supported the wind market as having had a lesser influence than the above key factors.

Table D-12 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

From 1999 to 2010, Iowa had relatively steady growth of small-wind capacity, with an average of 2.0 MW per year and a cumulative total of 26.9 MW by the end of 2010. All three interviewed stakeholders considered state and local policies to be the most influential factor in developing Iowa's small-scale wind market. Iowa's net metering policy, established in 1984, applies to renewable energy systems up to capacities of 500 kW, but is only available to customers of MidAmerican Energy and Alliant Energy Interstate Power and Light. Iowa also had a number of tax incentives in place that supported the small-wind market – a sales tax exemption for wind energy equipment was adopted in 1993, a special wind valuation for property tax purposes in 1994, and a state production tax credit for wind facilities of 2-30 MW in 2005. In addition, the Iowa Energy Center began providing interest-free loans for small-wind turbines through the Alternative Energy Revolving Loan Program in 1996.

Technical factors, such as the quality of Iowa's wind resource, also had relatively high perceived influence on the small-wind market, as did federal policies like the USDA Section 9006 grants (from the 2002 Farm Bill) and funding from the American Recovery and Reinvestment Act of 2009. In addition, one respondent mentioned the importance of the Iowa Power Fund, which supported research and development in wind technology.

### D.6.3 Summary of Wind Powering America Activities and Influence

Iowa has long been a leader in wind development. As a result, WPA did not specifically target Iowa for state-based activities and the state did not have a wind working group; however, WPA was involved in creating a small-wind development guide for the state. One stakeholder specifically indicated that WPA's greatest influence in Iowa was their production of credible technical information that was accessible to various stakeholders in the state. For example, WPA's wind resource maps helped provide legitimacy to those produced independently in Iowa and to the state's wind resource, and other materials helped build popular support for wind as an economically affordable power source. That same stakeholder also believed that WPA likely played a part in getting the Section 9006 Renewable Energy and Energy Efficiency Improvement Program included in the 2002 Farm Bill.

While most respondents were unable to provide any specific, empirical evidence of WPA's influence in Iowa, another interviewee mentioned that some stakeholders in the state took advantage of WPA's economic and financial modeling tools (e.g., the JEDI model), as well as the initiative's model interconnection standards. This respondent also suggested that farmers and landowners from Iowa attended WPA conferences in neighboring states; however, the study team was unable to confirm this directly.

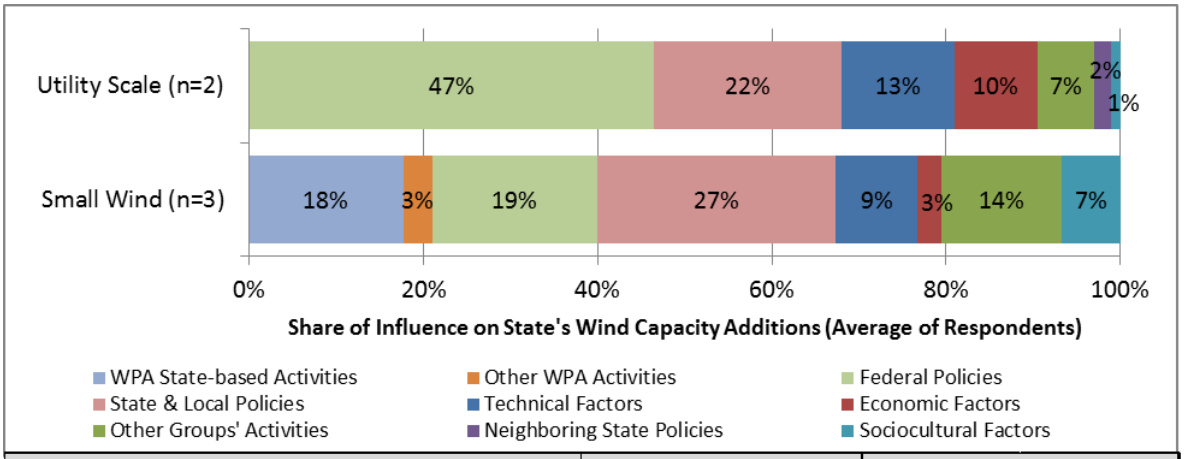
**Table D-12. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Iowa**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 4% | 5% | 150 | 1.37 | **Utility-Scale:** Provided credible information and gave the resource some legitimacy<br>**Small-Wind:** Interconnection standards, economic and financial modeling tools, wind conferences in other states |
| Other WPA Activities | 3% | 3% | 102 | 0.69 | **Utility-Scale:** "20% Wind Energy by 2030" report<br>**Small-Wind:** Rural economic development |
| Other Groups' Activities | 6% | 9% | 258 | 2.52 | **Utility-Scale:** State Energy Office, Department of Natural Resources, Iowa Wind Energy Association, AWEA<br>**Small-Wind:** State Energy Office, Iowa Energy Center, Department of Natural Resources, AWEA, Iowa Wind Energy Association |
| State & Local Policies | 18% | 27% | 748 | 7.32 | **Utility-Scale:** RPS, local siting ordinances, tax policies<br>**Small-Wind:** Net metering, interconnection standards, sales and property tax exemptions, rebates for community wind (including a state PTC), utility rebates |
| Neighboring State Policies | 3% | 0% | 136 | - | **Utility-Scale:** Neighboring state's RPSs: Illinois, Wisconsin and Minnesota<br>**Small-Wind:** N/A |
| Federal Policies | 18% | 15% | 748 | 4.12 | **Utility-Scale:** PTC, ITC, Farm Bill<br>**Small-Wind:** Farm Bill (REAP grants), ITC, ARRA funding |
| Economic Factors | 13% | 8% | 510 | 2.29 | **Utility-Scale:** The Iowa Utility Board's approval of rate recovery for utilities who wanted to own wind, high electricity demand<br>**Small-Wind:** Access to capital and investor interest, utilities' willingness to sign net meter, availability of skilled labor |
| Sociocultural Factors | 12% | 10% | 476 | 2.75 | **Utility-Scale:** Public awareness, engagement and support for the wind industry; economic impacts<br>**Small-Wind:** Manufacturers locating in Iowa has a positive influence on people's awareness |
| Research & Development | 3% | 7% | 136 | 1.83 | **Utility-Scale:** Pilot program (funded by DOE and EPRI); university research<br>**Small-Wind:** Iowa Power Fund program that funded research and development; companies doing R&D on wind technology. |
| Technical Factors | 20% | 17% | 816 | 4.58 | **Utility-Scale:** Wind resource, access to transmission (initially, currently being improved)<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **4,080** | **27.45** | |

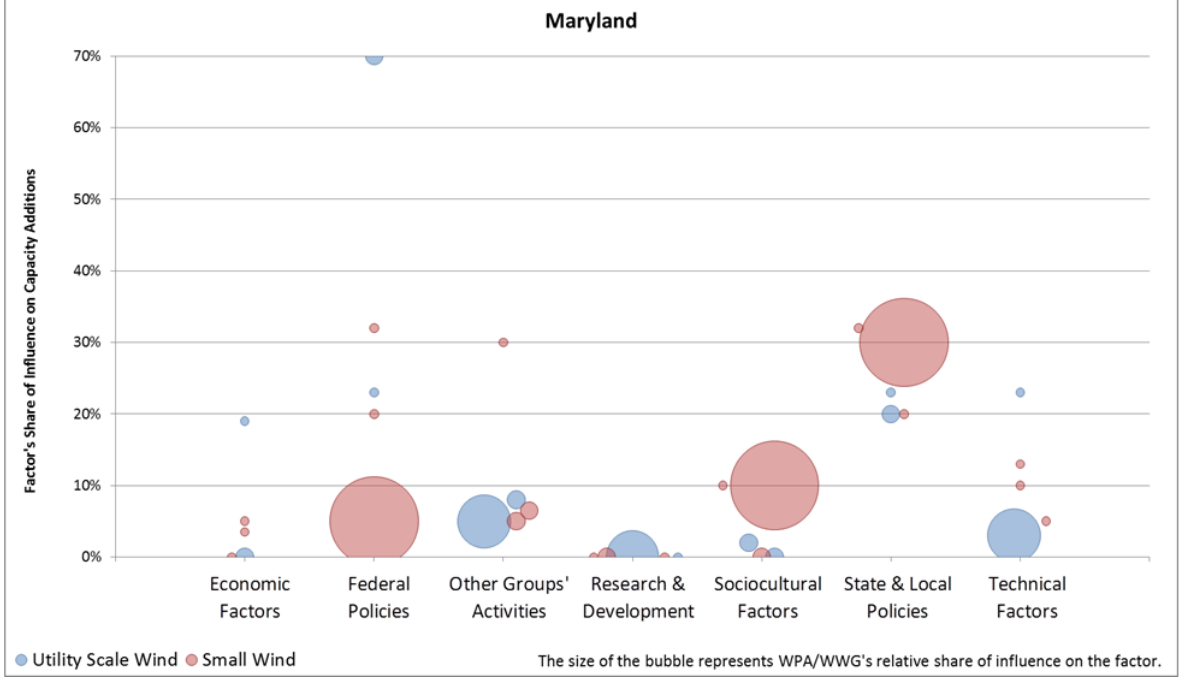
[a] Percentages based on simple averages of utility-scale (n=3) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.7 Maryland

**Figure D-13. Maryland: WPA Influence Summary Dashboard**

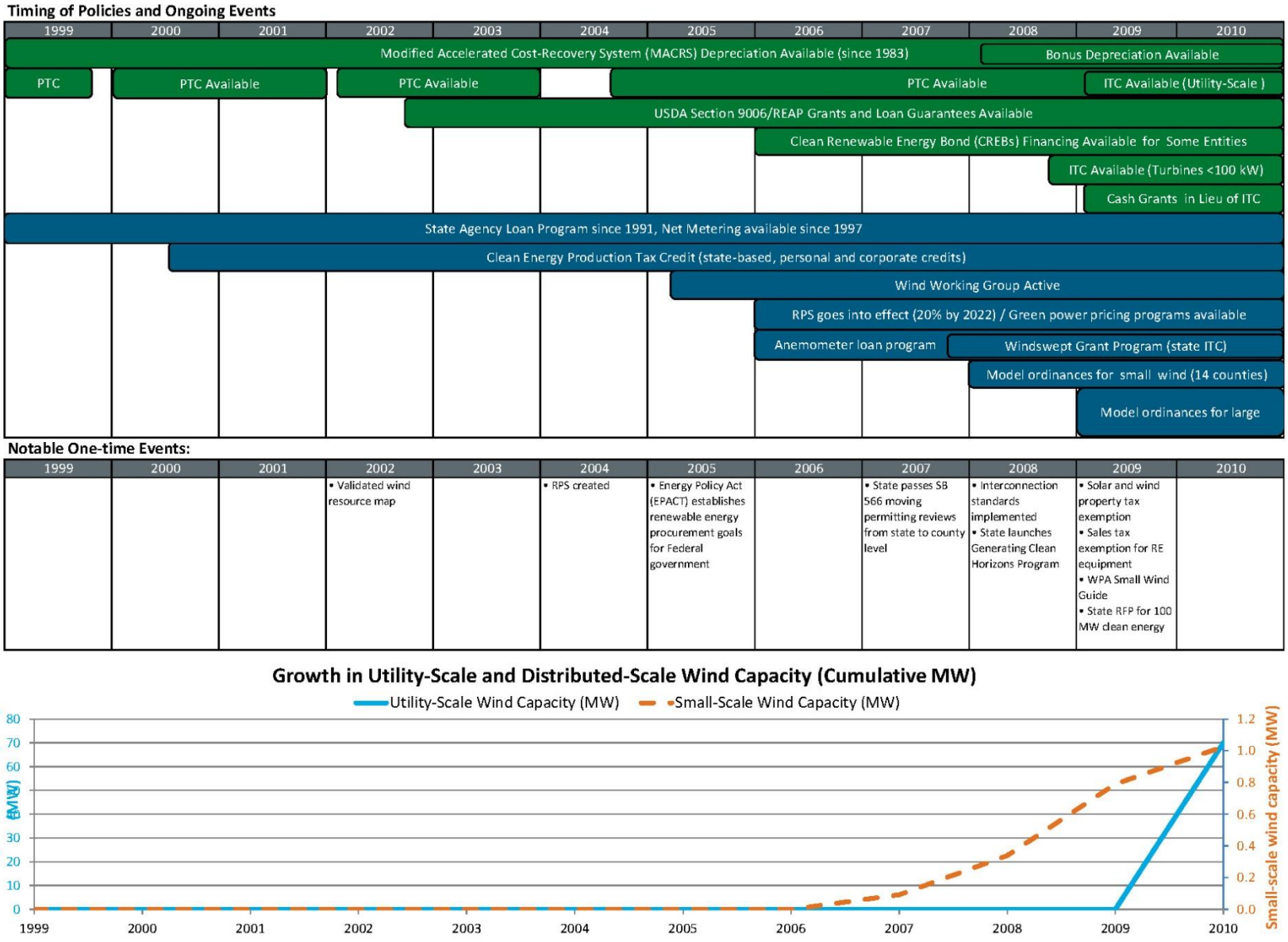



| Maryland | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 2 | 0 | 5 |
| State-based Activities | 1 | 0 | 2 |
| Other WPA Activities | 1 | 0 | 2 |
| **Small-Wind** | 0.3 | 0.2 | 0.3 |
| State-based Activities | 0.2 | 0.2 | 0.3 |
| Other WPA Activities | 0.1 | 0.0 | 0.1 |
| **Total** | **2** | **0** | **5** |
| *Total Capacity Additions, Post-WWG through 2011* | *122* | *122* | *122* |
| *WPA Influence as % of Total* | *2%* | *0%* | *4%* |




Source: Navigant analysis

**Figure D-14. Maryland Wind Market Timeline and Wind Capacity Additions (1999-2010)**




Source: Navigant analysis

### D.7.1 State Overview

The Maryland General Assembly enacted utility restructuring legislation in 1999 via the Maryland Customer Choice and Competition Act. Notably, the legislation did not allow for the signing of long-term power supply contracts between utilities and electric power suppliers (EIA 2010). As one interview respondent pointed out, the current process for procuring power requires utilities to buy power via 1-3 year contracts, thus making it difficult for developers to get long-term PPAs for renewable energy projects. The Maryland Public Service Commission oversees the state's electric utilities and electricity suppliers while the Maryland Energy Administration (MEA) advises the Governor on directions, policies and changes in the various segments of the energy market. The MEA was responsible for overseeing WPA activities in the state between 1999 and 2010.

In 1999, a total of 12 utilities served Maryland's 2.1 million customers. Four were investor-owned and eight were public or co-operative utilities representing 93% and 7% of 1999 retail sales, respectively. The largest of these utilities was Baltimore Gas & Electric Company (BG&E), which accounted for about 50% of the state's megawatt hours sold. As shown in Table D-13, the majority of Maryland's electricity came from coal-fired generation in 1999 (EIA 2001).

**Table D-13. Share of Maryland's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Nuclear | 25.7% |
| Coal | 57.4% |
| Natural Gas | 4.5% |
| Petroleum | 8.0% |
| Hydroelectric | 2.8% |
| Other | 1.6% |

Source: EIA 2001

Maryland enacted an RPS in 2004, establishing a requirement for all utilities (investor-owned, municipal and rural electric cooperatives) and retail suppliers in the state to generate 20% of their power from renewables by 2022. The policy went into effect in 2006. As shown in Figure D-14, Maryland had no installed wind capacity until after 2006. Beginning in 2007, small-wind capacity increased at an average rate of 250 kW per year, with one MW total installed by the end of 2010. The 70-MW Criterion project, Maryland's first utility-scale wind farm, came online in 2010.

The policies and events timeline shown in Figure D-14 provides some insight on factors that may have influenced these increases. For example, the state began offering the Anemometer Loan Program in 2006, with support from the wind working group, and in 2008, it launched the Windswept grant program. Finally, in 2009, local counties began adopting model ordinances for small-wind turbines, and the Federal government designated ARRA financial support for wind projects in the form of cash grants in lieu of the ITC.

### D.7.2 Development of State Wind Market

#### Utility-Scale Market

The two interviewed stakeholders that discussed the Maryland utility-scale wind market reported that federal policies, specifically the PTC, had the greatest influence on Maryland's utility-scale capacity additions. In addition to the federal PTC, both respondents described Maryland's RPS as an important

driver of utility-scale capacity in the state, and one respondent pointed out the significant role of the state's Clean Energy Production Tax Credit and local permitting ordinances in driving large-scale wind projects. The Maryland Energy Administration's (MEA's) Generating Clean Horizons initiative launched in 2008 as an effort to "kick-start" utility-scale green power generation in the state, and likely created momentum for large-scale wind beginning in 2008 and driving subsequent offshore wind legislation.

Respondents described technical factors and other group activities as having a smaller (but important) influence on utility-scale wind capacity growth. Both respondents cited the state's wind resource as moderately influential. One respondent described AWEA as the most active among "other groups," while the other respondent pointed to the MEA as the most influential (the MEA administered the state's WPA activities). Both stakeholders perceived neighboring state policies, sociocultural factors, and WPA activities as having minimal influence on the utility-scale market.

Table D-14 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Among the three stakeholders that discussed small-scale wind in Maryland, state and local policies had the greatest average perceived influence on capacity additions; however, individual respondents also cited federal policies, other groups' activities, and WPA state-based activities as equally or more important. All three respondents agreed that state-level financial incentives such as the state Clean Energy PTC and the state ITC, known to most as the Windswept Grant Program, made small-wind installations possible in the state. In addition, individuals cited other important policies, including local permitting ordinances and net metering.

Two of the three respondents felt that federal policies played an equally important role in driving small-wind capacity. As in other states the federal ITC's extension to small-wind power in 2008, and the cash grants offered as part of the ARRA package in 2009, made wind projects financially viable in a way not previously seen. To a lesser extent, grants tied to the Farm Bill drove interest in small-wind projects throughout the state; however, one respondent noted that Farm Bill funding had been difficult for in-state projects to secure. On average, stakeholders perceived WPA state-based activities' share of influence as almost as great as federal policies; however, specific comments about the WPA's role varied.

Each respondent described technical factors as having moderate influence on small-scale wind capacity growth. While one respondent described the quality of the wind resource as the important technical factor, another cited technology improvements. Specifically, he noted that seeing the technology work via demonstration projects and R&D efforts makes people more likely to want to install wind systems. One respondent felt that sociocultural factors had more of a negative than positive influence on the small-wind market in Maryland. He noted, for example, that in some cases the public had kept projects from moving forward due to concerns about noise, birds, and landscape views. This same respondent felt that the current economic climate is not conducive to investment in small-scale wind, and that without secure incentives and public support, small-wind projects are either too risky or not financially viable.

### D.7.3 Summary of Wind Powering America Activities and Influence

The WPA designated Maryland as a high-priority state and coordinated with the MEA to create the state wind working group in 2005. WPA provided wind resource maps each year from 2006 through 2008, and published a small-wind development guide in 2006. The MEA also implemented an Anemometer Loan Program with WPA funding from 2006 through 2008. The wind working group conducted outreach via local and regional events, such as the Maryland Farm Bureau conference, and facilitated workshops

and strategic planning sessions with key stakeholders in the state. Despite a stated need for more funding, working group activities apparently continued to some degree after federal WPA funding stopped, with the MEA paying for travel and the Anemometer Loan Program. Maryland did not have a Wind for Schools program.

Overall, respondents collectively indicated that WPA primarily affected Maryland's small-scale, rather than utility-scale, wind market. While one respondent felt the wind resource maps and WPA web tools were helpful, the two respondents discussing utility-scale wind said that the initiative's absence would have had little to no influence on the timing or rate of capacity additions in the state. One of the two respondents commented that only the early meetings were useful to help folks "move up the learning curve." This same respondent, however, also commented that DOE and NREL research efforts had been more useful than material from the wind working group (apparently not associating those DOE/NREL materials with WPA).

A different respondent said the wind working group was not working at all and was "just a collection of people forced together." This respondent commented that a lack of common goals and needs among stakeholders prevented any kind of critical mass forming around the group. Another respondent commented that the differences in wind resources and opportunities in various geographic areas of the state might have also contributed to this lack of cohesion: "There was no point in bringing people from western Maryland together with people from the eastern shore…it's just different geographic markets and its different issues."

The three respondents discussing the small-wind market, however, projected a greater influence from the initiative. Each projected that there would have been 25-50% less small-wind capacity installed without the WWG's and WPA's help, or that it would have been delayed for at least 6 months (if not significantly longer). One respondent commented that the WPA publicized the ITC cash grant via regional outreach, and that the WPA's presence at public meetings was helpful in getting model ordinances passed in different counties. This respondent noted, however, that those activities "do little good if no one wants to install." In addition, two respondents described the Anemometer Loan Program as helpful, although the third considered it to be not useful.

Some respondents were unaware of the connection between the wind working group and the MEA. As a result, some WPA activities may have affected small-scale wind capacity more than those respondents perceived. For example, one respondent said he was "not aware of any wind working group or other state-based activities of WPA in Maryland" and that he was "not aware of a nationally sponsored working group or WPA activities in Maryland." However, this same respondent went on to say that the "most active group in Maryland since 2009 is the state energy office and Andrew Gohn [the working group coordinator] in particular." This highlights a potential lack of awareness of the relationship between MEA activities, WPA, and the wind working group.

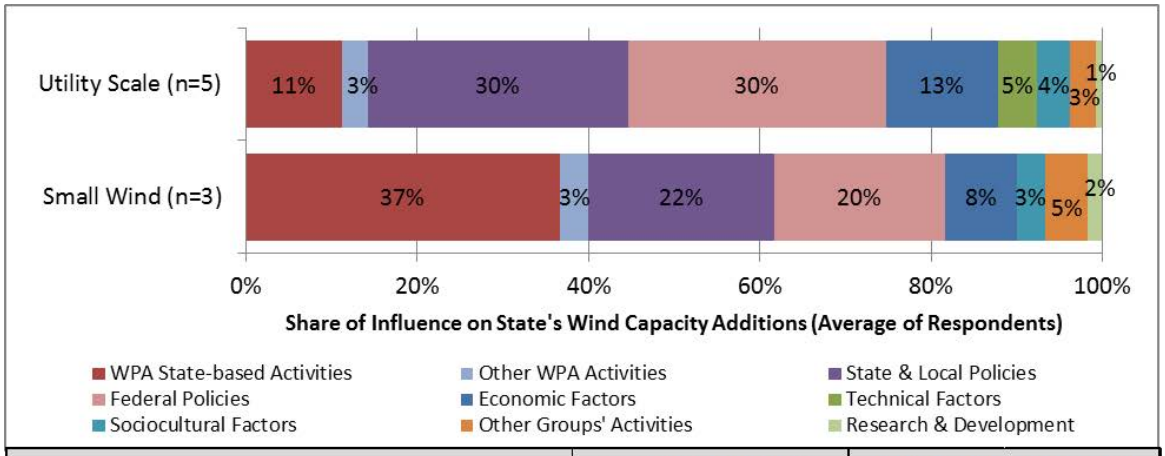
**Table D-14. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Maryland**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 0% | 18% | - | 0.22 | **Utility-Scale:** Impacted primarily small-scale wind; Overall, NREL research efforts have been more useful than material from WWG<br>**Small-Wind:** WWG, model ordinances, anemometer loan program, public outreach, resource maps, WPA website, wind for schools, stakeholder engagement |
| Other WPA Activities | 0% | 3% | - | 0.04 | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Other Groups' Activities | 7% | 14% | 8 | 0.17 | **Utility-Scale:** AWEA, Maryland Energy Administration<br>**Small-Wind:** Maryland Energy Administration |
| State & Local Policies | 22% | 27% | 26 | 0.34 | **Utility-Scale:** RPS, state PTC, permitting ordinances<br>**Small-Wind:** State tax credits for small-wind power, Windswept grant program, net metering |
| Neighboring State Policies | 2% | 0% | 2 | - | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Federal Policies | 47% | 19% | 56 | 0.24 | **Utility-Scale:** PTC<br>**Small-Wind:** ITC cash grant, MACRS depreciation, Farm Bills |
| Economic Factors | 10% | 3% | 11 | 0.04 | **Utility-Scale:** Electricity demand, power prices<br>**Small-Wind:** Availability of installers who are knowledgeable |
| Sociocultural Factors | 1% | 7% | 1 | 0.08 | **Utility-Scale:** Public support (more negative)<br>**Small-Wind:** Split issue - some people in favor for environmental reasons, others opposed due to visual impact and other environmental reasons (e.g., wildlife impacts) |
| Research & Development | 0% | 0% | - | - | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Technical Factors | 13% | 9% | 16 | 0.12 | **Utility-Scale:** Wind resource<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **120** | **1.25** | |

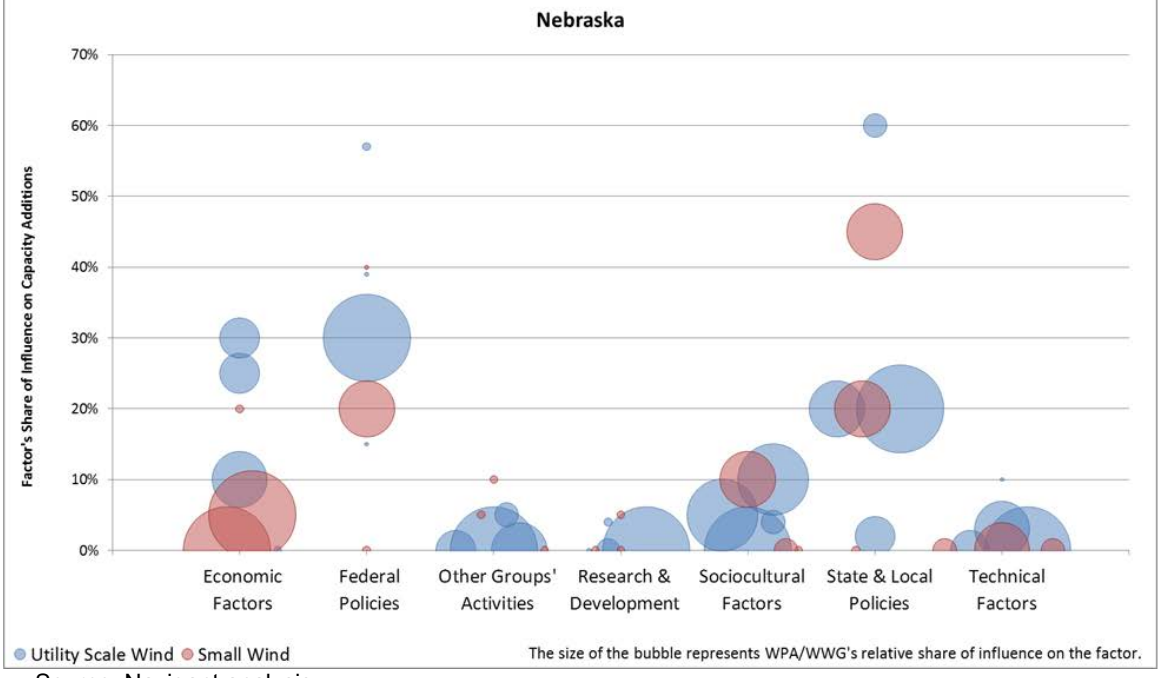
[a] Percentages based on simple averages of utility-scale (n=2) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.8 Nebraska

**Figure D-15. Nebraska: WPA Influence Summary Dashboard**

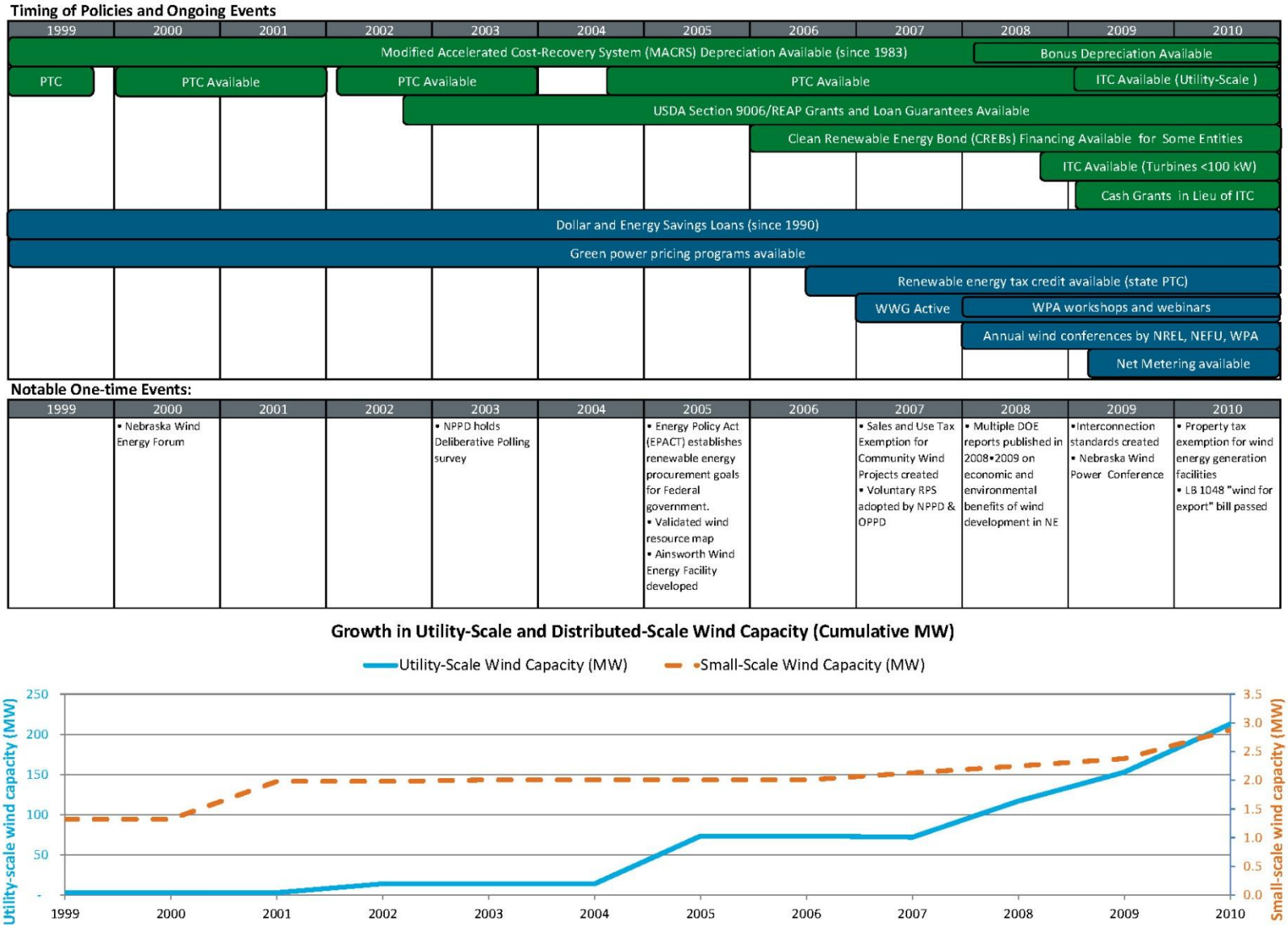



| Nebraska | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 76 | 54 | 109 |
| State-based Activities | 42 | 31 | 58 |
| Other WPA Activities | 35 | 23 | 51 |
| **Small-Wind** | 0.8 | 0.6 | 1.1 |
| State-based Activities | 0.6 | 0.6 | 0.8 |
| Other WPA Activities | 0.2 | 0.1 | 0.3 |
| **Total** | **77** | **55** | **110** |
| *Total Capacity Additions, Post-WWG through 2011* | *267* | *267* | *267* |
| *WPA Influence as % of Total* | *29%* | *20%* | *41%* |




Source: Navigant analysis

**Figure D-16. Nebraska Wind Market Timeline and Wind Capacity Additions (1999-2010)**




Source: Navigant analysis

### D.8.1 State Overview

In 1999, Nebraska's electricity was supplied by 161 publicly-owned or cooperative utilities and 1 federal utility. There were no investor-owned utilities in the state at the time. Publicly owned utilities accounted for 97.3% of retail sales while cooperative utilities and federal utilities only accounted for 2.1% and 0.6%, respectively (EIA 2001).[38] Omaha Public Power District (OPPD) was the largest utility in the state, representing 36% of the state's retail electricity sales. Nebraska Public Power District (NPPD) was the next largest, representing 14% of retail sales, followed by Lincoln Electric System with 12%. As shown in Table D-15, more than half (59.3%) of Nebraska's electricity came from coal-fired generation in 1999, while 33.6% came from nuclear (EIA 2001).

**Table D-15. Share of Nebraska's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 59.3% |
| Nuclear | 33.6% |
| Hydroelectric | 5.7% |
| Natural Gas | 1.3% |
| Petroleum | 0.1% |

Source: EIA 2001

Nebraska's installed wind capacity increased from 3 MW to 213 MW between 1999 and 2010. As shown in Figure D-16, utility-scale wind capacity was fairly limited in Nebraska until 2005, when it increased from 14 MW to 73 MW with the development of the Ainsworth Wind Energy Facility. Utility-scale wind capacity continued to grow by a rate of about 40 MW annually between 2007 and 2009, with additional utility-scale wind projects established in 2010 and subsequent years. Nebraska's small-scale wind capacity experienced little growth between 1999 and 2010.

Figure D-16 also suggests a possible connection between these capacity increases and the incidence of supportive state and local policies. Notably, Nebraska holds a unique distinction as the only state served entirely by publicly owned electric utilities. According to some interview respondents, this results in a close link between the utilities' interests and state policy decisions. In July 2006, Nebraska passed a state-based renewable energy production tax credit that supplemented the federal PTC. While the state has not mandated an RPS, in 2007, Nebraska's two largest utilities, OPPD and NPPD, adopted a de facto RPS by proclaiming a voluntary goal of procuring 10% of the state's electricity from renewable energy by 2020. Additionally, sales and use tax exemptions for community wind projects were adopted in October 2007. In 2010, the Nebraska legislature passed Legislative Bill (LB) 1048, allowing private developers to develop wind generation facilities specifically for the export of electricity out of the state of Nebraska. From a small-wind policy perspective, net metering and interconnection standards were passed in 2009 for wind systems up to 25 kW in size.

### D.8.2 Development of State Wind Market

#### Utility-Scale Market

Two of the five stakeholders interviewed about Nebraska's utility-scale wind market perceived that the public power districts' decision to set voluntary RPS goals in 2007 had the greatest singular influence on wind capacity additions between 1999 and 2010. Initially, all power production construction had to be done through the utilities, which, as public entities, were unable to take advantage of the federal PTC.

[38] Retail energy sales in 1999 totaled 22.8 million MWh (EIA 2001).

This pushed the public power providers to seek private developers who could leverage the PTC to develop wind projects. In the fall of 2007, NPPD became the first to enter into a PPA with a private developer. Four of the five respondents specifically cited the PTC as a primary market driver. One stakeholder also cited the LB 1048 bill as an important factor in creating a new trajectory for utility-scale wind in Nebraska by increasing the role of private developers and bolstering the wind industry's growth through wind exports. In addition to these state and federal policy issues, two stakeholders allocated a large share of market influence to economic factors, but in their supporting comments again described the public utilities' willingness and interest in signing PPAs as the underlying cause.

On average, the next most important factor in the state was WPA's state-based activities, including the wind working group. One stakeholder suggested that the working group and its relationship with the national labs influenced the public utilities' knowledge and comfort level with wind power and informed and influenced the utility and its ratepayers in regards to the wind power's benefits. Another noted the positive influence of a deliberative polling session held by NREL in 2003 to assess the community's support and desire for renewable energy. Influential WPA activities are further described in Section D.8.3.

Table D-16 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Although Nebraska experienced little growth in its small-scale wind market over the evaluation period, the three interviewed small-wind stakeholders did perceive WPA as having substantial influence on the capacity that was installed. One respondent specifically mentioned that WPA state-based activities were important in educating and supplying key stakeholders with the information necessary to effectively advocate for wind energy in Nebraska. As in the utility-scale wind market, the Nebraska WWG built public understanding and support for small-wind power by partnering with national laboratories, landowner groups, and wind associations through wind conferences, regional meetings, state fairs, and various forms of public outreach. Three stakeholders specifically mentioned the WPA Wind for Schools Program as especially influential, while another two mentioned the group's support of the five Nebraska Wind Power Conferences as a significant influence. The WPA also worked alongside the Nebraska State Energy Office to provide low-interest loans for residential and commercial renewable energy projects through the Dollar and Energy Savings Program. In addition to WPA activities, respondents cited either state and local policies (e.g., net metering rules) or federal policies (USDA grants) as the other primary drivers for the state's small-wind capacity. Few other factors received much share of the influence for small-wind capacity additions.

### D.8.3 Summary of Wind Powering America Activities and Influence

WWG prioritized Nebraska as a high-priority state due to a low installed wind capacity (less than 20 MW), the state's good wind resource, and the lack of supportive policies in place for the wind industry. The Nebraska WWG formed in 2007, and began working to improve the landscape for wind development in the state. As stated above, stakeholders generally perceived WPA as having had a significant influence on the evolution of the wind market in Nebraska. Three of the five respondents mentioned the validated wind resource map, which WPA distributed in 2005, as having notable influence, and all three small-wind stakeholders also commended WPA's Wind for Schools program, which was established in 2007. Beginning in 2008, the WWG facilitated annual wind power conferences, group workshops, informational meetings, and webinars. Three of the five stakeholders noted these community events as being important in increasing understanding and support surrounding state wind

development activities, and four of the respondents suggested that the WPA's involvement in community outreach and education was essential to the state's wind capacity additions.

As noted above, two of the respondents indicated that WPA and the wind working group had a significant influence on the utilities' interest and willingness to support the wind market through their efforts to educate both landowners and the utilities themselves about wind power's benefits. Subsequent actions taken by these utilities suggest those efforts had a lasting influence. For example, Midwest Wind Energy's website indicated it has six projects under development in Nebraska.[39] Similarly, Lincoln Electric System has committed to meeting all load growth over the next five years with renewables and energy efficiency.

From a process perspective, stakeholders pointed to the wind working group's appeal to a diverse set of interest groups as instrumental in its ability to build knowledge and support for wind in Nebraska. In particular, the group partnered with the American Corn Growers Foundation and the Nebraska Farmers Union (NEFU), using these relationships to help educate landowners on the benefits of wind energy. The production of reliable technical resources and the WWG's consistent education and outreach efforts through wind conferences, educational sessions, agricultural conventions, and webinars had a significant influence on their knowledge of and comfort with wind energy. Similarly, its efforts to include representatives from the public utilities were seen as an important step in having all of the necessary stakeholders at the table to effect real change in the state's wind market.

[39] http://www.midwestwind.com/projects/#http%3A//www.midwestwind.com/projects/index.php%3Fstate%3DNE. Accessed December 17, 2012.

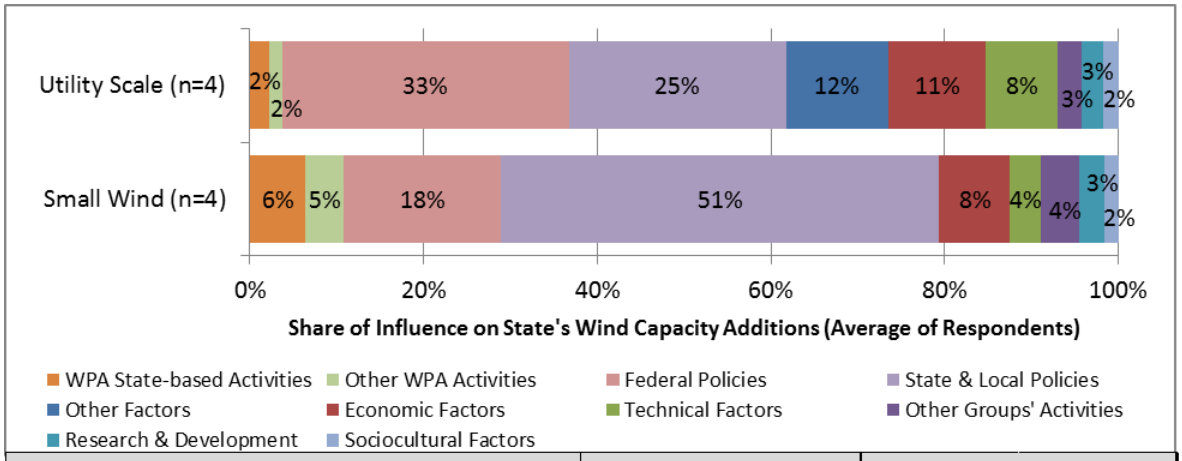
**Table D-16. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Nebraska**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 11% | 37% | 30 | 0.59 | **Utility-Scale:** WWG, outreach and educational sessions, wind conferences, education of land owners, wind resource maps, dissemination of technical materials, wind for schools<br>**Small-Wind:** WWG, wind for schools, Nebraska wind conference, wind resource maps, outreach and education, technical information |
| Other WPA Activities | 3% | 3% | 8 | 0.05 | **Utility-Scale:** JEDI model and rural economic development activities<br>**Small-Wind:** N/A |
| Other Groups' Activities | 3% | 5% | 8 | 0.08 | **Utility-Scale:** Nebraska Energy Office, landowner organizations, American Corn Growers Association<br>**Small-Wind:** State Energy Office low-interest loans |
| State & Local Policies | 30% | 22% | 81 | 0.35 | **Utility-Scale:** State goals from the public power districts, sales and use tax exemption for community wind, public power districts joining the Southwest Power Pool in 2009, wind-for-export bill<br>**Small-Wind:** Net metering |
| Neighboring State Policies | 0% | 0% | - | - | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Federal Policies | 30% | 20% | 80 | 0.32 | **Utility-Scale:** PTC<br>**Small-Wind:** Farm bill and USDA rural development funding for small turbines |
| Economic Factors | 13% | 8% | 35 | 0.13 | **Utility-Scale:** Electricity demand, utilities' willingness to sign PPAs<br>**Small-Wind:** Desire to self-generate |
| Sociocultural Factors | 4% | 3% | 10 | 0.05 | **Utility-Scale:** Public acceptance of wind power<br>**Small-Wind:** Public acceptance of wind power |
| Research & Development | 1% | 2% | 2 | 0.03 | **Utility-Scale:** Demonstration projects<br>**Small-Wind:** Pilot and demonstration projects |
| Technical Factors | 5% | 0% | 12 | - | **Utility-Scale:** Wind resource<br>**Small-Wind:** N/A |
| **Total** | **100%** | **100%** | **266** | **1.62** | |

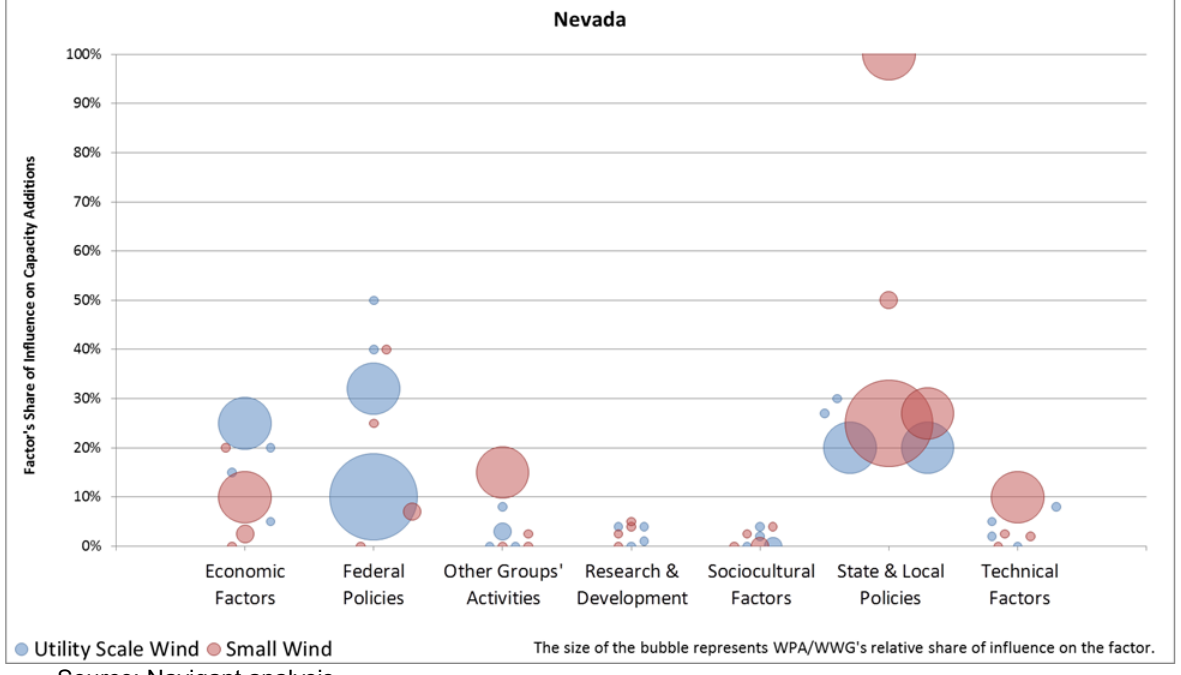
[a] Percentages based on simple averages of utility-scale (n=5) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.9 Nevada

**Figure D-17. Nevada: WPA Influence Summary Dashboard**




| Nevada | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 0 | 0 | 0 |
| State-based Activities | 0 | 0 | 0 |
| Other WPA Activities | 0 | 0 | 0 |
| **Small-Wind** | 0.6 | 0.5 | 0.7 |
| State-based Activities | 0.4 | 0.3 | 0.5 |
| Other WPA Activities | 0.2 | 0.1 | 0.3 |
| **Total** | **1** | **0** | **1** |
| *Total Capacity Additions, Post-WWG through 2011* | *5* | *5* | *5* |
| *WPA Influence as % of Total* | *12%* | *9%* | *14%* |




Source: Navigant analysis

## Figure D-18. Nevada Wind Market Timeline and Wind Capacity Additions (1999-2010)

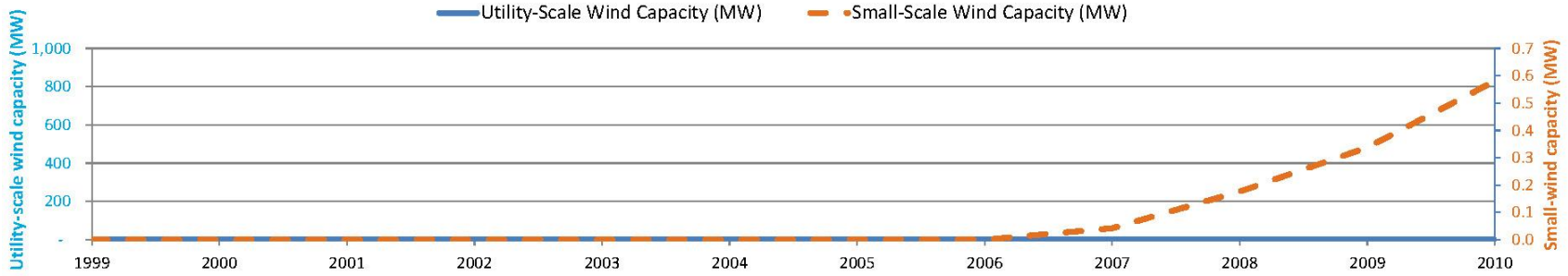
**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Property tax exemption since 1983 and net metering | | | | | | | | | | | |
| Renewable Portfolio Standard (RPS) in effect. Amended in 2001, 2003, 2005, 2009. Includes hydro, 25% by 2025. | | | | | | | | | | | |
| | | Renewable Energy and Energy Conservation Task Force meetings | | | | | | | | | |
| | | | Nevada Wind Working Group active (mostly from 2006-2009) | | | | WPA workshops, webinars, anemometer loans | | | | |
| | | | | | | | | | Small-wind Rebates available under NV Energy's Wind Generations Program | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • Wind easements established in 1995 to protect wind installations from restrictions<br>• RPS requirements created in 1997 | | • Renewable Energy and Energy Conservation Task Force created | • Validated wind resource map | | | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government.<br>• Small wind guide published | • Portfolio Energy Credits created (renewable energy producers can earn PECs then sell to utilities required to meet NV RPS)<br>• Nevada Wind Workshop | • Wind Technology Workshop at TechAdvantage Conference | | • Property, sales and use tax abatement (large wind)<br>• Nevada State Energy Reduction Plan (state agencies to reduce consumption and add renewables) | • Renewable Generations Rebate Program on hold |

**Growth in Utility-Scale and Distributed-Scale Wind Capacity (Cumulative MW)**




Source: Navigant analysis

### D.9.1 State Overview

Nevada passed electricity market restructuring legislation in 1997; however, after several years of delayed implementation, the legislature effectively suspended those efforts in 2001 (EIA 2010). In 1999, Nevada's electricity was supplied by 4 IOUs, 17 publicly owned or cooperative utilities, and 1 federal utility. Investor-owned utilities accounted for 88.8% of retail sales while public or cooperative utilities and federal utilities accounted for 10.8% and 0.4%, respectively (EIA 2001).[40] Nevada Power Company was the largest utility in the state, representing 58% of the state's retail electricity sales, followed by Sierra Pacific Power Company, representing about 30% of sales. In July 1999, these utilities merged and in 2008 started operating as NV Energy, which accounted for 62% of retail sales in 2010 (EIA 2012).[41] Over half (58%) of Nevada's electricity was generated from coal in 1999, followed by 28.5% generated from natural gas (see Table D-17).

**Table D-17. Share of Nevada's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 58.4% |
| Natural Gas | 28.5% |
| Hydroelectric | 8.6% |
| Petroleum | 0.1% |
| Other | 4.3% |

Source: EIA 2001

As Figure D-18 shows, Nevada had no utility-scale wind capacity and only about 600 kW of small-wind capacity installed between 1999 and 2010. The four utility-scale wind stakeholders interviewed all pointed to political barriers at the state and federal levels as the foremost reason that Nevada's wind capacity additions have lagged. Land management organizations, wildlife protection agencies, and the outdoor recreation community have presented significant challenges to wind power development at the state level. At the federal level, the U.S. Department of Defense (DOD) has created additional barriers to development arising from its vested interest in protecting military operations in the state.

Despite these impediments, stakeholders cited some state, local, and federal policies that have contributed positively to the landscape for wind development in Nevada. For example, Nevada has had a property tax exemption for renewable energy systems in effect since 1983. In 1995, the state enacted solar and wind easements to protect owners of these renewable energy system types against restrictions that would prevent them from installing such systems on their property. In 1997, the state established an RPS that required IOUs to supply a minimum percentage of total electricity sales using eligible renewable energy resources. The legislation began by establishing a goal of 1% renewables by 1999, but was amended in 2001 to increase the goal by 2% every two years, culminating in a 15% requirement by 2013 and a target of 25% by 2025. More recently, the state enacted property, sales, and use tax abatements for large-scale renewable energy projects of at least 10 MW in size in 2009.

Specific to the small-wind market, the state also enacted net metering legislation for renewable energy systems in 1997, including wind systems up to 1 MW in capacity or 100% of the customer's annual electricity requirements. The passage of three additional policies coincided with the marked increases in Nevada's small-wind capacity additions. The first is the Portfolio Energy Credit (PEC) trading program that began in February 2006. The PEC program allows renewable energy producers to earn PECs and then sell them to utilities that are required to meet the RPS. The other two policies that correspond to the increase in wind capacity additions are the 2009 ARRA ITC Cash Grant program and NV Energy's

[40] Retail energy sales in 1999 totaled 26.4 million MWh (EIA 2001).
[41] https://www.nvenergy.com/company/index.cfm; http://www.eia.gov/electricity/state/pdf/sep2010.pdf.

Renewable Generations Rebate Program, which provides incentives to help customers offset the installation costs of renewable energy systems.

### D.9.2 Development of State Wind Market

#### Utility-Scale Market

All four stakeholders in the utility-scale wind market in Nevada conveyed that federal tax credits have had the most significant influence on driving wind project development from 1999 to 2010. Unlike most states, however, the first utility-scale wind project in Nevada (the Spring Valley Project, which came online in August 2012) used the 30% ITC (available to PTC-eligible technologies as part of ARRA) rather than the PTC. According to one interview respondent, Nevada's average wind speeds (and therefore expected project capacity factors) are lower than those in many surrounding states. In this case, the ITC may have provided a more immediate and attractive return to project investors than the PTC. In addition to these federal policies, respondents also mentioned the importance of the state's RPS and its connection to utilities' willingness to sign power purchase agreements. However, as one respondent pointed out, in Nevada this effectively translates to the interest of a single IOU (NV Energy) in buying power from a particular wind project, reflecting a somewhat limited in-state PPA market for developers.

Despite favorable policies, utility-scale wind projects faced repeated hurdles over the evaluation period. Three of the four respondents noted that more than 80% of Nevada's landmass is managed by either federal or state government agencies, leaving little unrestricted private land on which to install wind projects.[42] As a result of opposition from wildlife and public land conservationists, hunters, and DOD, wind developers have looked to more rural areas with less political resistance in northern Nevada to install wind systems. These interviewees noted that this confined environment for utility-scale wind development is augmented by the state's limited transmission system, which exists in relation to Nevada's concentrated population hubs. Interview respondents did mention that U.S. Senator Harry Reid's advocacy of renewable energy policies and willingness to facilitate meetings with other state and federal agencies (e.g., the Department of Defense), had a positive influence on the development of the wind market in Nevada.

Table D-18 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Four stakeholders in Nevada's small-scale wind industry cited various state and local and (to a lesser degree) federal policies as the primary drivers for the capacity additions made to the state's small-wind market from 1999-2010. Of the state and local policies, these stakeholders most often referred to the Renewable Generations Rebate Program (run by NV Energy) as spurring growth in the small-scale wind market. Other important state policy influences included a property tax exemption and net metering benefits. Influential federal policies identified included the 2008 USDA Farm Bill grants and the ARRA stimulus funding that enabled ITC cash grants. One respondent explained that the Renewable Generations Rebate Program was the precursor for the provision of small-scale wind developments but that the ITC cash grants sparked a surge of capacity additions in the small-scale wind market in Nevada around 2009.

In addition to policy support, stakeholders indicated that the economic environment of the agricultural sector contributed, albeit to a lesser degree, to investments in small-scale wind systems. Specifically, beginning in late 2008, NV Energy filed for rate increases and peak penalties for the agricultural community, causing some customers in the sector to seek other ways to produce energy and lessen their

[42] Federally owned land represents 81.1% of Nevada (http://www.fas.org/sgp/crs/misc/R42346.pdf).

reliance on NV Energy.[43] Also noted by one respondent, while siting ordinances precluded small-scale wind activity within densely populated areas, the industry did not face the same level of resistance from rural stakeholders and interest groups (e.g., wildlife and land management) as did the utility-scale wind market.

### D.9.3 Summary of Wind Powering America Activities and Influence

The Nevada WWG formed in 2002, and was most active between 2006 and 2009. WPA categorized Nevada as a high-priority state because, despite the existence of favorable state policies and an active WWG, the state had failed to see significant increases in installed capacity. As described above, the lack of utility-scale capacity likely stemmed in part from the political and sociocultural barriers associated with the development of utility-scale wind in Nevada (i.e., wildlife and public land interests and Department of Defense concerns). However, stakeholder comments suggested that these obstacles were largely out of the WWG's sphere of influence and that they consequently had a limited influence on the utility-scale market. In fact, one respondent involved in past WWG activities stated that the group spent limited efforts (mostly stakeholder meetings with various agencies and policymakers) on the utility-scale wind market for those reasons. Regardless, three of these four stakeholders conveyed that the WWG still played an indirect role by helping to shape Senator Reid's advocacy of renewable energy resource policy by strengthening his knowledge of the market and those key barriers. The WWG also provided an outlet of communication between policymakers, developers, utilities, ratepayers, and other key players in the utility-scale industry.

For the small-wind market, three of four stakeholders perceived that the WWG and WPA did have some degree of positive influence, but they demonstrated mixed opinions on the level of influence. The WWG's focus on Nevada's small-scale wind market supported a variety of activities. The WWG distributed a validated wind map in the same year the group was formed. In March 2005, WPA published a small-wind consumers' guide that provided information to consumers regarding the feasibility of investing in a small-wind system for their home or business. The group established an anemometer loan program and held workshops, webinars, and regular meetings beginning in 2006. One stakeholder commented on the educational importance of the anemometer loan program, while two of the three cited the WWG's role as a dependable source of information, especially with respect to wind resource maps and model wind ordinances. They also mentioned that the WWG has provided greater accessibility to industry experts, community outreach support, and objective input on key policy issues relating to the small-scale wind industry.

From a process perspective, respondents felt that there were few additional steps the WWG could have taken to overcome the above-mentioned barriers to affecting the utility-scale market. However, some respondents offered constructive criticism related to issues that may have facilitated an earlier influence on the small-wind market. For example, one respondent mentioned periodic changes in the WWG's leadership that contributed to a lack of momentum and positive progress in the first several years. From 2002-2005, the working group was part of the Nevada State Energy Office (NSOE). Coordination was then shifted temporarily to the Nevada Attorney General's Consumer Protection Group until the NSOE received WPA funding to hire a private contractor to coordinate the group.

Another respondent commented that, at early points in the group's work, some members of the WWG sought to exclude the state's primary IOU (NV Energy) from the group's activities and discussions. The resulting lack of inclusiveness early on may have contributed to slower progress being made in the small-wind market. As mentioned above, however, it was NV Energy's eventual offering of rebates (that were enabled by state legislation) that most stakeholders saw as the key factor in the market's growth. Notably, NV Energy is the organization currently funding and coordinating ongoing WWG efforts. Unfortunately, this arrangement makes it difficult for the group to solicit or receive outside funding (an issue several parties were seeking to remedy at the time of this report's writing).

[43] http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2005_THRU_PRESENT/2009-11/32803.pdf.

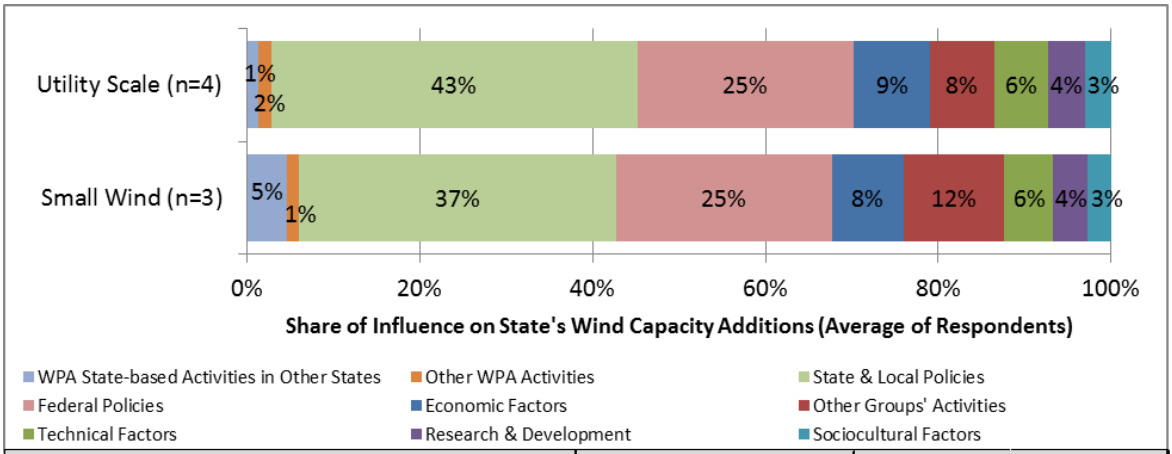
**Table D-18. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Nevada**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 2% | 6% | 0 | 0.33 | **Utility-Scale:** Modest credit, partly because Senator Reid's staffers attended the meetings, which may have emboldened his efforts<br>**Small-Wind:** Anemometer loan program, wind resource map, WWG activities, wind for schools |
| Other WPA Activities | 2% | 5% | 0 | 0.23 | **Utility-Scale:** Rural economic development<br>**Small-Wind:** Rural economic development |
| Other Groups' Activities | 3% | 4% | 0 | 0.23 | **Utility-Scale:** AWEA, National Wind Coordinating Council<br>**Small-Wind:** AWEA, State Energy Office |
| State & Local Policies | 25% | 51% | 1 | 2.62 | **Utility-Scale:** RPS, siting and permitting, interconnection<br>**Small-Wind:** Small-wind incentives, real estate tax abatement and sales tax credits, Wind Generations Program, net metering |
| Neighboring State Policies | 0% | 0% | - | - | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Federal Policies | 33% | 18% | 0 | 0.93 | **Utility-Scale:** PTC, ITC cash grant<br>**Small-Wind:** ITC, ARRA funding, Farm Bills |
| Economic Factors | 11% | 8% | 0 | 0.42 | **Utility-Scale:** Electricity demand, wholesale electricity prices<br>**Small-Wind:** Electricity prices (particularly for the agricultural sector) |
| Sociocultural Factors | 2% | 2% | 0 | 0.08 | **Utility-Scale:** More of a negative factor (public opposition)<br>**Small-Wind:** Desire to self-generate |
| Research & Development | 3% | 3% | 0 | 0.15 | **Utility-Scale:** Demonstration projects, publication of wind related reports<br>**Small-Wind:** Demonstration projects, publication of wind related reports |
| Technical Factors | 8% | 4% | 0 | 0.19 | **Utility-Scale:** Wind resource<br>**Small-Wind:** Wind resource |
| Senator Reid's Advocacy and Meetings | 12% | 0% | - | - | **Utility-Scale:** Opposition to proposed coal plant<br>**Small-Wind:** N/A |
| **Total** | **100%** | **100%** | **-** | **5.18** | |

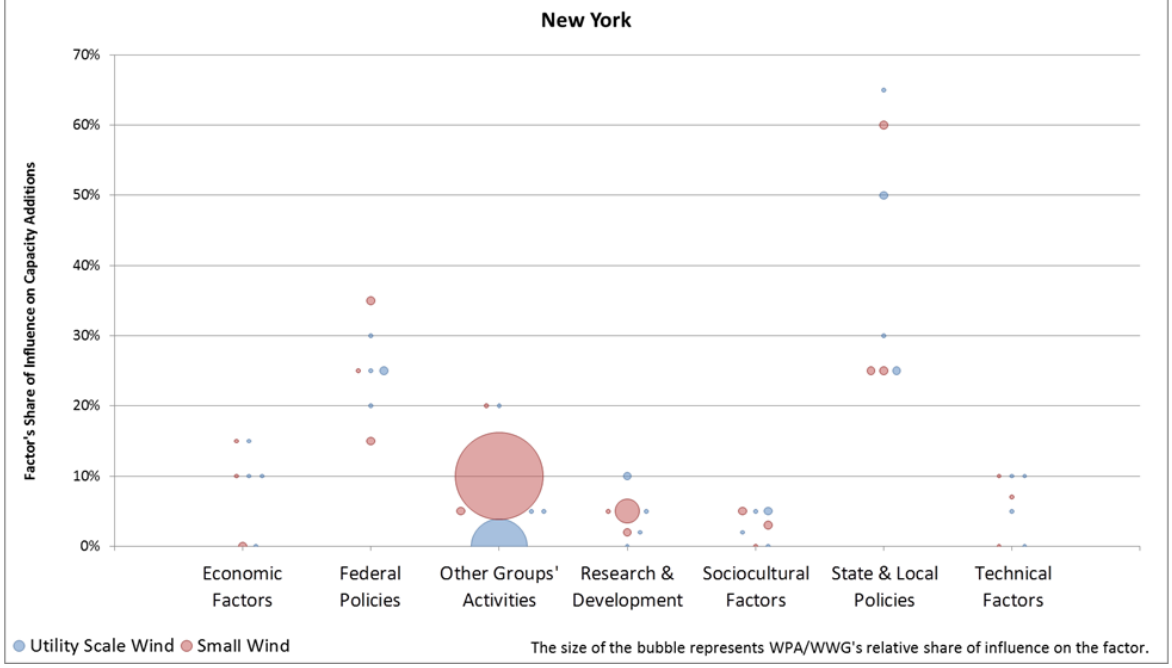
[a] Percentages based on simple averages of utility-scale (n=4) and small-wind (n=4) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.10 New York (Non-Targeted State)

**Figure D-19. New York: WPA Influence Summary Dashboard**




| New York | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 103 | 56 | 162 |
| State-based Activities | 61 | 33 | 99 |
| Other WPA Activities | 42 | 23 | 63 |
| **Small-Wind** | 0.5 | 0.3 | 0.7 |
| State-based Activities | 0.4 | 0.3 | 0.5 |
| Other WPA Activities | 0.2 | 0.1 | 0.2 |
| **Total** | **103** | **56** | **163** |
| *Total Capacity Additions, 2000 through 2011* | *1,408* | *1,408* | *1,408* |
| *WPA Influence as % of Total* | *7%* | *4%* | *12%* |




Source: Navigant analysis

## Figure D-20. New York Wind Market Timeline and Wind Capacity Additions (1999-2010)

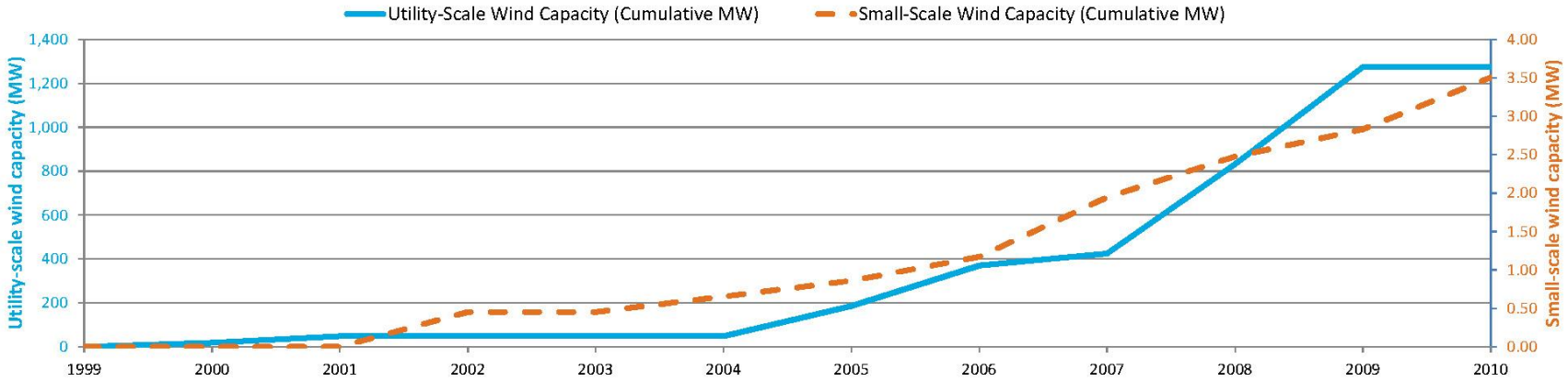
**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Energy Conservation Improvements Property Tax Exemption (since 1977), solar/wind/biomass energy systems exemption since 1991 | | | | | | | | | | | |
| | | WPA national workshops and webinars | | | | | | | | | |
| | | | | | | Renewable Portfolio Standard (RPS) in effect (enacted Sep 2004 but retroactive to 2003 for qualifying | | | | | |
| | | | | | Net Metering for residential wind (expanded to non-residential in Aug 2008) | | | | | | |
| | | | | | | | Green power pricing programs available | | | LIPA wind energy rebate | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | • Interconnection standards implemented | • NY-PA Wind Forum and Workshop | • Interconnection standards amended | • Statewide siting process for power generation projects expires | • WPA Small Wind Development Guide<br>• NYSERDA Solicitation | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government | • New York Wind Power video from ACENY<br>• NYSERDA Solicitation | • Model ordinance for small and large wind | | | • RPS expanded to 30% by 2015<br>• NYSERDA Solicitation |

**Growth in Utility-Scale and Distributed-Scale Wind Capacity (Cumulative MW)**




Source: Navigant analysis

### D.10.1 State Overview

In 1996, the New York State Public Service Commission (PSC) ordered the state's electric industry to open to competition, thereby allowing customers to choose their electricity supplier. Under restructuring, the PSC also adopted a Systems Benefit Charge (SBC) to fund research and development related to energy service, storage, generation, the environment, and renewable energy, among other areas (EIA 2010). In 1999, 61 utilities served New York's 7.5 million customers. Eight of these were investor-owned and 53 were public or co-operative utilities representing 72% and 27% of 1999 retail sales, respectively. The two largest of these utilities were Niagara Mohawk Power Corp., which accounted for about 26% of the state's megawatt-hours sold, and Consolidated Edison, with 25% of the state's megawatt-hours sold.

As of 1999, the majority of New York's electricity came from natural gas and nuclear resources. However, according to the EIA, New York is the largest producer of hydroelectric power of any state east of the Rocky Mountains; the state gets about 16% of its power from hydroelectric resources (see Table D-19). Notably, New York's energy prices have historically been some of the highest in the country; in 2011, the state had the fourth highest average electricity prices in the U.S. (EIA 2012a).

**Table D-19. Share of New York's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Natural Gas | 32.1% |
| Nuclear | 25.6% |
| Hydroelectric | 16.3% |
| Coal | 14.8% |
| Petroleum | 9.2% |
| Other | 1.9% |

Source: EIA 2001

Based on a feasibility study called for in New York's 2002 State Energy Plan, New York enacted an RPS in 2004. (The policy was made retroactive to 2003 for qualifying resources.) The state's original RPS had a renewables target of 25% of state electricity consumption by 2013, but the PSC adjusted the standard in January 2010 to 30% by 2015 (DSIRE 2012).

The New York State Energy Research and Development Authority (NYSERDA), a public benefit corporation created in 1975, is a key player in the state's energy landscape. NYSERDA helps New York meet its goals to reduce energy consumption, promote the use of renewable energy sources, and protect the environment (NYSERDA 2012a). With respect to renewable energy and the RPS, NYSERDA is responsible for centrally procuring "eligible new renewable resources" to meet roughly 75% of the RPS. These eligible new renewable resources fall into two tiers: a Main Tier and a Customer-Sited Tier (CST). Main Tier eligible technologies include methane digesters and other forms of biomass, liquid biofuels, fuel cells, hydroelectric power, photovoltaics (PV), ocean power, tidal power, and wind power. NYSERDA procures Main Tier resources through auction, requests for proposals (RFPs), or standard offer contracts. Eligible resources for the CST include fuel cells, photovoltaics, solar hot water, wind turbines, and methane digesters. The PSC allocates state funding for CST projects based on market demand and budget availability.

As shown in Figure D-20, New York's utility-scale and small-scale wind capacity grew gradually between 2000 and 2010, with slight inflections over the years. From 2000 through 2010, total installed wind capacity increased from zero to 1,274 MW, including 3.5 MW of small-wind capacity. Small-scale wind capacity gradually increased from 2001 to 2010, with slightly more distinct jumps between 2001 and 2002 (zero to about 0.5 MW), and again between 2009 and 2010 (3 MW to 3.5 MW). The policy and event timeline shown in Figure D-20 provides some insight on factors that may have influenced these

increases. New York's early utility-scale wind capacity arose from two demonstration projects, totaling 48 MW by 2001, funded by NYSERDA's Wind Plant Development Program (NYSERDA 2012b). Subsequent capacity growth remained flat through 2004, and then grew to 370 MW in 2006. Capacity growth then spiked in 2008 and 2009, at a rate of about 400 MW/year. This growth coincides with NYSERDA's solicitations for RPS projects in 2004 and 2006.

Utility-scale capacity remained flat through 2010. According to one respondent, this slowdown was partially due to controversial concerns about improper conduct in the New York wind development industry. In late 2008, the New York Office of the Attorney General (OAG) reviewed wind development company records and practices. Based on this review, the OAG issued a code of conduct agreement for the industry in 2009 to assure "that the industry is acting properly and within the law" (New York State Office of the Attorney General 2009).

### D.10.2 Development of State Wind Market

#### Utility-Scale Market

All four stakeholders in the New York utility-scale wind market reported that state and local policies, specifically the RPS, had the greatest influence on wind capacity additions from 1999 to 2010. As suggested above, one respondent cited NYSERDA's policies and demonstration programs for capacity added before the RPS. In addition to NYSERDA, respondents described New York's status as a home-rule state and the State Environmental Quality Review system, which allow local governments control of site reviews, as further support to wind project development. Interview respondents gave lesser to equal weight to federal policies, specifically the PTC, as playing a critical role in driving New York's utility-scale wind market from 1999 to 2010.

Economic, technical, and sociocultural factors, other group activities, and research and development had smaller, but important, influence on utility-scale wind capacity growth over the time period. As noted by one respondent, New York does not have a PPA market; however, demand for electricity and high conventional energy prices bolster the wind market as a cost-effective opportunity for wholesale power. For example, prices for natural gas, which accounted for nearly a third of the state's energy generation in 1999, began to climb steadily in 2003 (EIA 2012d). These factors, coupled with the RPS and an educated industry workforce, created a positive economic environment for utility-scale wind.

Three of the respondents cited the importance of industry groups such as AWEA, the Alliance for Clean Energy New York (ACENY), Windustry, and UWIG in successfully pushing for the RPS.[44] New York's environmental policy NGOs, such as the New York Public Interest Research Group (NYPIRG) and Citizens for the Environment, also helped educate the public on benefits from wind power generation and played a role in pressuring state and local policymakers to pass the RPS. While these groups were not the main attraction for wind development companies, their collective efforts helped "make projects happen" in the state, thus improving the market. Stakeholders perceived technical and sociocultural factors, research and development, and WPA activities as having minimal influence on the utility-scale market.

Table D-20 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

As with the utility-scale wind market, three interview respondents considered state and local policies as having had the greatest influence on small-scale wind capacity additions, primarily because of the Customer-Sited Tier of the RPS and the related NYSERDA incentives and information. These

[44] One respondent linked ACENY's founding and focus on the RPS to AWEA's regional partnership model in other markets.

respondents also described the state's interconnection standards—first implemented in 2000 and amended in 2002—as being influential. All three respondents felt that federal policies played a similarly significant role in driving small-wind capacity. The ITC's extension to small-scale wind in 2008, and the cash grants offered as part of the ARRA package in 2009, made wind projects financially viable in a way not previously seen. Grants tied to the Farm Bill also drove small-wind projects throughout the state. These federal incentives for wind, especially when coupled with state incentives, provided critical support to the industry.

One respondent cited public education efforts by groups such as ACENY, NYPIRG, and Citizens for the Environment as raising awareness for and tolerance of small-wind projects. Such organizations reportedly worked closely with local governments, community groups, and farm bureaus to conduct workshops and seminars to educate members about the benefits of wind power. These organizations also put pressure on state and local policymakers to pass the RPS. Additional groups, such as the Distributed Wind Energy Association (DWEA) and the Small Wind Certification Council (SWCC), have come to play a significant role in the small-wind market since 2010. Economic factors, specifically the high-price power in New York, also played an important role in driving small-wind capacity. Two respondents reported that the state's high power prices have made customers acutely aware of the economics behind electricity. In some cases, this awareness translates into action, or as one respondent summarized, "as the cost of electricity goes up, people want to generate their own."

Technical factors, R&D, and sociocultural factors had minimal influence on small-wind capacity. One respondent described wind resource measurement tools as "necessary but not sufficient on their own," and R&D as having more long-term influence than immediate influence. While one respondent described New Yorkers as being "pretty environmentally aware," another respondent noted that negative local response to large-scale turbines has often also affected small-scale wind due to siting ordinance limitations that inadvertently capture small-wind turbines in the same net as utility-scale wind. Stakeholders perceived WPA as having a small influence on small-wind capacity in New York, but it was not a driving force.

### D.10.3 Summary of Wind Powering America Activities and Influence

Given the state's independent efforts toward market restructuring and supporting renewable energy, the WPA did not target New York with its state-based activities and the state did not have a WWG. While the WPA also did not offer the Wind for Schools program or an anemometer loan program in New York, four of the five respondents did feel that WPA state-based and national activities did have some limited influence over the New York wind market. In particular, two utility-scale respondents perceived the "20% Wind Energy by 2030" report as a key resource. One respondent also specifically mentioned the likelihood that WPA had an influence on the PTC via its work in and focus on states in the Midwest (which helped drive political support for and the continuation of the PTC).

Respondents also described WPA's work to measure and document wind resources in other states, particularly Massachusetts, as helpful in encouraging the market in New York. In addition, two respondents acknowledged the influence of Massachusetts' small- and community wind policies on helping New York expand its rebate program to additional wind turbine sizes. These comments suggest, to the degree that WPA and the Massachusetts WWG influenced policies and the small-wind market in Massachusetts, that the initiative may have had an indirect influence on New York's small-wind market.[45]

[45] Massachusetts was not included in the sample for this evaluation, but the state was a WPA priority state and started a WWG in 2005.

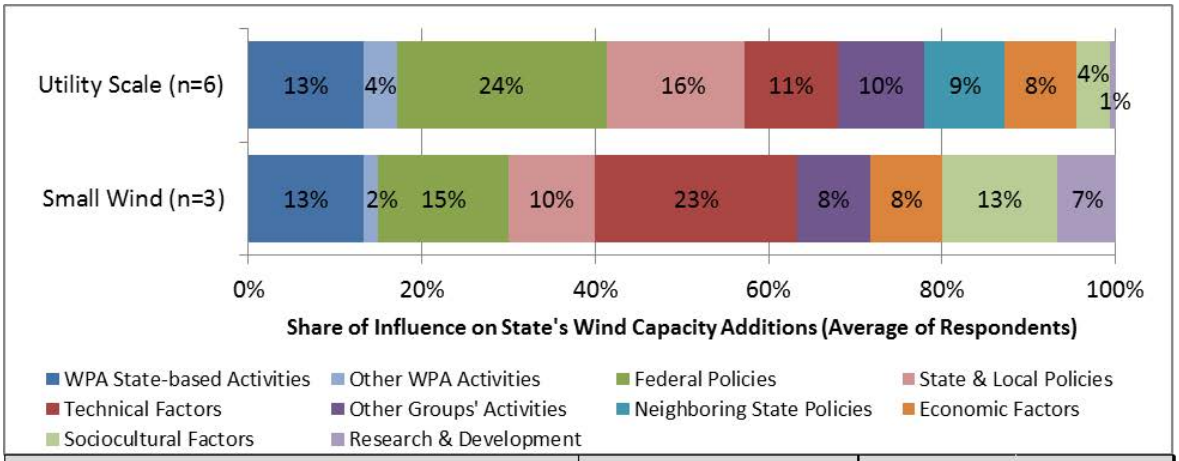
**Table D-20. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: New York**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 1% | 5% | 18 | 0.22 | **Utility-Scale:** Wind resource maps<br>**Small-Wind:** WPA activities in Massachusetts (e.g., measuring wind, dealing with environmental and threatened species issues) |
| Other WPA Activities | 2% | 1% | 21 | 0.06 | **Utility-Scale:** "20% Wind Energy by 2030" report<br>**Small-Wind:** "20% Wind Energy by 2030" report |
| Other Groups' Activities | 8% | 12% | 105 | 0.54 | **Utility-Scale:** AWEA, Alliance for Clean Energy New York (ACENY), Windustry, UWIG, NYSERDA, New York Public Interest Research Group (NYPIRG), Citizens for the Environment<br>**Small-Wind:** ACENY, NYSERDA, NYPIRG, Citizens for the Environment, Distributed Wind Energy Association, Small Wind Certification Council |
| State & Local Policies | 43% | 37% | 596 | 1.70 | **Utility-Scale:** RPS, siting and permitting ordinances (specifically that it was permitting was run at the local level), interconnection standards, other NYSERDA activities<br>**Small-Wind:** RPS, interconnection standards, NYSERDA programs and rebates |
| Neighboring State Policies | 0% | 0% | - | - | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Federal Policies | 25% | 25% | 351 | 1.16 | **Utility-Scale:** PTC, ITC cash grant.<br>**Small-Wind:** ITC and cash grant, Farm Bills, ARRA funding |
| Economic Factors | 9% | 8% | 123 | 0.39 | **Utility-Scale:** Electricity demand, wholesale and retail electricity prices<br>**Small-Wind:** Retail electricity prices, availability of local labor |
| Sociocultural Factors | 3% | 3% | 42 | 0.12 | **Utility-Scale:** Environmental awareness, local economic impact<br>**Small-Wind:** Environmental awareness |
| Research & Development | 4% | 4% | 60 | 0.19 | **Utility-Scale:** Demonstration projects, projects funded by the System Benefit Charge<br>**Small-Wind:** Demonstration projects, projects funded by the System Benefit Charge |
| Technical Factors | 6% | 6% | 88 | 0.26 | **Utility-Scale:** Wind resource, access to transmission<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **1,403** | **4.63** | |

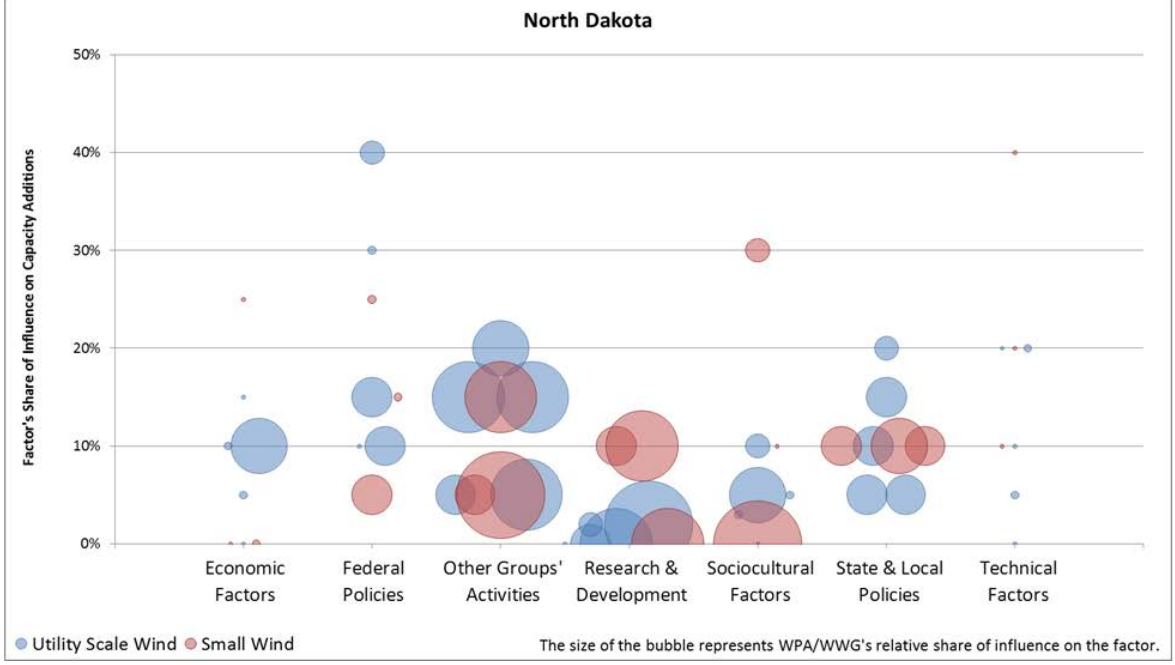
[a] Percentages based on simple averages of utility-scale (n=4) and small-wind (n=2) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.11 North Dakota

**Figure D-21. North Dakota: WPA Influence Summary Dashboard**




| North Dakota | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 274 | 225 | 322 |
| State-based Activities | 203 | 173 | 232 |
| Other WPA Activities | 71 | 52 | 90 |
| **Small-Wind** | 0.3 | 0.3 | 0.4 |
| State-based Activities | 0.3 | 0.2 | 0.3 |
| Other WPA Activities | 0.1 | 0.0 | 0.1 |
| **Total** | **275** | **225** | **323** |
| *Total Capacity Additions, Post-WWG through 2011* | *1,446* | *1,446* | *1,446* |
| *WPA Influence as % of Total* | *19%* | *16%* | *22%* |




Source: Navigant analysis

## Figure D-22. North Dakota Wind Market Timeline and Wind Capacity Additions (1999-2010)

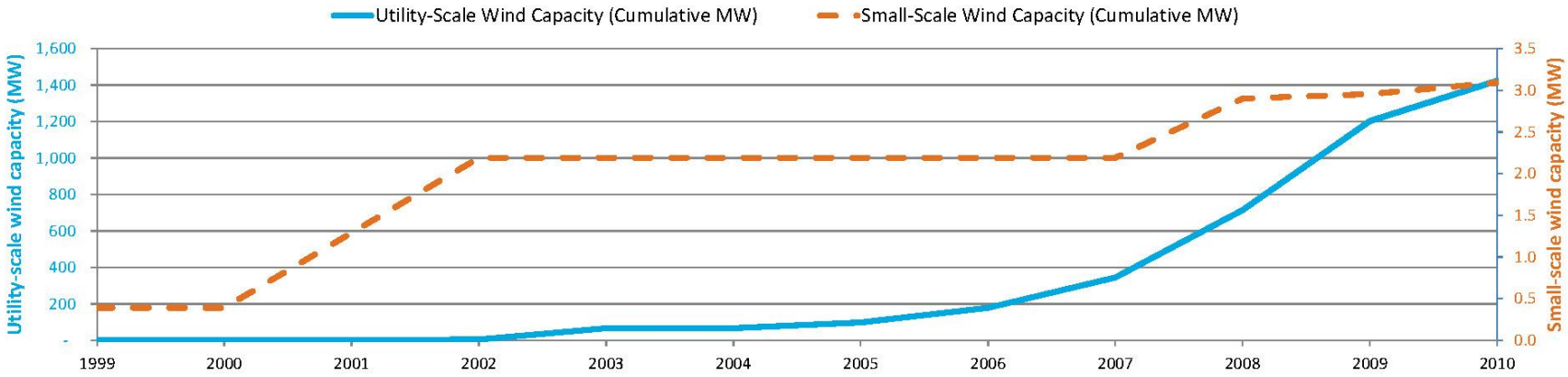
**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | | PTC Available | | | ITC Available (Utility-Scale ) | |
| | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Net metering | Green power pricing programs available | | | | | | | | | | |
| | Annual Wind Energy and Rural Development Conference | | | | | | Anemometer loan program, workshops, and webinars | | | | |
| | | Wind Working Group active | | | | | | | | | |
| | | State tax incentives: Corporate renewable energy tax credit, property tax deductions for large wind, property tax exemption (electrical generating facilities) | | | | | | | | | |
| | | | | | | | | Voluntary Renewable Portfolio Standard (RPS) in effect | | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | • ND was early focus of WPA with pilot workshop and one of the first validated wind resource maps | | | | | • Energy Policy Act establishes renewable energy goals for Federal government<br>• Wind Access Policy and Easements enacted | | • Property tax exemption available for locally assessed systems<br>• (Apr) Small wind guide published | | • County wind turbine ordinances adopted by 4 counties through 2010 | |

**Growth in Utility-Scale and Distributed-Scale Wind Capacity (Cumulative MW)**




Source: Navigant analysis

### D.11.1 State Overview

The North Dakota legislature considered electric market restructuring starting in 1997, but ultimately did not pursue deregulation (EIA 2010). At the time, customers in North Dakota were served by 3 investor-owned utilities and 36 public or co-operative utilities, representing 54.3% and 44.4% of 1998 retail sales, respectively (EIA 2001).[46] The largest of these was Northern States Power Company, which individually accounted for about 19.5% of the state's retail electricity sales revenue in 1998. Notably, a large share of North Dakota's wholesale market is served by large generation and transmission cooperatives like Basin Electric, who also own a significant amount of coal-fired generation in the state. As shown in Table D-21, 91.3% of North Dakota's electricity came from coal in 1999 (EIA 2001).

**Table D-21. Share of North Dakota's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 91.3% |
| Hydroelectric | 8.3% |
| Petroleum | 0.2% |
| Other Gases Derived from Fossil Fuels (Excludes Natural Gas) | 0.2% |

Source: EIA 2001

As shown in Figure D-22, North Dakota had little installed wind capacity until 2003, when North Dakota Wind I and II were installed (40.5 and 21 MW, respectively). A third large wind farm was installed in 2005 – the 31.5-MW Wilton Wind Farm. From 2007 to 2010, multiple wind projects were installed each year at an average annual rate of 265 MW/year. Figure D-22 also suggests a connection between these capacity increases and the adoption of state and local policies intended to support the renewable energy and wind market. In 2001, the state established a property tax reduction for commercial wind turbines. Initially, wind turbines with a capacity of 100 kW or greater would be eligible for a 70% reduction in property taxes. The law was updated to increase the assessed value of wind turbines constructed between June 30, 2006, and January 1, 2015 by 1.5%. In addition, North Dakota enacted a voluntary Renewable and Recycled Energy Objective in 2007, setting a goal that 10% of all retail electricity be generated by renewable or recycled energy by 2015. North Dakota has had a net metering policy in place since 1991; the policy applies to renewable energy systems up to 100 kW; however, because rural electric co-ops are not regulated by the state commission, net metering was conventionally only available to customers of investor-owned utilities.

### D.11.2 Development of State Wind Market

#### Utility-Scale Market

The six stakeholders interviewed about North Dakota's utility-scale wind market had competing individual perceptions about the factors with the highest relative shares of influence on the market's development. On average, however, they collectively perceived that the federal PTC had the greatest singular influence on wind capacity additions from 1999 to 2010. Beyond the PTC, state and local policies—particularly the voluntary renewables objective—also played a key role in supporting the state's utility-scale wind market. One stakeholder noted that the 2001 state legislative session marked a particularly important political shift towards a more positive view of wind in North Dakota. It included significant property, sales, and income tax reductions for commercial wind turbines with capacities greater than 100 kW. Two of the six respondents specifically mentioned the 2007 Renewable and Recycled Energy Objective as a key driver. Notably, five of six interviewed stakeholders also considered

[46] Retail energy sales in 1998 totaled 8.2 million MWh (EIA 2001).

Minnesota's renewable energy policies to be influential in North Dakota's utility-scale wind development. Minnesota first adopted a non-mandatory renewable energy objective in 2001, but made several revisions in subsequent years that eventually led to a mandatory RPS in 2007 (Minnesota Department of Commerce 2007).

Economic and technical factors also influenced the development of North Dakota's utility-scale wind market. This included utilities' willingness to sign power purchase agreements (likely tied closely to both North Dakota's and Minnesota's renewables targets), as well as the fact that North Dakota boasts the greatest wind energy potential of any state in the U.S. Two respondents suggested that in the early part of the decade (2001-2005), a lack of in-state demand growth and limited transmission capacity may have stunted the market's growth. Over time, however, the combination of improving wind project economics, increasing load growth associated with the state's thriving energy extraction industry, and political pressure contributed to some of the major utilities' willingness to get on board with utility-scale wind project development. Respondents noted that several organizations played an active role in supporting wind energy, including the North Dakota state energy office, the North Dakota Renewable Energy Partnership, and the Wind Interest of North Dakota. Sociocultural factors and research and development were perceived to have had a lesser influence than the above key factors.

Table D-22 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Interview respondents suggested that the small-scale wind market has faced greater hurdles in North Dakota than utility-scale projects. All three stakeholders who discussed the small-wind market made comments related to utilities' opposition to small-wind power and initial unwillingness among co-ops to net meter customers' projects (both based on a desire to maintain low rates). For the capacity that was installed, stakeholders considered technical factors, such as the abundance of North Dakota's wind resource, to be the most influential on average. Federal policies, such as the Section 9006 grants and ARRA funding starting in 2009, were also regarded as significant. Equally as important were sociocultural factors (e.g., customers' interest in environmental issues or reduced dependence on utility services) and WPA activities such as conferences, resource maps, and the anemometer loan program.

All three stakeholders observed that state and local policies, such as net metering and tax exemptions, influenced the small-scale wind market to some degree. North Dakota's net metering policy, adopted in 1991, applies to renewable energy systems up to 100 kW, but was conventionally only available to customers of investor-owned utilities. However, one interview respondent mentioned that at least two of the state's large co-operative utilities began providing their customers with limited net metering following federal passage of the 2005 Energy Policy Act. In 2001, a corporate tax credit of 3% per year for 5 years was enacted for renewable systems on property owned or leased by the taxpayer in North Dakota. This coincides with an addition of 1.8 MW of small-scale wind from 2001-2002. In 2007, a local property tax exemption was also enacted for wind turbines less than 100 kW. Like the aforementioned federal policies, the timing of this tax exemption immediately precedes an additional 900 kW of small-scale wind added between 2008 and 2010, bringing cumulative small-wind capacity to 3.1 MW.

### D.11.3 Summary of Wind Powering America Activities and Influence

In 2000, North Dakota became WPA's first state partner. Five of the six respondents for the utility-scale market and all three respondents for the small-scale market thought WPA had a positive influence in North Dakota. Responses indicated that WPA and the wind working group's greatest influence in North Dakota was their role in bringing together diverse interest groups (e.g., landowners, utilities, and policymakers), disseminating technical information and resources to them, and increasing the general

public's support for wind power. WPA was also perceived to lead the way in research and development in North Dakota with the publication of key wind-related reports, demonstration projects, and the anemometer loan program described above. At least two stakeholders considered them to be instrumental in providing credible information to policymakers and utilities and in helping to lay the groundwork for state and local policies supporting wind. One of the six utility-scale respondents, however, felt that the wind working group may have had a negative influence on the market, particularly in the latter half of the decade. Specifically, the respondent mentioned the group's distracting focus on landowner concerns about property setbacks and shadowing laws.

Two respondents suggested that, as a result of North Dakota's early WPA activity, the experiences of the state's wind working group helped shape similar activities in other states. For example, one respondent suggested that the successful anemometer loan program in North Dakota became the impetus for similar programs in 20 other states; however, the relatively low (20-meter) towers used meant the data was more useful for small-scale wind than for decisions related to utility-scale projects. North Dakota also boasted the WPA's first state wind map, which was also deemed very useful in building public and political support for the wind market. In addition, North Dakota hosted annual conferences on wind energy and rural development from 2000 to 2005. The state has ongoing educational programs at Bismarck State College and Lake Region State College.

From a process perspective, interview responses suggested that a contributing factor to the working group's success was the involvement of numerous committed individuals and organizations that supported the wind power market in North Dakota. This included the North Dakota Wind Energy Council, the Farm Bureau, the North Dakota Industrial Commission and others. In addition, the group made efforts to draw a broad cross section of stakeholders (e.g., cooperative and public utilities, tribal organizations, landowners, politicians, and agricultural organizations) and collaborate with other national organizations (e.g., AWEA, NWCC, and UWIG).

In terms of barriers, respondents pointed to several factors that may have lessened or at least delayed the working group's success. For example, two respondents pointed to an initial anti-wind attitude among some politicians and several utilities; however, another respondent suggested that the wind working group sought to exclude utilities from their early meetings and conversations out of a lack of trust. Another respondent discussed the fact that an initial lack of in-state load growth and adequate transmission capacity prevented earlier wind capacity additions, despite increasing public support for large wind farms and the economic development it would provide. These respondents generally agreed that the rate of capacity growth in the state increased after utilities—responding to political pressure—began to support wind power and electricity demand growth provided more of an in-state market for PPAs.

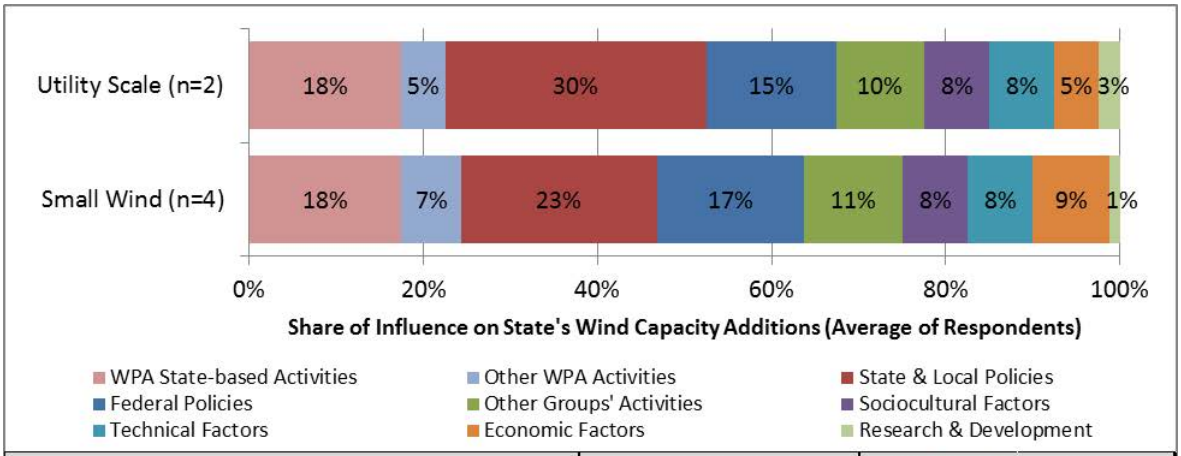
**Table D-22. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: North Dakota**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 13% | 13% | 193 | 0.25 | **Utility-Scale:** Conferences and workshops; discussions with key players; consensus-building; wind resource map; landowner meetings; anemometer loan program.<br>**Small-Wind:** Wind resource map, anemometer loan program, conferences |
| Other WPA Activities | 4% | 2% | 55 | 0.03 | **Utility-Scale:** Reaching out to public power<br>**Small-Wind:** Rural development |
| Other Groups' Activities | 10% | 8% | 144 | 0.15 | **Utility-Scale:** State's energy office; Wind Interest of North Dakota; local community development organizations; NCSL, WAPA, ND Renewable Energy Partnership<br>**Small-Wind:** SWCC, Windustry, AWEA |
| State & Local Policies | 16% | 10% | 229 | 0.19 | **Utility-Scale:** RPS (non-binding objective); siting and permitting ordinances; 2001 state legislation providing tax incentives.<br>**Small-Wind:** Siting and permitting, interconnection, tax incentives, net metering (particularly among co-ops) |
| Neighboring State Policies | 9% | 0% | 132 | - | **Utility-Scale:** Minnesota's RPS<br>**Small-Wind:** No influence. |
| Federal Policies | 24% | 15% | 349 | 0.28 | **Utility-Scale:** PTC, accelerated depreciation<br>**Small-Wind:** Farm bills and ARRA funding |
| Economic Factors | 8% | 8% | 120 | 0.15 | **Utility-Scale:** Electricity demand (including that of Minnesota); utilities' willingness to sign PPAs; Basin Electric became interested on wind<br>**Small-Wind:** Low electrical rates (negative) |
| Sociocultural Factors | 4% | 13% | 55 | 0.25 | **Utility-Scale:** Economic impact to local communities<br>**Small-Wind:** Environmental awareness, independence from utility, public support |
| Research & Development | 1% | 7% | 10 | 0.12 | **Utility-Scale:** Some of the early demonstration projects<br>**Small-Wind:** Demonstration projects, technology improvements |
| Technical Factors | 11% | 23% | 156 | 0.43 | **Utility-Scale:** Wind resource and decreasing costs for wind power (transmission was a barrier)<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **1,444** | **1.85** | |

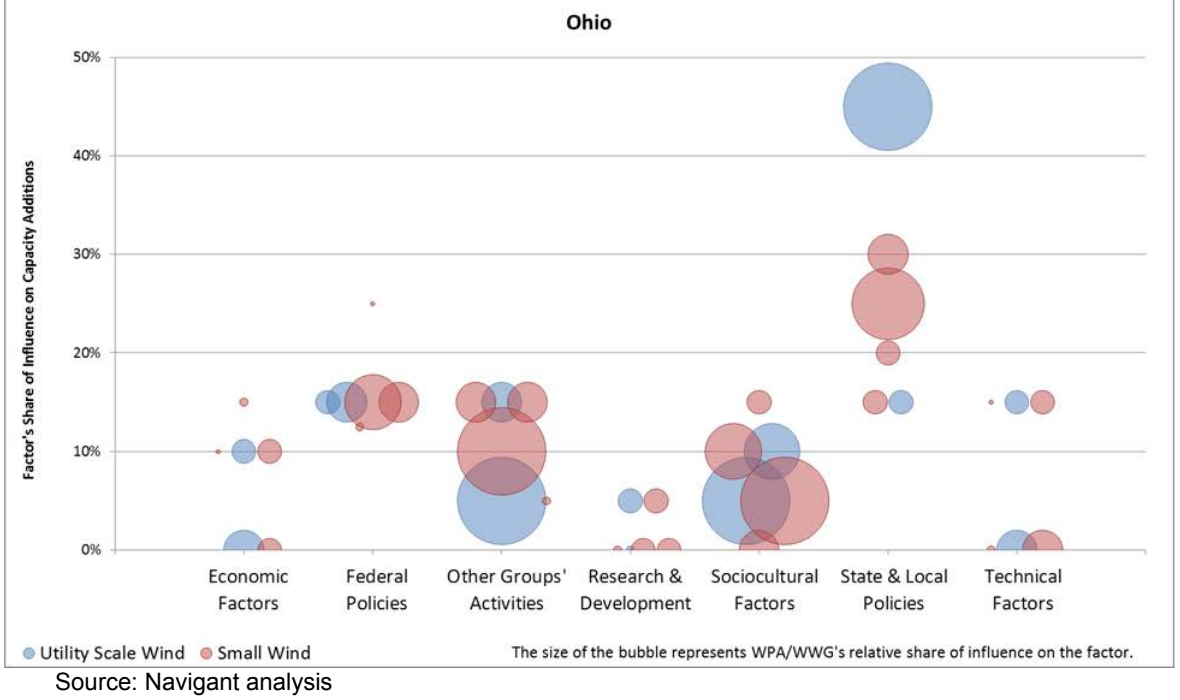
[a] Percentages based on simple averages of utility-scale (n=6) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.12 Ohio

**Figure D-23. Ohio: WPA Influence Summary Dashboard**




| Ohio | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 29 | 23 | 35 |
| State-based Activities | 21 | 19 | 25 |
| Other WPA Activities | 7 | 5 | 11 |
| **Small-Wind** | 2.9 | 2.6 | 3.3 |
| State-based Activities | 2.1 | 1.9 | 2.3 |
| Other WPA Activities | 0.8 | 0.7 | 1.0 |
| **Total** | **32** | **26** | **38** |
| *Total Capacity Additions, Post-WWG through 2011* | *123* | *123* | *123* |
| *WPA Influence as % of Total* | *26%* | *21%* | *31%* |




Source: Navigant analysis

## Figure D-24. Ohio Wind Market Timeline and Wind Capacity Additions (1999-2010)

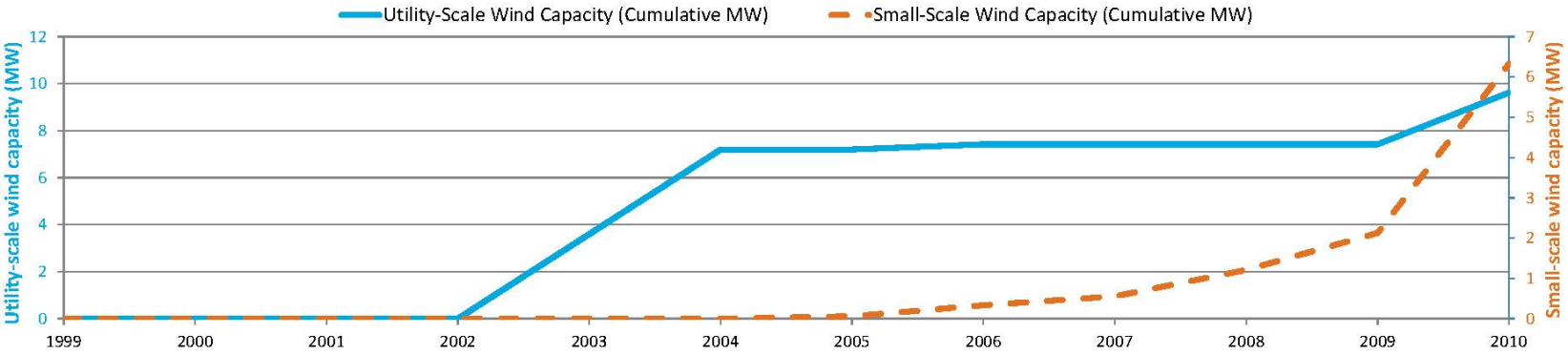
**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Green power pricing programs, state incentives for small wind | | | | | | | | | | | |
| | Advanced Energy Fund available to support investments in renewables | | | | | | | | | | |
| | Net metering available | | | | | | | | | | |
| | | | | WPA workshops/webinars | | | Anemometer Loan Program | | | | |
| | | | | | | | | | | Alternative Energy Portfolio | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • Energy conversion facilities sales tax exemption in effect since 1978<br>• Interconnection standards implemented | | | • Ohio Wind Power Conference and Trade Show | | | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government | • Validated wind resource map<br>• Advanced Energy Fund replenished with uniform fee for IOU customers | • Net metering rules amended<br>• Interconnection standards amended | • Net metering rules amended<br>• REC program retroactive as part of AEP<br>• Advanced Energy Job Stimulus Program<br>• Air quality improvement tax incentives | • Energy Conservation for Ohioans Program created<br>• Additional funding for Advanced Energy Fund from AEP compliance payments | |

**Growth in Utility-Scale and Distributed-Scale Wind Capacity (Cumulative MW)**




Source: Navigant analysis

### D.12.1 State Overview

In 1999, Ohio passed Senate Bill 3 to allow retail customers to choose their energy suppliers beginning January 1, 2001 (EIA 2010). As part of this restructuring legislation, the state created the Advanced Energy Fund to provide funding support for renewable energy and energy efficiency projects. The state's energy office, the Ohio Development Services Agency (ODSA), collaborated with the Public Utilities Commission of Ohio (PUCO) to oversee the fund and its resulting programs (DSIRE 2012). In 1999, a total of 119 utilities served Ohio's 5.2 million customers. Nine were investor-owned and 110 were public or co-operative utilities representing 91% and 9% of 1999 retail sales, respectively. The largest of these utilities was Ohio Power Company, a subsidiary of AEP Ohio, which accounted for about 19% of the state's megawatt-hours sold. Columbus Southern Power, also a subsidiary of AEP Ohio, accounted for 10% of the state's megawatt-hours sold. As shown in Table D-23, the majority of Ohio's electricity came from coal-fired generation in 1999 (EIA 2001).

**Table D-23. Share of Ohio's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 86.5% |
| Nuclear | 11.5% |
| Natural Gas | 0.8% |
| Other | 0.5% |
| Petroleum | 0.3% |
| Hydroelectric | 0.3% |

Source: EIA 2001

As part of the ongoing restructuring process initiated with Senate Bill 3, Ohio enacted an alternative energy portfolio (AEP) standard in May of 2008. The AEP requires investor-owned electric utilities to generate 25% of their retail electricity supply from alternative energy resources by 2025. While the standard includes specific annual benchmarks for renewable and solar energy resources, utilities can meet half of the standard with "any new, retrofitted, refueled, or repowered generating facility located in Ohio", including fossil fuels, making the renewables portion of the standard 12.5% renewables by 2025 (DSIRE 2012).

As shown in Figure D-24, Ohio's total installed wind capacity increased from zero to 15.9 MW from 2002 through 2010, including 6.3 MW in small-scale wind capacity. Ohio's small-scale wind capacity gradually increased from 2005 to 2009 for a total of 2.13 MW in 2009. Between 2009 and 2010, small-scale capacity increased threefold to reach a total capacity of 6.32 MW. The policies and events timeline shown in Figure D-24 provides some insight on factors that may have influenced this increase. In 2009, the state enacted the AEP standard and replenished the Advanced Energy Fund with funding from AEP compliance payments. That same year, the federal government designated ARRA financial support for wind projects in the form of cash grants in lieu of the ITC.

Utility-scale wind capacity in Ohio increased from zero MW in 2002 to 7.20 MW in 2004 with the completion of two AMP-Ohio/Green Mountain Energy Wind Farm projects at 3.6 MW each. After 2004, utility-scale capacity remained flat through 2009, with another small addition that brought the total to 9.63 MW by the end of 2010. Ohio only had a few, relatively small utility-scale projects by the end of the period covered by this evaluation. However, a 102 MW project came online in 2011 and a number of additional projects were under construction in 2012. According to AWEA, Ohio's installed wind capacity grew over 950% in 2011 with the completion of the state's first utility-scale project, making Ohio the fastest growing state for new wind installations in 2011 (AWEA 2012b). Ohio recently

allocated $200,000 from State Energy Program funds to continue wind working group activity (under assumption that WPA funding will cease) (AWEA 2012b).

The ODSA focuses on growing the state's economy by connecting companies and communities to financial and technical resources to deploy renewable energy technologies and energy efficiency. To that end, state programs focus on the manufacturing and supply chain aspect of the wind industry. AWEA estimates that wind projects supported between 3,000 and 4,000 direct and indirect jobs in 2011 (AWEA 2012b). PUCO oversees the state's utility rates, services, and compliance with policies. Green Energy Ohio (GEO), a key nonprofit player in the Ohio wind industry, promotes renewable energy by acting as a clearinghouse for information and collaboration.

### D.12.2 Development of State Wind Market

#### Utility-Scale Market

Both stakeholders in the Ohio utility-scale wind market reported that state and local policies, specifically the AEP standard, had the greatest influence on wind capacity additions from 1999 to 2010. One respondent also mentioned the importance of having a "utility champion at a municipal co-op who wanted wind", referring to the AMP-Ohio/Green Mountain Energy Wind Farm projects in Bowling Green. In addition to state and local policies, respondents perceived WPA's state-based activities as key to influencing wind capacity in Ohio. One respondent felt that WPA's efforts to educate the public and policy officials affected state and local policy. Interview respondents gave lesser to equal weight to federal policies, specifically the PTC, as playing a critical role in driving Ohio's utility-scale wind market from 1999 to 2010.

Both respondents felt that industry groups such as GEO, the Ohio Environmental Council, the Ohio Farm Bureau, the NWCC, the Clean Energy States Alliance, and Windustry played a significant role in advocating wind projects at the utility scale. Economic, technical, and sociocultural factors, other group activities, and research and development had a smaller influence on utility-scale wind capacity growth. Both respondents mentioned the importance of wind's economic influence on local communities when discussing sociocultural factors. The state's push for clean energy as an economic development and job creation strategy may have influenced public expectations for wind projects. One respondent also described the DOE/NREL "20% Wind Energy by 2030" report as helpful.

Table D-24 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Among the four stakeholders that discussed small-scale wind in Ohio, state and local policies had the greatest average perceived influence on capacity additions. However, individual respondents also cited federal policies as equally important. All four respondents felt that Ohio's net metering policies were important to the small-wind market. Two stakeholders described the state's financial incentives, meaning the Alternative Energy Fund, as being a "big factor". One respondent pointed to the graph in Figure D-24 to highlight his point. In 2009, when additional funding for alternative energy was made available through AEP compliance payments, "you can see where (capacity) took off. People were putting in $60,000 turbines and getting $25,000 grants from the state." In addition, individuals cited other important policies, including local permitting ordinances.

Two of the four respondents felt that federal policies played an equally important role in driving small-wind capacity. As in other states, the federal ITC's extension to small-scale wind in 2008, and the cash grants offered as part of the ARRA package in 2009, made wind projects financially viable in a way not

previously seen. To a lesser extent, grants tied to the Farm Bill drove interest in small-wind projects throughout the state; however, one respondent noted that Farm Bill funding had been difficult for in-state projects to secure. While some respondents felt the WPA did not focus on small-scale wind, on average stakeholders perceived WPA state-based activities' share of influence as slightly higher than federal policies; however, specific comments about the WPA's role varied.

As with utility-scale capacity, all four respondents felt that industry groups such as GEO, the National Wind Coordinating Collaborative, the Clean Energy States Alliance, the Appalachian Regional Commission, and Windustry played a small, but significant role in advocating small-scale wind projects. Economic, technical, and sociocultural factors, other group activities, and research and development had a smaller influence on utility-scale wind capacity growth over the time period. Three respondents cited economic factors, specifically retail power prices and electricity demand, as an important factor.

### D.12.3 Summary of Wind Powering America Activities and Influence

The WPA designated Ohio as a high-priority state and coordinated with the state energy office and Green Energy Ohio to create the Ohio Wind Working Group (OWWG) in 2003. The OWWG held quarterly meetings from 2003 through 2010 and worked with regional groups to coordinate the Great Lakes Wind Collaborative, a multi-sector coalition of wind energy stakeholders. The Great Lakes Wind Collaborative held annual meetings up until 2010. WPA provided wind resource maps each year beginning in 2005 through 2008, and published a small-wind guide in 2005. Ohio implemented an Anemometer Loan Program (ALP) from 2006 through 2010.

Respondents felt that the wind working group did have an influence on both the small-scale and utility-scale markets (the latter more recently), and that the group helped speed the adoption of wind power in the state at least 1-2 years. WPA materials and interview responses indicate that the wind working group was active at developing the state AEP standard, as well as siting guidelines for wind projects less than 50 MW, as none existed beforehand. Respondents also reported that the wind maps, the ALP, and wind working group meetings and conferences were helpful.

One respondent said, "the best thing the wind working group did was provide a forum to educate the public and policy officials". The wind working group's ability to bring stakeholders together, including those from various state agencies, had a positive influence. Some respondents had difficulty delineating between the activities of the wind working group, GEO, and the ODSA. One respondent stated that the WPA had no influence on small-scale capacity and followed with a comment that the ALP had a 10% share of influence on capacity additions. This respondent went on to explain that the GEO funded and implemented the ALP, not the WPA. Respondents also referenced the 20% by 2030 report as helpful, although both associated the report with the WPA, rather than the DOE and NREL.

Respondents considered partnership and collaboration with GEO as important to the wind working group's eventual success and influence; one respondent considered the GEO's grassroots, citizen-based focus an asset. Respondents also noted that the wind working group successfully collaborated with organizations like the farm bureau (a wind advocate) and local governments. In terms of barriers to additional success, some respondents mentioned that additional funding could have led to greater (or faster) influence. In addition, another respondent mentioned that it has been difficult getting the utilities interested in signing power purchase agreements.

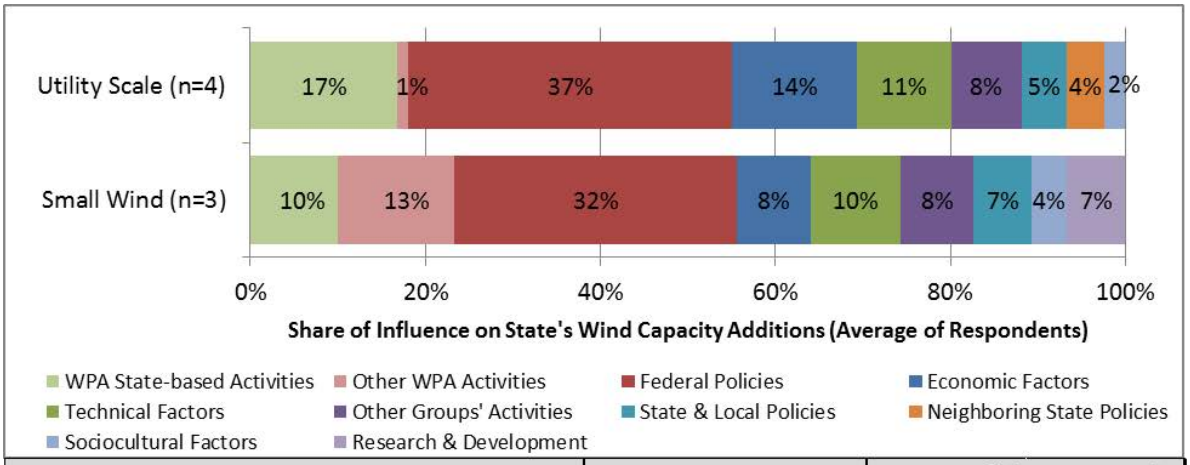
**Table D-24. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Ohio**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 18% | 18% | 20 | 1.91 | **Utility-Scale:** WWG meetings, workshops, education and wind farm tours for policy makers, model siting ordinances, wind resource maps, anemometer loan program, technical tools wind for schools<br>**Small-Wind:** Wind working group meetings, workshops and conferences, wind resource map, model wind ordinances and interconnection standards, Wind for Schools, anemometer loan program |
| Other WPA Activities | 5% | 7% | 6 | 0.75 | **Utility-Scale:** "20% Wind Energy by 2030" report<br>**Small-Wind:** "20% Wind Energy by 2030" report |
| Other Groups' Activities | 10% | 11% | 11 | 1.23 | **Utility-Scale:** Green Energy Ohio, Ohio Environmental Council, Ohio Farm Bureau, state energy office, NWCC, Clean Energy States Alliance, Windustry<br>**Small-Wind:** State energy office, National Wind Coordinating Council, Clean Energy States Alliance, Windustry, Green Energy Ohio, Appalachian Regional Commission |
| State & Local Policies | 30% | 23% | 34 | 2.45 | **Utility-Scale:** RPS, siting and permitting ordinances, interconnection standards, Senate Bill 221<br>**Small-Wind:** Interconnection, net metering, siting and permitting ordinances, state grant program |
| Neighboring State Policies | 0% | 0% | - | - | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Federal Policies | 15% | 17% | 17 | 1.84 | **Utility-Scale:** PTC, ARRA funding<br>**Small-Wind:** ITC, ARRA funding, USDA Farm Bill |
| Economic Factors | 5% | 9% | 6 | 0.95 | **Utility-Scale:** Electricity demand, wholesale and retail electricity prices, competing energy sources' LCOE<br>**Small-Wind:** Electricity demand, retail electricity prices |
| Sociocultural Factors | 8% | 8% | 8 | 0.82 | **Utility-Scale:** Economic impact on local communities<br>**Small-Wind:** Economic impact to local communities |
| Research & Development | 3% | 1% | 3 | 0.14 | **Utility-Scale:** Pilot or demonstration projects, publication of key wind-related reports<br>**Small-Wind:** Pilot or demonstration projects |
| Technical Factors | 8% | 8% | 8 | 0.82 | **Utility-Scale:** Wind resource, access to transmission<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **112** | **10.91** | |

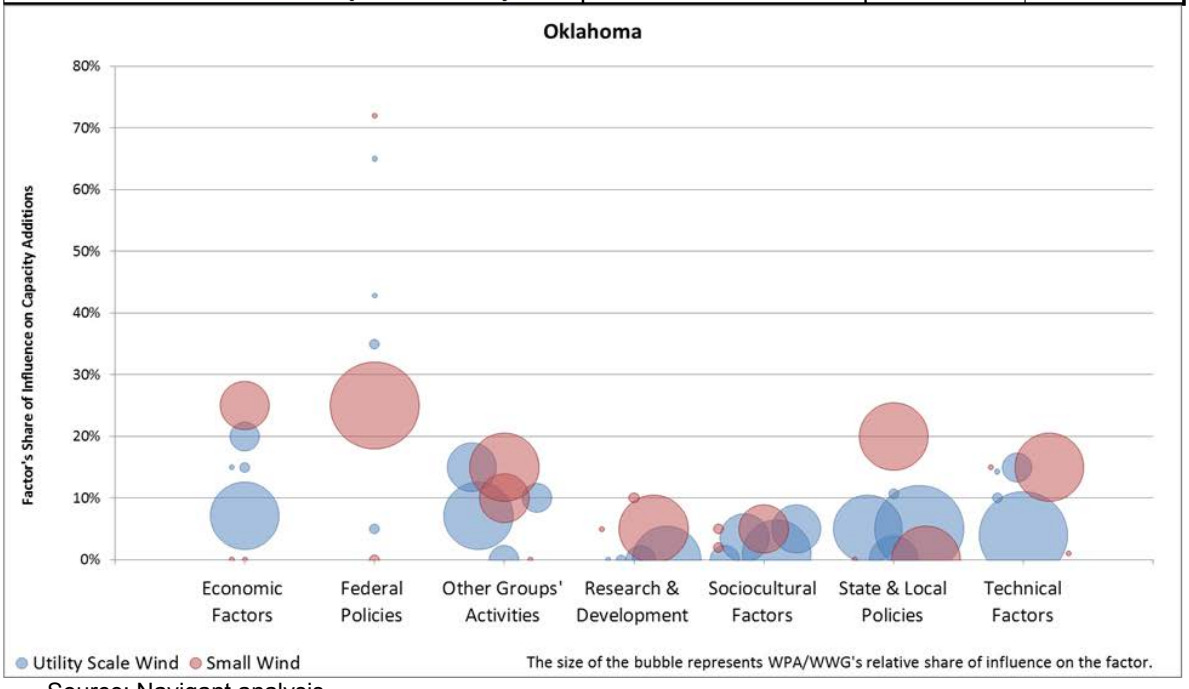
[a] Percentages based on simple averages of utility-scale (n=2) and small-wind (n=4) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.13 Oklahoma

**Figure D-25. Oklahoma: WPA Influence Summary Dashboard**




| Oklahoma | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 554 | 375 | 792 |
| State-based Activities | 436 | 323 | 569 |
| Other WPA Activities | 118 | 52 | 223 |
| **Small-Wind** | 0.3 | 0.2 | 0.4 |
| State-based Activities | 0.1 | 0.1 | 0.2 |
| Other WPA Activities | 0.2 | 0.1 | 0.2 |
| **Total** | **555** | **375** | **792** |
| *Total Capacity Additions, Post-WWG through 2011* | *2,008* | *2,008* | *2,008* |
| *WPA Influence as % of Total* | *28%* | *19%* | *39%* |




Source: Navigant analysis

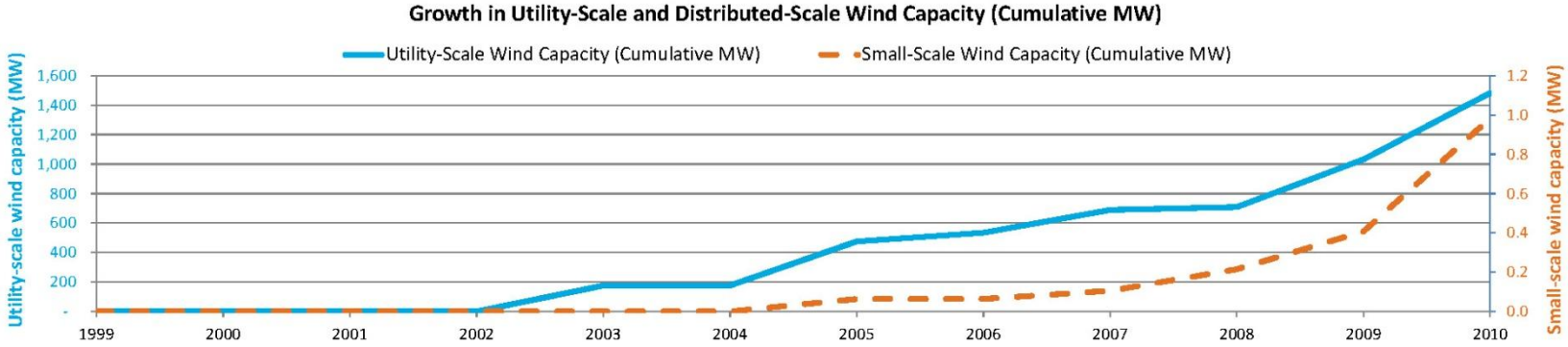
## Figure D-26. Oklahoma Wind Market Timeline and Wind Capacity Additions (1999-2010)

**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | ITC Available (Turbines <100 kW) | | |
| | | | | | | | | | | ITC Available (Utility-Scale ) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Net metering available | | | | | | | | | | | |
| | | Wind Working Group active (Oklahoma Renewable Energy Council, monthly meetings, annual conferences) | | | | | | | | | |
| | | Property tax exemption for Independent Power Producers (IPPs) | | | | | | | | | |
| | | | | State Incentives available for small wind, tax credit for manufacturers of small wind turbines | | | | | | | |
| | | | | Zero emission facilities production tax credit | | | | | | | |
| | | | | Green power pricing programs available | | | | | | | |
| | | | | | | | Anemometer Loan Program | | | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • Energy Loan Fund for Schools since 1998 | | | | | | • Energy Policy Act establishes renewable energy procurement goals for Federal government<br>• Farm Bill Section 9006 workshops | • Higher Education Energy Loan Program | • Small Wind Guide published | • Oklahoma Wind Energy Conference<br>• High performance building standards for state buildings | • Oklahoma Wind Commerce 2009 Conference held by the Oklahoma Department of Commerce | • Voluntary RPS requirements created<br>• Oklahoma Wind Energy Development Act passed for 2011 |




Source: Navigant analysis

### D.13.1 State Overview

In 1999, Oklahoma's electricity was supplied by 4 investor-owned utilities and 92 publicly-owned or cooperative utilities. Investor-owned utilities accounted for 75.9% of retail sales while public or cooperative utilities accounted for 24% (EIA 2001).[47] Oklahoma Gas & Electric Company (OG&E) was the largest utility in the state, representing 42% of the state's retail electricity sales. Public Service Company of Oklahoma was the next largest utility in the state, accounting for 33% of sales. As shown in Table D-25, almost two-thirds (61.5 %) of Oklahoma's electricity was generated from coal, with 32.6% generated from natural gas and only 5.6% coming from hydroelectric (EIA 2001).

**Table D-25. Share of Oklahoma's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 61.5 |
| Natural Gas | 32.6 |
| Hydroelectric | 5.6 |
| Other | 0.3 |

Source: EIA 2001

Oklahoma's overall installed wind capacity increased from 0 MW to 1481 MW between 1999 and 2010. As shown in Figure D-26, Oklahoma did not have any wind capacity until 2003, when the first commercial wind project came online in Woodward County. Utility-scale wind capacity climbed steadily after that with a notable increase of 298 MW between 2004 and 2005, with the addition of Oklahoma's largest wind farm (151.2 MW) in Carter County, and another 773 MW jump between 2008 and 2010. By 2010, Oklahoma's installed wind capacity included 1 MW of small-scale wind, more than double the capacity of small-wind power from the year before.

Figure D-26 also suggests a possible connection between these capacity increases and the incidence of state and local policies intended to support the renewable energy and wind market. Oklahoma has had net metering in place since 1988. Since 1998, an Energy Loan Fund for Schools has been available, providing funds to public and nonprofit K-12 schools to improve energy efficiency. A similar loan fund for higher education institutions was also passed in 2006. Property tax exemption for Independent Power Producers (IPPs) in the state began in 2001. As of 2003, Oklahoma established state incentives for small-scale wind and a tax credit was created for manufacturers of small-wind turbines. Green power pricing programs were available beginning in the same year. In addition, in 2003, the state enacted the Zero-Emission Facilities Production Tax Credit, a state-level Production Tax Credit for electric power producers using renewable energy resources from zero-emission facilities in Oklahoma. The availability of both the federal PTC and the state-based PTC coincide with the gradual increase in wind capacity additions beginning in 2003.

In 2005, DOE sponsored educational workshops in Oklahoma on the Farm Bill Section 9006 application process, which passed in 2008 as an extension of the 2002 Farm Bill. In May 2010, the Oklahoma legislature established voluntary RPS requirements, calling for 15% of Oklahoma's total installed generation capacity to be derived from renewable energy by 2015. The legislation does not include any interim goals leading up to 2015 or any targets that extend beyond that date. Oklahoma also passed the Oklahoma Wind Energy Development Act in May 2010, providing decommissioning, payment, and insurance rules for wind facility owners. However, the legislation did not come into effect until the following year of 2011.

[47] Retail energy sales in 1999 totaled 46.7 million MWh (EIA 2001).

### D.13.2 Development of State Wind Market

#### Utility-Scale Market

Two stakeholders in the Oklahoma utility-scale wind market perceived that the federal PTC had the greatest singular influence on wind capacity additions from 1999 to 2010. The PTC was available for wind projects most of the time between 1999 and 2010, with the exception of three brief periods of time in which the tax credit had expired. Beyond the PTC at the federal level, state and local policies, such as the state PTC, also played a key role in increasing wind power development in Oklahoma. One stakeholder mentioned Oklahoma's Zero Emissions Tax Credit (i.e., state PTC) as having particular influence on wind development activity, pointing out the fact that the utilities never allowed a state-mandated RPS and explaining a perception that the federal PTC as a nationwide policy did not necessarily have a direct influence in Oklahoma because every state was eligible. Three stakeholders mentioned that state incentives pushed utilities that were initially resistant to wind power to purchase and promote wind energy developments in Oklahoma after state incentives allowed wind to become a cost-competitive resource. It is also possible that the WWG and others helped utilities understand reliability issues and eased their concerns. After the utilities bought their first few wind projects, they then launched a campaign to promote wind, which subsequently created widespread public support. Customers signed up for green power, and the utilities bought more projects.

One stakeholder perceived neighboring state policies as having a significant influence on wind development activities in Oklahoma, indicating that development in other regional states (e.g., Iowa, Kansas) influenced Oklahoma because wind development concepts were proven in these states and Oklahoma could simply replicate the efforts. Economic factors were perceived to have a lesser influence than the above key factors, with one stakeholder indicating that economic factors were tied to natural gas prices for Oklahoma and another indicating that wind is a risk mitigation tool against future emissions taxes. Stakeholders also mentioned that other wind industry groups played a limited role in the development of wind project development, including AWEA, UWIG, and the Oklahoma Wind Power Assessment Initiative (OWPI).

Table D-26 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Two small-scale wind stakeholders indicated that state incentives for small-scale wind in Oklahoma were either non-existent or ineffective from 1999 to 2010, and one respondent indicated that the net metering programs were helpful. One respondent also identified the lack of siting and permitting standards as the primary barrier to small-scale wind in the state at the time.

Despite these barriers to wind activity development in Oklahoma, stakeholders identified federal policies as having had a significant influence on the small-wind market in the state. Two stakeholders mentioned the federal ITC and the cash grant as being particularly important, while another mentioned the PTC and the accelerated depreciation established by the federal government as the main drivers in wind development at the time. In addition to federal policies, two stakeholders mentioned the positive influence of Bergey Wind Power's location in Oklahoma and the company's role as industry leader in the small-scale wind market, providing high visibility for wind development in the area. Two respondents also identified the USDA's Rural Economic Development Loan and Grant (REDLG) Program and the associated support from farmers as a key factor in the development of small-wind projects in Oklahoma, albeit to a lesser extent than the factors listed above.

### D.13.3 Summary of Wind Powering America Activities and Influence

As of 1999, WPA categorized Oklahoma as a high-priority state due to an installed wind capacity of less than 20 MW, strong wind resources, and the lack of supportive policies in place for the wind industry. The WWG was formed in Oklahoma in 2001 and worked to improve the landscape for wind development in the state. The group held regular monthly meetings beginning in 2001 and was active in many community outreach activities to build support and understanding of wind energy. These events included Farm Bill and rural development workshops, exhibits, presentations, and annual conferences. One Oklahoma market actor interviewed as part of this evaluation indicated that the annual WPA conferences held between 2001 and 2004 were particularly influential in creating momentum for wind development in Oklahoma. In addition to these earlier conferences, the WPA participated in the Oklahoma Wind Energy Conference held in 2008 and the Oklahoma Wind Commerce 2009 conference. The WWG also supported an anemometer loan program in 2006 and published a guide to small-wind development in 2007.

Stakeholders from the utility-scale wind industry had disparate views as to the level of influence that WPA activities had on capacity additions, though three of the four provided a high-end estimate of 25% or greater for the initiative's share of influence. Stakeholders characterized the WPA as having had an indirect influence on wind development activities. Two stakeholders mentioned that the WWG was a great source of industry and local knowledge, while another commented that the WWG provided an unbiased resource for information. All four commented that the WWG played the important role of organizing meetings and bringing a diverse group of members together with their open-door policy, welcoming anyone to participate who was interested. Three stakeholders indicated that the WPA played a significant role in providing educational and community outreach regarding wind power in Oklahoma; one stakeholder mentioned the particular importance of WWG's focus on landowner education through early statewide conferences. Another stakeholder believed that neighboring states' WPA activities may have influenced wind development in Oklahoma more so than Oklahoma's WWG did. Two stakeholders also commended the WPA for their efforts in distributing wind resource maps throughout the state.

Stakeholders from Oklahoma's small-wind industry also perceived WPA state-based activities as having had little influence on wind development, with one stakeholder mentioning that that WWG was probably not as active with small-scale wind as it was with utility-scale wind in the state. Despite this general consensus, these stakeholders did recognize WPA as having some degree of indirect influence on wind development activities. Two stakeholders commended WPA for increasing the general public's support, or reducing their resistance to, wind turbines and wind farms in Oklahoma. Two stakeholders also indicated that the WPA was influential in developing and disseminating targeted technical information. The same number of stakeholders cited the WPA for building networks and improving information sharing among stakeholders. All of the small-wind respondents commented on the significance of WPA's educational or promotional outreach activities. In addition, two stakeholders also perceived the WPA as a credible, non-biased source of information, while one stakeholder stressed the importance of the wind power conferences held around 2001. Although mentioned to a lesser degree, stakeholders identified WPA's Wind for Schools Program and its influence on state, local, and federal policy as noteworthy in regards to the wind power movement in Oklahoma.

The process evaluation findings for Oklahoma revealed that the WWG was a reasonably diverse group that was well respected as a credible source of wind-related information. All interviewed respondents rated information sharing, increasing public support, and disseminating technical information as "very important" or "somewhat important". Two market actors indicated that the WWG could have been more effective if the membership and group efforts were more consistent. And although the group was run out of a state office, two respondents spoke of a dearth of funding and support from the state as being a limiting factor for the group's ability to influence the market.

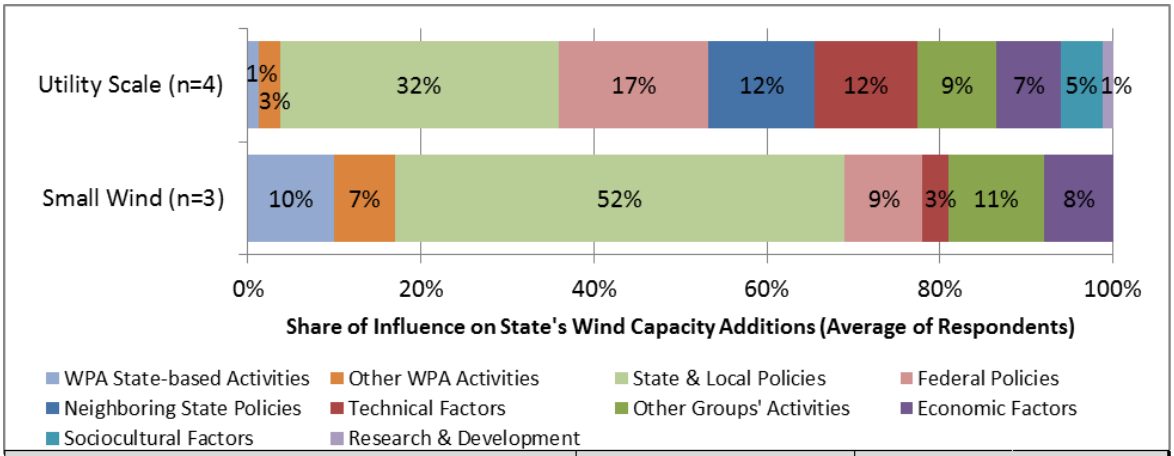
**Table D-26. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Oklahoma**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 17% | 10% | 337 | 0.12 | **Utility-Scale:** Building public awareness and support, unbiased source of technical information, examples of siting and permitting approaches, wind for schools, wind resource map<br>**Small-Wind:** WPA conferences, wind for schools |
| Other WPA Activities | 1% | 13% | 25 | 0.16 | **Utility-Scale:** Public utility partnerships, rural economic development activities<br>**Small-Wind:** Public utility partnerships, rural economic development activities |
| Other Groups' Activities | 8% | 8% | 161 | 0.10 | **Utility-Scale:** AWEA, UWIG<br>**Small-Wind:** AWEA, USDA, State Energy Office |
| State & Local Policies | 5% | 7% | 104 | 0.08 | **Utility-Scale:** Interconnection standards, siting and permitting flexibility, state-level PTC<br>**Small-Wind:** Net metering |
| Neighboring State Policies | 4% | 0% | 86 | - | **Utility-Scale:** Texas RPS<br>**Small-Wind:** N/A |
| Federal Policies | 37% | 32% | 742 | 0.38 | **Utility-Scale:** PTC<br>**Small-Wind:** ITC and the cash grant, Farm bills |
| Economic Factors | 14% | 8% | 287 | 0.10 | **Utility-Scale:** Access to capital, levelized cost of energy, high natural gas prices (2009-2010)<br>**Small-Wind:** High natural gas prices |
| Sociocultural Factors | 2% | 4% | 48 | 0.05 | **Utility-Scale:** Public awareness and support<br>**Small-Wind:** Bergey Windpower's decision to locate in Oklahoma |
| Research & Development | 0% | 7% | - | 0.08 | **Utility-Scale:** N/A<br>**Small-Wind:** Small pilot projects |
| Technical Factors | 11% | 10% | 217 | 0.12 | **Utility-Scale:** Wind resource, access to transmission<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **2,007** | **1.18** | |

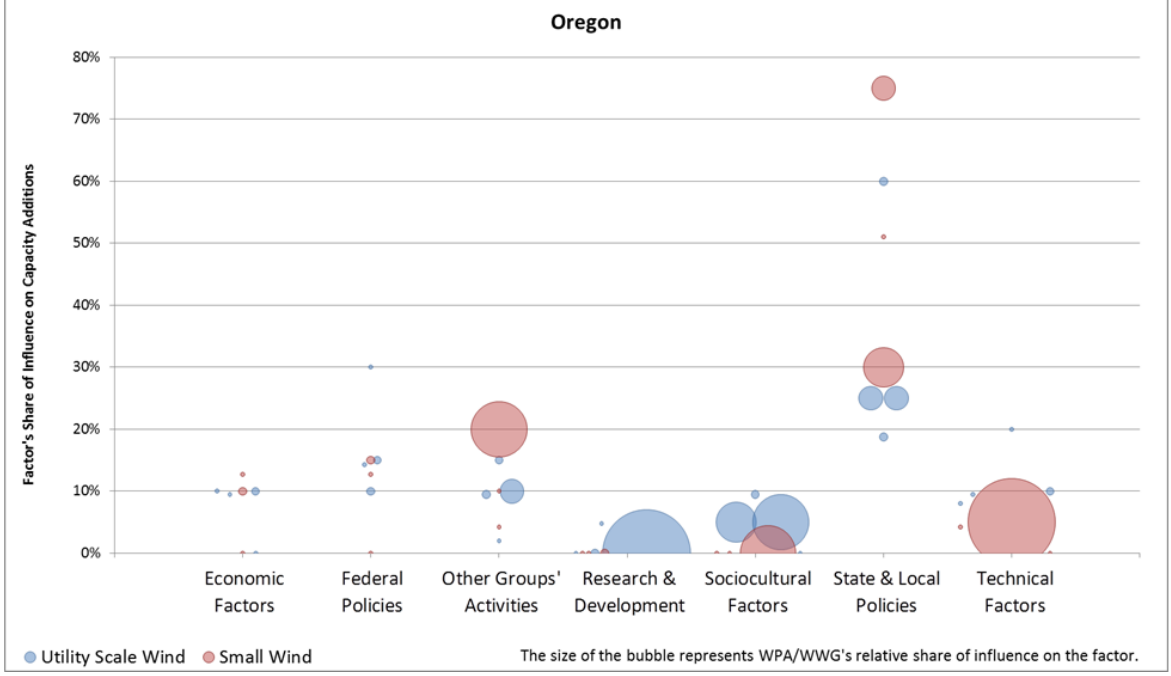
[a] Percentages based on simple averages of utility-scale (n=4) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.14 Oregon

**Figure D-27. Oregon: WPA Influence Summary Dashboard**




| Oregon | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 165 | 95 | 246 |
| State-based Activities | 68 | 38 | 104 |
| Other WPA Activities | 98 | 57 | 142 |
| **Small-Wind** | 0.3 | 0.2 | 0.4 |
| State-based Activities | 0.2 | 0.1 | 0.2 |
| Other WPA Activities | 0.1 | 0.1 | 0.1 |
| **Total** | **166** | **95** | **247** |
| *Total Capacity Additions, Post-WWG through 2011* | *2,358* | *2,358* | *2,358* |
| *WPA Influence as % of Total* | *7%* | *4%* | *10%* |




Source: Navigant analysis

## Figure D-28. Oregon Wind Market Timeline and Wind Capacity Additions (1999-2010)

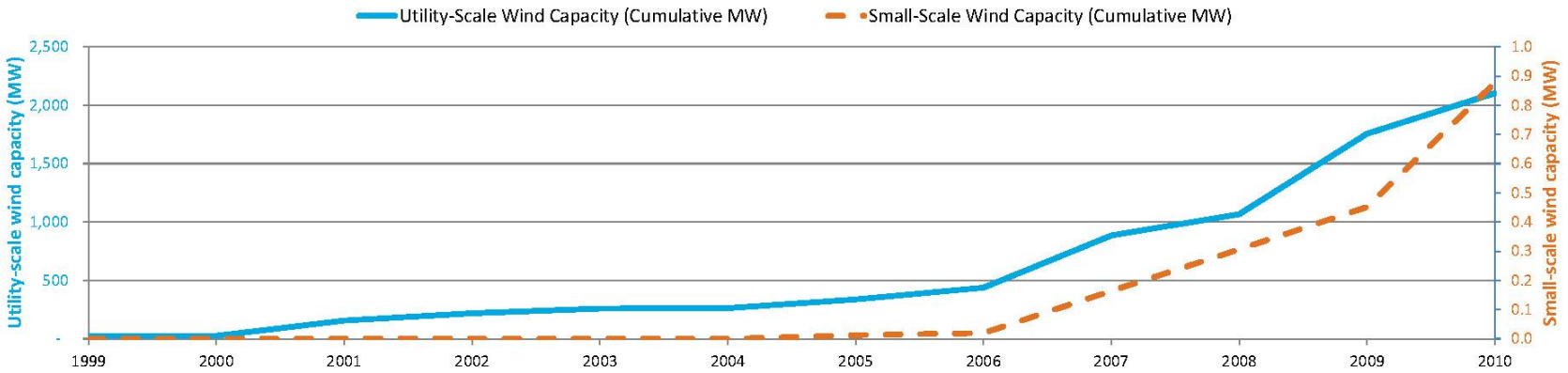
**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Green power pricing and net metering programs available | | | | | | | | | | | RPS Enacted |
| State incentives for small wind, small-scale energy loan program (state low interest loans since 1981) | | | | | | | | | | | |
| | | | Wind Working Group Active | | | | | | | | |
| | | | | | | | | Commercial scale wind incentive program (Energy Trust of Oregon) | | | |
| | | | | | | | WPA Anemometer Loan Program | | | GreenStreet Lending Program (Energy Trust Oregon and Umpqua Bank) | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • Interconnection standards implemented | | | • Validated wind resource map<br>• State Wind Working Group Summit | | • Interconnection standards amended | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government.<br>• Model ordinance for large wind | • Residential energy tax credit | • Community Renewable Energy Feasibility Fund Program<br>• Net metering rules amended<br>• Business Energy Tax Credit increase | • RPS amended to include REC system | • Interconnection standards amended | |

**Growth in Utility-Scale and Distributed-Scale Wind Capacity (Cumulative MW)**




Source: Navigant analysis

### D.14.1 State Overview

In 1999, Oregon had three investor-owned utilities that accounted for 71.5% of retail electric sales, and 37 public, federal, and cooperative utilities that accounted for 28.5% of retail sales. Oregon's five largest utilities by sales are Portland General Electric Co., PacifiCorp, City of Eugene, Central Lincoln People's, and Clatskanie People's. As shown in Table D-27, the vast majority of Oregon's electricity sales came from hydroelectric power and the remaining electricity is primarily generated from gas and coal (EIA 2001).

**Table D-27. Share of Oregon's Electricity Generation by Fuel Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Hydroelectric | 80.5% |
| Gas | 12.0% |
| Coal | 6.6% |
| Other | 1.0% |

Source: EIA 2001

Oregon created an RPS in 2007 and committed to renewable energy generation goals of 25% for large utilities, 10% for small utilities, and 5% for the smallest utilities by 2025. The RPS has incremental goals in 2011, 2015, and 2020. The wind resource in Oregon, however, is moderate. There are some areas with class 4 and 5 wind resource in the central and northern regions of the state. In 1999 and 2000, Oregon had 25 MW of utility-scale wind capacity installed. In 2001, 132 MW of utility-scale wind was added and the capacity started increasing steadily. The added capacity started growing at an increasing rate in 2007. By 2010, Oregon had 2,104 MW of utility-scale wind. There was no small-scale wind in Oregon until 2007, when 200 kW was installed. Between 2007 and 2010, an additional 700 kW was installed, totaling 900 kW of small-scale wind in Oregon by 2010.

### D.14.2 Development of State Wind Market

#### Utility-Scale Market

Evaluators interviewed a diverse group of market actors whose experience spanned utility- and community-scale wind developers, state government, and non-profit organizations. Respondents indicated that the primary driver of utility-scale wind capacity additions in Oregon between 1999 and 2010 was aggressive state and local policies, and they credit about one-third of Oregon's utility-scale wind capacity additions to this market factor category. Oregon offered a number of enticing state incentives, the most prominent of which was the Business Energy Tax Credit (BETC) program. The BETC was an investment-style incentive available for projects that generated renewable energy. The program dates back to 1979. In 2007, the BETC was expanded to cover up to 50% of eligible project costs (up from 35%), and the cap was increased from $10 million to $20 million. Three of the four interviewed market actors indicated that this was a significant factor in adding wind capacity in Oregon. The respondents thought that the incentive on capital investment was more important than the PTC because of the relatively moderate wind resource in Oregon. Other state-level incentives mentioned by market actors were the commercial-scale and small-wind incentives offered by the Energy Trust of Oregon.

Respondents thought that federal policies such as the PTC, along with ARRA cash grants and ITC, were the second most influential factors on the capacity additions, largely for making projects financially viable. Similar to Washington (see Section D.16), respondents also thought neighboring state policies and technical factors had an influence on the addition of utility-scale wind capacity. Primarily, the RPS

in California was a driver for the wind export market in Oregon. One respondent indicated that a policy shift by Bonneville Power Administration (BPA) sometime during the middle of the decade positively influenced wind growth because it "freed up constrained transmission paths by creating a process to offer transmission under a defined procedure that allowed several critical upgrades to go forward." That respondent strongly believed that eliminating the BPA transmission constraints was a key factor that stimulated the wind market, and such growth may not have been possible without the necessary technical upgrades.

Stakeholders also expressed that economic factors and other groups' activities had an influence on the wind market development in Oregon. Specifically, the Renewable Northwest Project had a presence in Oregon before WPA and was also involved with developing the wind market. Respondents gave WPA state-based activities little credit for direct influence in the utility-scale wind additions in Oregon.

Table D-28 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Similar to utility-scale wind, interviewed respondents thought that the majority of the small-scale wind market was driven primarily by state and local policies. The small-wind incentive offered by Energy Trust of Oregon – which provided incentives for up to 60% of total installed project costs – was specifically mentioned. The USDA Rural Energy for America Program (REAP) was also mentioned by one respondent as a driver of small-wind development.

Interviewed respondents thought that WPA state-based activities had more of an influence on small-scale capacity additions than they did on utility-scale. The Oregon WWG had an influence through its outreach and education activities, creation of networking opportunities, the anemometer loan program, and the wind resource map.

### D.14.3 Summary of Wind Powering America Activities and Influence

Oregon was not a priority state for WPA. Activity started in 2002 with a published validated wind map as well as the founding of the Oregon Wind Working Group. The WWG was run out of the Oregon Department of Energy. Interview respondents suggested, however, that the WWG was viewed as a grassroots, educational outreach initiative, while the broader Oregon Department of Energy was engaged in major wind-related policy and siting issues.

The anemometer loan program was active between 2006 and 2008. WPA published a small-wind consumer's guide for Oregon in 2007. Throughout its active time in Oregon, WPA also offered education and outreach events for small-scale wind projects. This included creating networking opportunities through community seminars and grassroots events.

Similar to Washington, market actors in Oregon believed that other regional wind advocacy groups had more of an influence on capacity additions than WPA. Two respondents mentioned Renewable Northwest Project (RNP), including a utility-scale developer who said that the company would turn to RNP first on "any issue that was hanging us up."

In addition to the above process finding, several interviewed respondents from Oregon had a difficult time isolating WPA or WWG-specific efforts from other activity going on in the state. One utility-scale developer recalled several specific issues relating to property taxes, siting rules, and noise limits that required engagement from various stakeholders throughout the state. The respondent said that a cohesive approach was needed to resolve the issues and that there was some involvement from the Oregon state energy representatives; however, he could not recall specific WPA involvement.

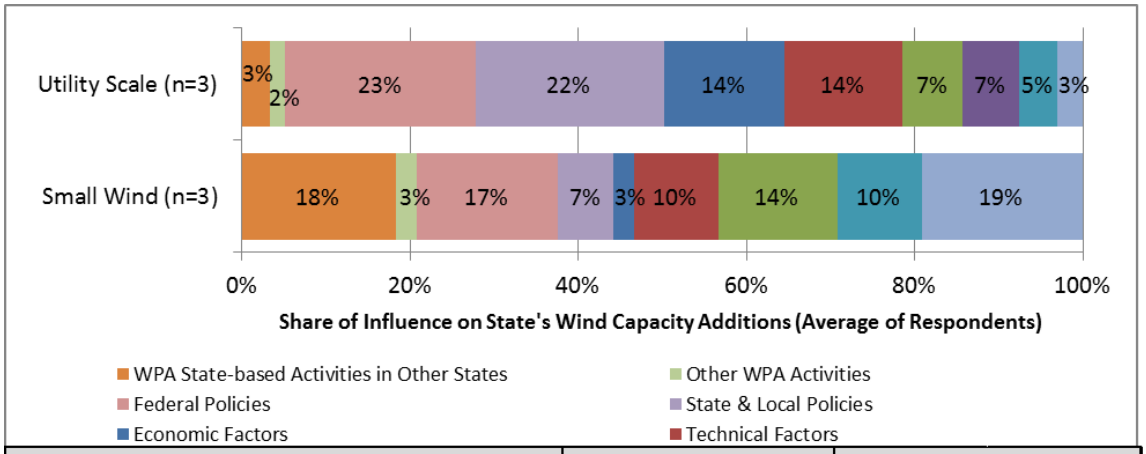
**Table D-28. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Oregon**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 1% | 10% | 29 | 0.16 | **Utility-Scale:** Technical information<br>**Small-Wind:** Wind maps, anemometer loan programs. |
| Other WPA Activities | 3% | 7% | 59 | 0.11 | **Utility-Scale:** Rural economic development activities<br>**Small-Wind:** Rural economic development activities |
| Other Groups' Activities | 9% | 11% | 215 | 0.18 | **Utility-Scale:** Oregon Department of Energy's interpretation of projects being eligible for state incentives, AWEA, Northwest Power and Conservation Council, Oregon public utility commission, Renewable Northwest Project (RNP), Bonneville Power Administration, Energy Trust of Oregon (ETO)<br>**Small-Wind:** Oregon Small Wind Energy Association, Distributed Wind Energy Association, RNP, ETO, Clean Energy Coalition, Oregonians for Renewable Energy Policy, Community Renewable Energy Association |
| State & Local Policies | 32% | 52% | 758 | 0.82 | **Utility-Scale:** Business Energy Tax Credit (BETC), siting ordinances<br>**Small-Wind:** BETC, ETO incentives, state loan programs |
| Neighboring State Policies | 12% | 0% | 290 | - | **Utility-Scale:** California's RPS, Washington<br>**Small-Wind:** N/A |
| Federal Policies | 17% | 9% | 408 | 0.15 | **Utility-Scale:** PTC, ITC cash grants<br>**Small-Wind:** ITC, USDA grants |
| Economic Factors | 7% | 8% | 174 | 0.12 | **Utility-Scale:** Utilities' willingness to sign power purchase agreements<br>**Small-Wind:** Good load matching with net metering; utilities' willingness to interconnect |
| Sociocultural Factors | 5% | 0% | 115 | - | **Utility-Scale:** Landowner support, local economic impacts<br>**Small-Wind:** N/A |
| Research & Development | 1% | 0% | 28 | - | **Utility-Scale:** Given the power prices, innovations in technology that helped drive the prices down in a realm where BPA sets prices,<br>**Small-Wind:** N/A |
| Technical Factors | 12% | 3% | 280 | 0.05 | **Utility-Scale:** Access to transmission, BPA transmission upgrades<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **2,356** | **1.58** | |

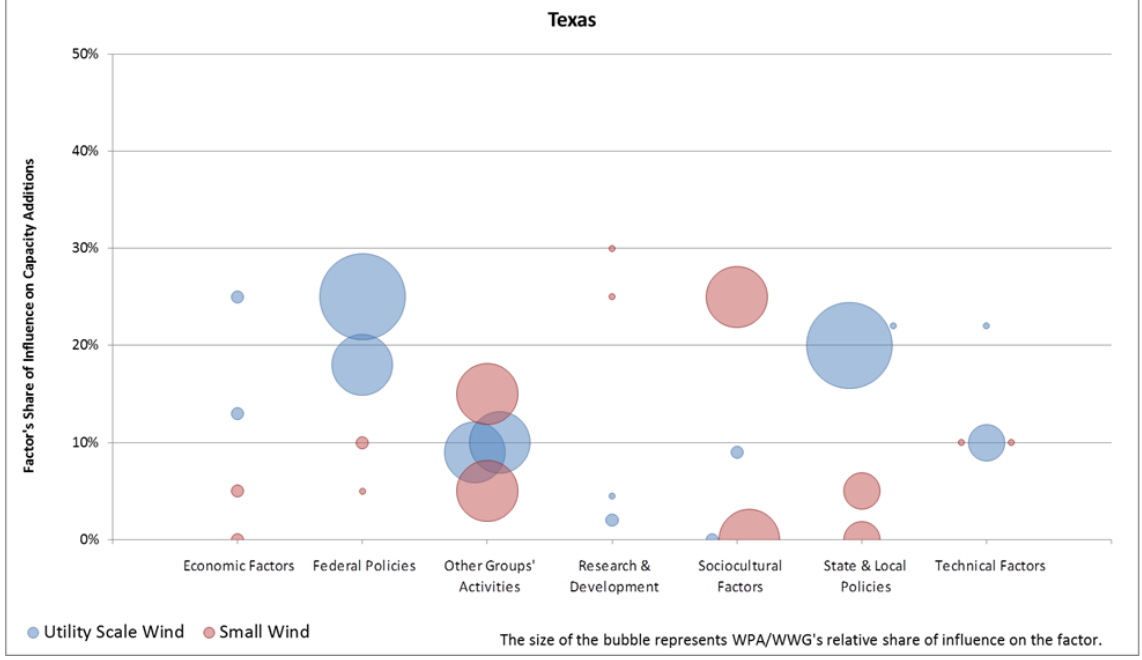
[a] Percentages based on simple averages of utility-scale (n=4) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.15 Texas (Non-Targeted State)

**Figure D-29. Texas: WPA Influence Summary Dashboard**




| Texas | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 718 | 539 | 938 |
| State-based Activities | 417 | 300 | 549 |
| Other WPA Activities | 301 | 239 | 390 |
| **Small-Wind** | 2.1 | 1.9 | 2.3 |
| State-based Activities | 1.7 | 1.6 | 1.9 |
| Other WPA Activities | 0.4 | 0.3 | 0.5 |
| **Total** | **720** | **541** | **941** |
| *Total Capacity Additions, 2000 through 2011* | *10,220* | *10,220* | *10,220* |
| *WPA Influence as % of Total* | *7%* | *5%* | *9%* |




Source: Navigant analysis

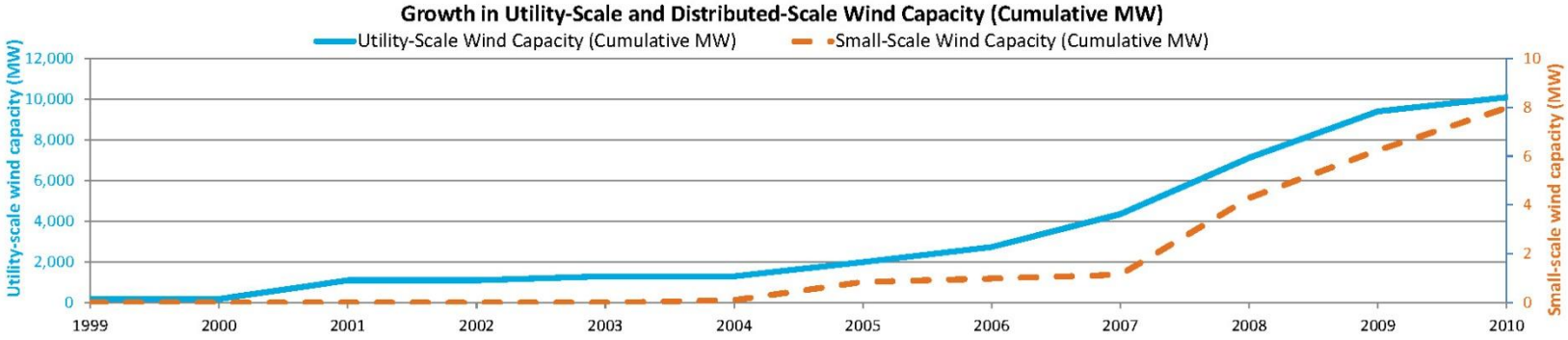
**Figure D-30. Texas Wind Market Timeline and Wind Capacity Additions (1999-2010)**

**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Property tax exemption, franchise tax deduction/exemption in place since early 1980s | | | | | | | | | | | |
| Green power pricing programs, state incentives for small wind | | | | | | | | | | | |
| Renewable Portfolio Standard (RPS) in effect (2,880 by 2009). Amended in 2005 to 5,880 by 2015. | | | | | | | | | | | |
| | | | | | Limited net metering (Austin Energy and city of Brenham) | | | | | | |
| | | | | | | | | Green Power Purchasing (Houston 35% and Dallas 40% electricity from wind annually, Austin to get 100% green power by 2012) | | | |
| | | | | | | | | | | Utility Incentives for small wind | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| • Utilities required to provide renewable energy educational materials to customers<br>• RPS requirements created<br>•Interconnection standards | • Green building requirements for city projects | | | | | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government | | | • WPA State Summit<br>• PUC issues order 33672 to assign $4.93 billion of Competitive Renewable Energy Zone transmission projects | • Wind turbine ordinances for several counties | • WPA 9th Annual All-States Summit<br>• GovEnergy<br>• Best Practices in Wind Energy: Pathways to Developing a Sustainable Workforce |




Source: Navigant analysis

### D.15.1 State Overview

In 1999, the Texas legislature voted to restructure the state's electric industry to allow for retail competition beginning in 2002. The bill also called for an increase in renewable energy generation and for 50% of the new capacity to be generated from natural gas (EIA 2010). In 1999, Texas's electricity was supplied by 10 investor-owned utilities, 74 publicly-owned utilities, and 75 cooperative utilities. Investor-owned utilities accounted for 78.9% of retail sales while public utilities and cooperative utilities accounted for 12.6% and 8.5%, respectively.[48] TXU Electric Company was the state's largest utility, representing 32% of the state's retail electricity sales. Reliant Energy HL&P was the next largest utility, accounting for 23% of sales. Notably, almost half (49.2%) of Texas's electricity was generated from natural gas in 1999 (see Table D-29), with 39.2% generated from coal and 10.2% generated from nuclear power (EIA 2001).

**Table D-29. Share of Texas's Electricity Generation by Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Natural Gas | 49.2% |
| Coal | 39.2% |
| Nuclear | 10.2% |
| Petroleum | 0.6% |
| Other | 0.5% |
| Hydroelectric | 0.3% |

Source: EIA 2001

As shown in Figure D-30, Texas had some wind generation capacity prior to 2001, when wind capacity increased from 184 MW to 1,096 MW. This growth in wind generation capacity continued, more than doubling between the end of 2005 and 2007, and again between 2007 and the end of 2009. Texas's overall installed wind capacity increased from 183 MW to 10,089 MW between 1999 and 2010, at which point Texas was the nation's leading state in wind power generation. Small-scale wind development experienced limited growth in Texas until a boom in capacity from 1.1 MW to 8.0 MW between 2007 and 2010.

Figure D-30 also suggests a possible connection between these capacity increases and the incidence of state and local policies intended to support the renewable energy and wind market. Texas has had property and franchise tax exemptions for renewable energy systems in place since the early 1980s. In 1999, the Public Utility Commission of Texas (PUCT) adopted rules for a Renewable Energy Mandate in the state, creating an RPS, a trading program for renewable energy credits (RECs), and renewable energy purchase requirements for competitive retailers. The original RPS called for 2,880 MW by 2009, including 880 MW of existing wind capacity. The RPS then increased in 2005 to a target of 5,880 MW by 2015, which equated to about 5% of the state's electricity demand, and included a target of 500 MW of renewable energy capacity from renewable resources other than wind. In addition to the 2015 target, the 2005 legislation established a longer-term target of 10,000 MW of renewable energy by 2025. The RPS in particular coincides with increases in utility-scale wind capacity in Texas from 2001 to 2006. In 2007, the cities of Houston and Dallas signed Green Power Purchasing agreements, pledging to procure 35% and 40% of their electricity from wind annually, respectively. Austin also signed a 2008 Climate Protection Plan that sought to power all government facilities with renewable energy by 2012 and to meet 30% of its energy needs through the use of renewable resources by 2020.

[48] Retail energy sales in 1999 totaled 301.8 million MWh (EIA 2001).

Interconnection standards were passed in Texas in November 1999, supporting customer access to on-site distributed generation in the state. Texas does not have conventional net metering regulations, but some municipal utilities (e.g., Austin and Brenham) began offering net metering to their customers in 2004. More recently, some utilities (e.g., Guadalupe Valley Electric Cooperative and Oncor) have offered incentives for customer-sited renewable energy systems, including small-scale wind.

### D.15.2 Development of State Wind Market

#### Utility-Scale Market

The three stakeholders interviewed about Texas's utility-scale wind market perceived that the RPS and the PTC were the two factors with the greatest influence on wind capacity additions from 1999 to 2010. One respondent clarified that the RPS and the PTC would not have had as much of an influence on wind project development without the deregulation of the Texas electricity market. Deregulation set the stage for wind power to develop by opening the market to competition and, subsequently, exposing the state to rising natural gas prices. Due to the fact that almost half of the electricity in Texas was generated from natural gas in 1999, the state was vulnerable to high natural gas prices in the face of increasing energy demand. Stakeholders identified these interrelated economic and technical factors as playing a significant role in the development of the wind market in Texas. The favorable price of wind energy relative to that of natural gas, coupled with favorable wind resources in Texas, fostered an environment for increased wind power development in the state.

Another influence on wind power development cited by two of the three respondents was a state-sponsored polling process held around 1999 that sought to ascertain the public's knowledge and support of various energy sources. This process revealed a high level of community interest and support of which stakeholders were not previously aware and led to the advocacy and subsequent creation of important state and local policies, such as the RPS and county wind ordinances. Public support continued to grow in Texas as the associated positive economic impacts of an expanding wind market were realized (e.g., increased job opportunities). Data and information collection by various groups, including the State Energy Conservation Office (SECO), the National Conference of State Legislatures (NCSL), AWEA, and local universities, were perceived as having a lesser influence on wind development activities in Texas than the above key factors. Stakeholders felt that the WPA had a limited influence in Texas, as discussed below.

Table D-30 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Stakeholders indicated a wide range of factors that influenced the small-scale wind market in Texas, including the 2008 Farm Bill and the 2009 ARRA funding. All three respondents perceived that WPA and other wind industry groups played a role in the small-scale wind industry in Texas by generally increasing education about small-scale wind's viability and increasing public support. Two respondents also identified research and development initiatives (particularly SECO demonstration projects with schools) as having had a significant influence on the wind market in Texas.

Despite these positive influences on the state's small-wind industry, the market has generally been hindered by a lack of state-level policy support. All three stakeholders identified net metering, interconnection standards, and utility incentives for small-scale wind as having a limited positive influence on the market due to their restricted scope. The RPS did not mandate small-scale wind, and there were no statewide small-wind ordinances in Texas at the time. In particular, respondents also cited

a lack of conventional net metering requirements, particularly for municipal and co-operative utilities, as contributing to a lack of small-wind installations.

### D.15.3 Summary of Wind Powering America Activities and Influence

Texas was an early leader in the wind industry. As a result, WPA did not specifically target Texas for state-based activities and the state did not have a WWG. However, the WPA did hold state summits in Texas in 2008 and 2010, and also participated in the GovEnergy and Best Practices in Wind Energy conferences held in the state in 2010. Although stakeholders did not perceive the WPA as having a significant influence on utility-scale wind power development in Texas, all three stakeholders commended the WPA for providing credible information and raising awareness and acceptance of wind energy. One stakeholder provided the example of the WPA drawing "broad grassroots attention" to the prospect of wind energy in Texas, while another stated that WPA "brought people together in settings where they could share information."

WPA's influence on the state's small-scale wind industry, however, was seen as more substantial by all three respondents. However, two of these respondents provided only general examples of that influence, for instance, by pointing to WPA's role as a source of technical information (e.g., from conferences and wind maps) to help educate stakeholders about issues relevant to the small-wind market. The other respondent, however, specifically pointed out how the state tried to replicate the WPA Wind for Schools Program. This respondent explained that despite a lot of interest in small-scale wind projects for schools, the program met with limited success due to project economics and a requirement for the schools to provide matching funds.

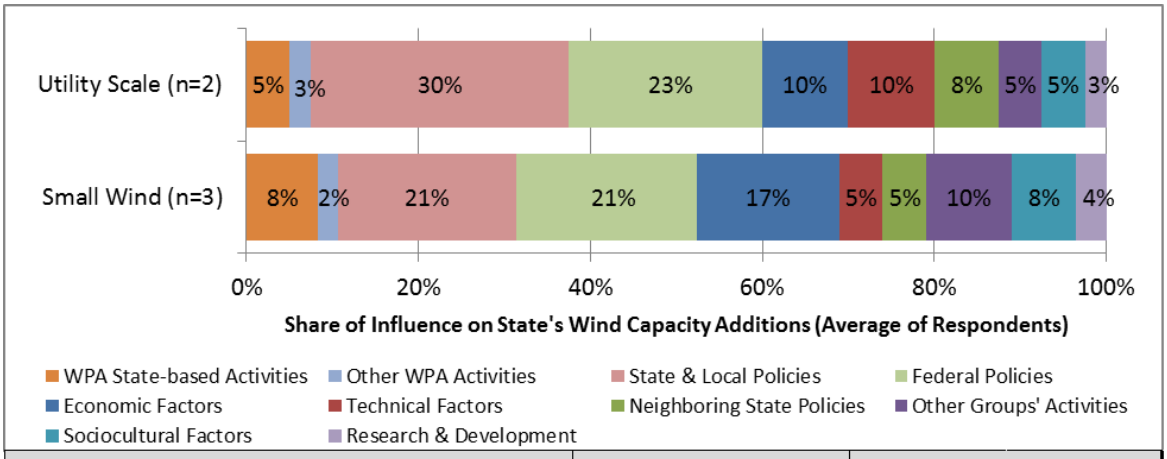
**Table D-30. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Texas**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 3% | 18% | 340 | 1.72 | **Utility-Scale:** Wind resource maps, public outreach, availability of credible technical information, particularly regarding visual, sound and wildlife impacts<br>**Small-Wind:** Same as utility-scale, plus the Wind for Schools Project approach |
| Other WPA Activities | 2% | 3% | 187 | 0.23 | **Utility-Scale:** Federal wind program, "20% Wind Energy by 2030" report<br>**Small-Wind:** "20% Wind Energy by 2030" report |
| Other Groups' Activities | 7% | 14% | 732 | 1.33 | **Utility-Scale:** State Energy Conservation Office, AWEA, National Conference of State Legislatures, Texas Wind Coalition, NWCC, UWIG, SWCC<br>**Small-Wind:** SWCC, Windustry, AWEA, Windustry, NWCC, State Energy Conservation Office |
| State & Local Policies | 22% | 7% | 2,280 | 0.62 | **Utility-Scale:** RPS, siting and permitting ordinances, interconnection standards, public utility commission activities<br>**Small-Wind:** Interconnection standards, net metering under municipal utilities |
| Neighboring State Policies | 0% | 0% | - | - | **Utility-Scale:** N/A<br>**Small-Wind:** N/A |
| Federal Policies | 23% | 17% | 2,314 | 1.56 | **Utility-Scale:** PTC<br>**Small-Wind:** Farm bill, ARRA funding |
| Economic Factors | 14% | 3% | 1,463 | 0.23 | **Utility-Scale:** Electricity demand<br>**Small-Wind:** Cost was more of a barrier |
| Sociocultural Factors | 5% | 10% | 476 | 0.94 | **Utility-Scale:** Increased acceptance around visual, sound and wildlife issues; environmental awareness; economic impact to local communities<br>**Small-Wind:** Customer desire for self-generation |
| Research & Development | 3% | 19% | 306 | 1.80 | **Utility-Scale:** University R&D, wind related reports from the governor's office<br>**Small-Wind:** Pilot and demonstration projects |
| Technical Factors | 14% | 10% | 1,429 | 0.94 | **Utility-Scale:** Wind resource, improved transmission availability over time, levelized cost (when wind was competitive with natural gas)<br>**Small-Wind:** Wind resource |
| ERCOT (grid operator) | 3% | 0% | 340 | - | **Utility-Scale:** Access to the grid |
| Deregulation | 3% | 0% | 340 | - | **Utility-Scale:** One respondent thought deregulation deserved to be called out separately, as it contributed to other factors |
| **Total** | **100%** | **100%** | **10,210** | **9.37** | |

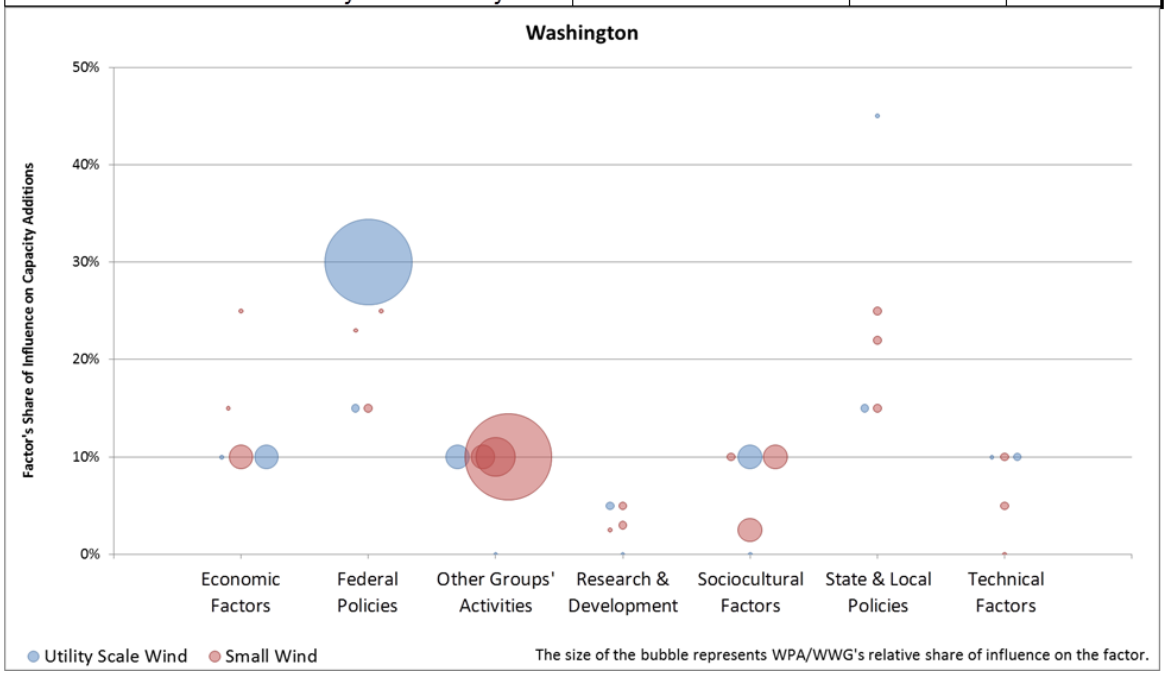
[a] Percentages based on simple averages of utility-scale (n=3) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.16 Washington

**Figure D-31. Washington: WPA Influence Summary Dashboard**




| Washington | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 180 | 127 | 234 |
| State-based Activities | 109 | 82 | 133 |
| Other WPA Activities | 72 | 45 | 101 |
| **Small-Wind** | 0.3 | 0.2 | 0.4 |
| State-based Activities | 0.2 | 0.2 | 0.3 |
| Other WPA Activities | 0.1 | 0.1 | 0.1 |
| **Total** | **181** | **127** | **234** |
| *Total Capacity Additions, Post-WWG through 2011* | *2,398* | *2,398* | *2,398* |
| *WPA Influence as % of Total* | *8%* | *5%* | *10%* |




Source: Navigant analysis

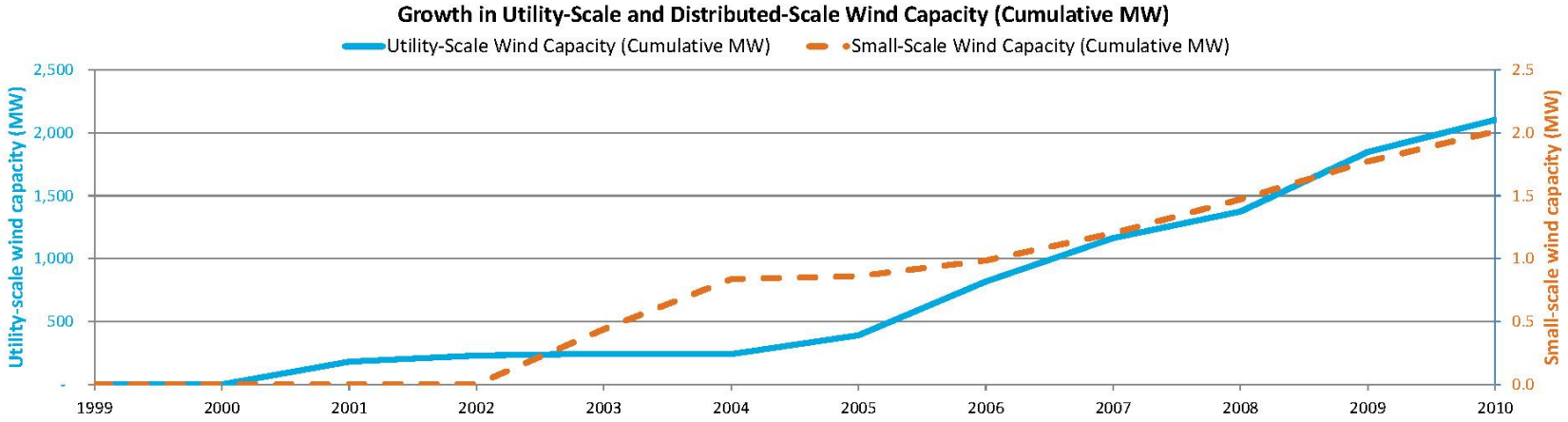
## Figure D-32. Washington Wind Market Timeline and Wind Capacity Additions (1999-2010)

**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Net Metering in effect since 1998 (up to 100 kW), Green power pricing programs available | | | | | | | | | | | |
| | | | Wind Working Group active | | | | | | | Wind Working Group Active | |
| | | | | | | State production based incentive for individuals, business, local government ($0.15/kWh) | | | | | |
| | | | | | | | Renewable energy sales and use tax exemption | | | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | • Mandatory utility green power option | •Validated wind resource map<br>• Harvesting Clean Energy Conference<br>•Sustainable Natural Power Producers Program (Chelan County PUD) | •WA Dept. of Fish and Wildlife's Wind Power Preliminary Guidelines Developed | •Sustainable Natural Alternative Power Producers Program (Okanogan County PUD) | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government. | • Interconnection standards implemented<br>• Energy Independence Act (RPS) standards created (15% by 2020), no requirements until 2012 | • Northwest Public Power Association Annual Conference<br>• Northwest Public Power Association Annual Conference | | •WA Dept. of Fish and Wildlife's Wind Power Guidelines Finalized | |




Source: Navigant analysis

### D.16.1 State Overview

Washington's retail electricity is provided by 3 investor-owned utilities and 61 public, federal, and cooperative utilities. The three IOUs provide 32.2% of retail electricity sales; the remaining 67.8% of retail electricity sales comes from the 61 public, federal, and cooperative utilities. The three largest utilities by retail sales are Puget Sound Energy, Bonneville Power Administration, and Seattle City Light. In 1999, the state of Washington sold a total of 94 million MWh and the primary energy source was hydroelectric power (EIA 2001). Table D-31 shows the energy mix by source.

**Table D-31. Share of Washington's Electricity Generation by Fuel Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Hydroelectric | 82.8% |
| Nuclear | 5.2% |
| Gas | 3.4% |
| Coal | 7.4% |
| Other | 1.1% |

Source: EIA 2001

Central Washington has a few spots of class 4 and 5 wind resource, but the state is considered to have a moderate resource overall. The first utility-scale wind project built in Washington was the 180 MW Stateline project on the border of Washington and Oregon on the Columbia River Gorge in 2001. The wind capacity grew slowly; in 2005, there were 390 MW of wind. In 2006, the rate of wind capacity growth increased, and by 2010 there were 2,104 MW of utility-scale wind in Washington. There was no small-scale wind capacity in Washington until 2003. At that time, there was 400 kW of small-scale wind. The small-scale wind market grew quickly initially and doubled to 800 kW in 2004. The market has seen slower, steady growth since 2004. In 2010, the small-scale wind capacity was 2 MW.

### D.16.2 Development of State Wind Market

#### Utility-Scale Market

Despite contacting a large number of market actors to request participation in an interview, evaluators were only able to complete interviews with two respondents for each market. Several of the key market actors pursued for the evaluation either refused to participate, had retired and could not be reached, or deferred the request to someone else. For the utility-scale market, stakeholders estimated that 5% of share of influence on capacity additions stemmed from WPA state-based activities. The respondents assigned the highest share of influence (about 30%) on wind capacity additions to state and local policies, followed by federal policies at about 22%. The state and local policies cited by interview respondents included the RPS in both Washington and surrounding states such as Oregon and California.

When Colorado became the first state to pass RPS by ballot initiative in 2004, Washington officials had greater hope that it was possible for them as well. They proceeded to pass the RPS by ballot initiative in 2006. Interview respondents indicated that the Northwest Energy Coalition did the most work for promoting the RPS in Washington. Additionally, California had a relatively aggressive RPS starting in 2002, aiming for 20% renewables by 2017. California's RPS had a big influence on wind developers in the Pacific Northwest because utilities in California were willing to buy renewables from nearby states. This encouraged developers to build wind projects, despite the moderate wind resource in their own states.

One stakeholder indicated that members of the Washington WWG may have worked alongside RNP and other groups with the Washington Fish and Wildlife Service and Bureau of Land Management in their efforts to understand the environmental impacts of wind development when creating the Washington Department of Fish and Wildlife Wind Power Guidelines. This stakeholder indicated that any work toward providing fair guidelines may have avoided a slow-down in growth of the wind capacity market in Washington (which subsequently occurred due to curtailment issues).

As in other states, the primary federal policy that contributed to wind development was the PTC. Both respondents indicated that the PTC made wind economically viable in Washington. Other contributors of wind capacity additions, although to a lesser extent, were economic and technical factors. The interviewees indicated that the primary economic factor relating to wind capacity additions in Washington was the price of gas. While Washington had a moderate wind resource, they had the advantage of access to BPA transmission to get wind to market, and one respondent cited the maturity of wind turbine technology as a factor that allowed for a decreased levelized cost of energy.

Table D-32 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

#### Small-Scale Market

Stakeholders indicated that state, local, and federal policies had the highest influence in growing the small-scale wind market in Washington, although they both implied that the small-scale capacity could be more than it is. One respondent thought that WPA influenced the small-scale market through the state-based anemometer loan program, Wind for Schools, and resource maps.

Market actors credited economic factors as the next most influential component in the development of the small-wind market. The interviewees indicated that the primary economic factor relating to wind capacity additions in Washington was the price of gas. WPA state-based activities, other groups' activities, and sociocultural factors also had minor effects on small-scale wind capacity additions.

### D.16.3 Summary of Wind Powering America Activities and Influence

Washington was not a priority state for WPA because there was already wind development activity in the state before WPA started working there. WPA published a validated wind resource map for Washington and started a Wind Working Group in 2002. The WWG was active between 2002 and 2006, and again between 2009 and 2010; it was not active in 2007 and 2008. The Washington WWG did not receive additional or matching funds from the state to encourage further WPA activity, and one interview respondent indicated that the state was somewhat "neglected" by NREL and WPA because the market was taking off on its own and the initiative would be more effective elsewhere.

The process evaluation revealed that WPA was not considered to be a driving force behind the wind market in Washington. This finding may be further supported by the difficulty encountered by the evaluation team in finding market actors willing to participate in the interview process. There was a gap in 2007 and 2008 during which the Washington WWG was not active, and when the group restarted in 2009 it was under new leadership. One respondent indicated that the original WWG could have been more effective if it had pursued additional funding from the state, and a different respondent thought that the WWG had a "reluctance to work with the conservative landowner, rancher, or farmer community." A third respondent alluded to some instances where the early WWG leadership became viewed as a polarizing group that was not well aligned with other industry participants.

All of the interviewed respondents suggested that other wind advocacy groups were more successful than WPA at influencing the market for wind development in Washington. Renewable Northwest Project, the

Northwest Energy Coalition, and Northwest SEED were all mentioned as contributors. Two respondents said that the Northwest Energy Coalition played a key role in promoting the RPS policies, and one respondent said that "Renewable Northwest Project was more influential on a regional basis."

Interview respondents did mention some things that made the WWG effective in Washington. Two market actors said the WWG helped to bring different stakeholders together, including utilities, and provided an organized way to advocate for the wind-related issues. Another successful attribute of the WWG was that it provided an avenue to connect Washington stakeholders to a "national group of players."

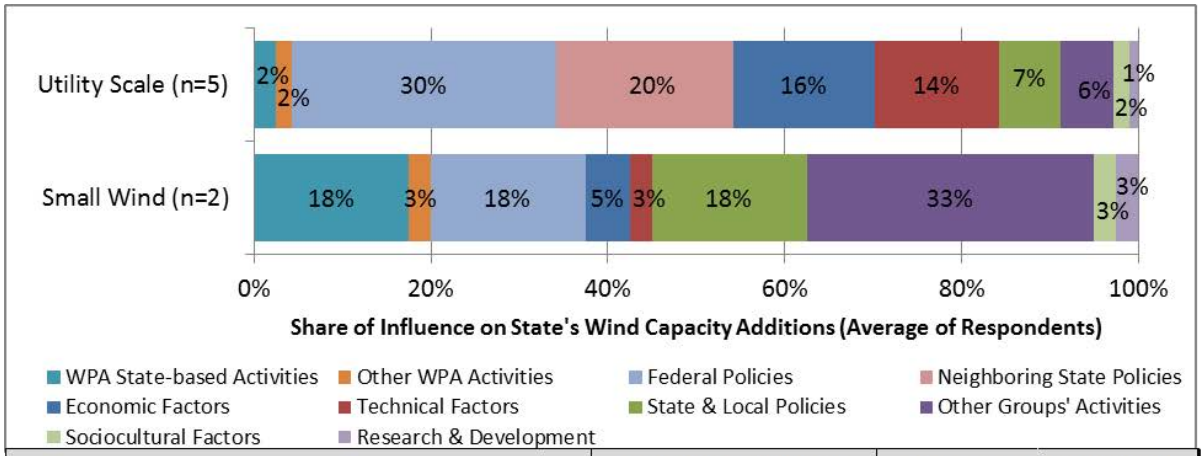
**Table D-32. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Washington**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 5% | 8% | 120 | 0.20 | **Utility-Scale:** Meetings, stakeholder outreach, lessons from other states, connection to national experts<br>**Small-Wind:** Wind working group, Wind for Schools, anemometer loan program, public educations |
| Other WPA Activities | 3% | 2% | 60 | 0.06 | **Utility-Scale:** Rural economic development, public power partnerships<br>**Small-Wind:** Rural economic development, public power partnerships |
| Other Groups' Activities | 5% | 10% | 120 | 0.24 | **Utility-Scale:** Northwest Energy Coalition, Northwest SEED, Renewable Northwest Project, Northwest & Intermountain Power Producers Coalition<br>**Small-Wind:** Renewable Northwest Project, Northwest Power Producers, State Energy Office, AWEA, Windustry, SWCC |
| State & Local Policies | 30% | 21% | 719 | 0.50 | **Utility-Scale:** RPS, Utility commission policies<br>**Small-Wind:** Net metering, small-wind incentives, state tax benefits |
| Neighboring State Policies | 8% | 5% | 180 | 0.12 | **Utility-Scale:** Colorado's adoption of an RPS (as an example), California's RPS<br>**Small-Wind:** N/A |
| Federal Policies | 23% | 21% | 539 | 0.50 | **Utility-Scale:** PTC, ITC, Fish and Wildlife guidelines, BLM implementation<br>**Small-Wind:** Farm Bill and USDA funding, ITC, ARRA funding |
| Economic Factors | 10% | 17% | 240 | 0.40 | **Utility-Scale:** Utility support (Puget Sound Energy, Bonneville Power Administration)<br>**Small-Wind:** Utility initiatives to promote wind, electricity prices (negative) |
| Sociocultural Factors | 5% | 8% | 120 | 0.18 | **Utility-Scale:** Moderate public support<br>**Small-Wind:** Somewhat of a barrier at times |
| Research & Development | 3% | 4% | 60 | 0.08 | **Utility-Scale:** N/A<br>**Small-Wind:** Technical improvements related to reliability |
| Technical Factors | 10% | 5% | 240 | 0.12 | **Utility-Scale:** Wind resource, access to transmission<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **2,396** | **2.40** | |

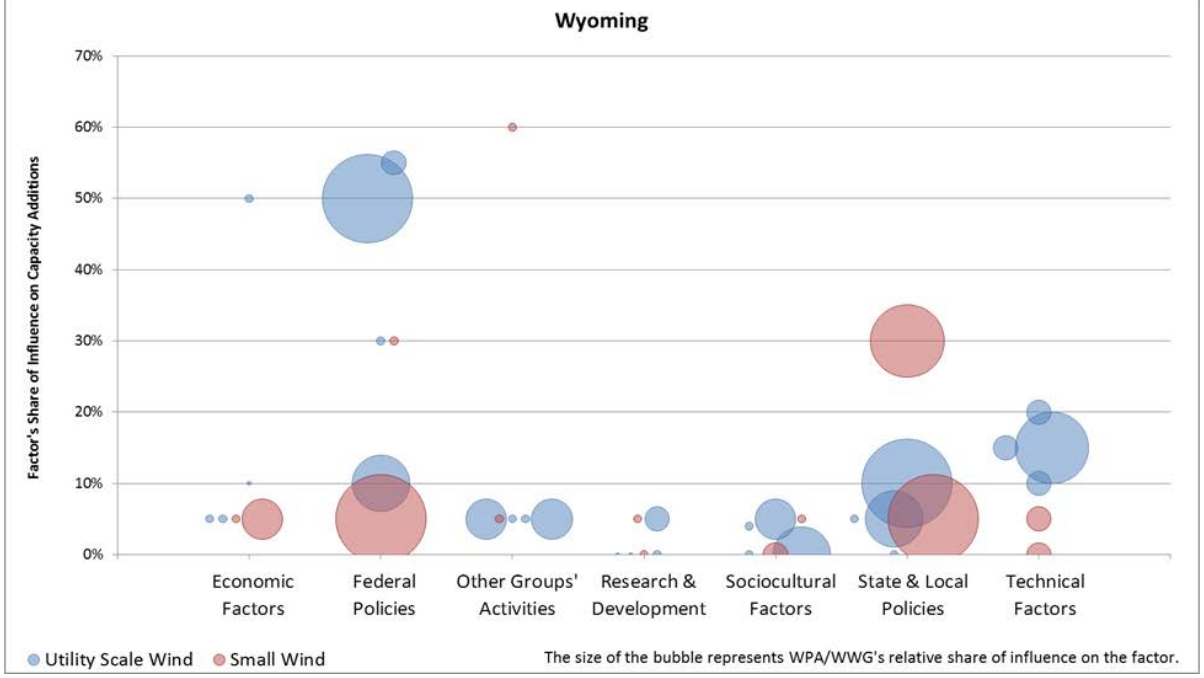
[a] Percentages based on simple averages of utility-scale (n=2) and small-wind (n=3) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis

## D.17 Wyoming

**Figure D-33. Wyoming: WPA Influence Summary Dashboard**




| Wyoming | Capacity-Equivalent Share of Influence (MW) | 90% Confidence Interval | |
|---|---|---|---|
| | | Lower Bound | Upper Bound |
| **Utility-Scale** | 96 | 62 | 135 |
| State-based Activities | 52 | 35 | 71 |
| Other WPA Activities | 44 | 27 | 64 |
| **Small-Wind** | 0.7 | 0.5 | 0.9 |
| State-based Activities | 0.5 | 0.4 | 0.6 |
| Other WPA Activities | 0.2 | 0.1 | 0.3 |
| **Total** | **97** | **62** | **136** |
| *Total Capacity Additions, Post-WWG through 2011* | *1,126* | *1,126* | *1,126* |
| *WPA Influence as % of Total* | *9%* | *6%* | *12%* |




Source: Navigant analysis

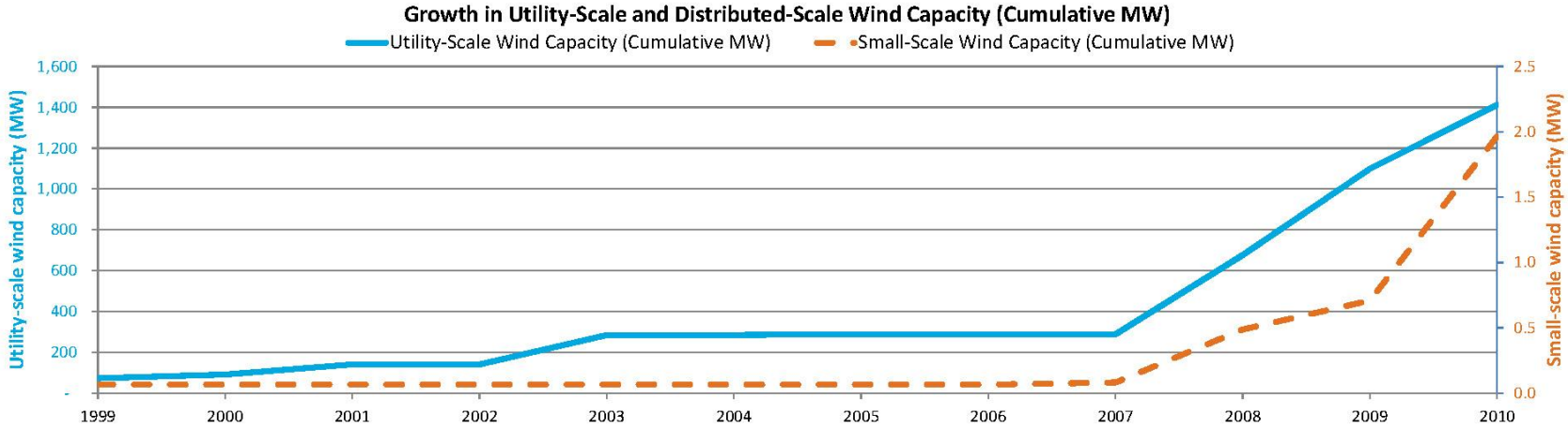
## Figure D-34. Wyoming Wind Market Timeline and Wind Capacity Additions (1999-2010)

**Timing of Policies and Ongoing Events**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Modified Accelerated Cost-Recovery System (MACRS) Depreciation Available (since 1983) | | | | | | | | | Bonus Depreciation Available | | |
| PTC | PTC Available | | PTC Available | | | PTC Available | | | | ITC Available (Utility-Scale ) | |
| | | | | USDA Section 9006/REAP Grants and Loan Guarantees Available | | | | | | | |
| | | | | | | | Clean Renewable Energy Bond (CREBs) Financing Available for Some Entities | | | | |
| | | | | | | | | | | ITC Available (Turbines <100 kW) | |
| | | | | | | | | | | Cash Grants in Lieu of ITC | |
| Green power pricing programs available | | | | | | | | | | | |
| | | Net Metering available | | | | | | Pacificorp Integrated Resource Plan Renewables | | | |
| | | | | State Incentives available for small wind | | | | | | | |
| | | | | | | | Anemometer Loan Program | | | | |
| | | | | | | | Anemometer Loan Program, Workshops, Webinars | | | | |
| | | | | | | | | | Wind Working Group Active | | |

**Notable One-time Events:**

| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | • Interconnection standards | • Validated wind resource map | •Wind and Renewable Energy Conference | | • Energy Policy Act (EPACT) establishes renewable energy procurement goals for Federal government. | • Small wind guide published | | | | • Wind permitting standards require county permits for new wind or expansion of existing wind |




Source: Navigant analysis

### D.17.1 State Overview

Wyoming's electricity is sold by 5 investor-owned utilities and 30 publicly-owned utilities, which account for 72.04% and 27.96% of all retail electricity sales in the state, respectively. The three largest utilities in Wyoming are PacifiCorp, Powder River Energy Corp, and Cheyenne Light, Fuel & Power Co. In 1999, the total retail electricity sales in Wyoming were 11.7 million MWh. The vast majority of this came from coal (EIA 2001). The breakdown of electricity sales by generation source is shown below in Table D-33.

**Table D-33. Share of Wyoming's Electricity Generation by Fuel Source in 1999**

| Resource | Percentage of Generation Profile in 1999 |
|---|---|
| Coal | 96.2% |
| Hydroelectric | 2.7% |
| Gas | 0.9% |
| Petroleum | 0.1% |
| Other | 0.2% |

Source: EIA 2001

Wyoming has an excellent wind resource in a large portion of the state. The entire southeast quadrant of the state has a resource around 8 m/s, making wind development more economical than in other states. In 1999, Wyoming had 73 MW of utility-scale wind. The capacity grew steadily to 288 MW in 2007, followed by an increasing rate of capacity additions in 2008. By 2010, there was 1,412 MW of utility-scale wind in Wyoming. In 1999, Wyoming had 100 kW of small-scale wind. There was no additional small-wind capacity until 400 kW was added in 2008, after which a consistent rate of small-wind capacity additions led to a total of 2 MW installed by the end of 2010.

### D.17.2 Development of State Wind Market

#### Utility-Scale Market

Wyoming's energy market provides important context for assessing the development of wind power in the state. The state's electric load is relatively low due to Wyoming's small population, creating more of an export than in-state market for energy. Furthermore, electricity prices are relatively low, and the state is historically conservative in nature. With fewer drivers related to economics or state-specific policies, Wyoming stakeholders indicated that federal policies were the greatest source of influence on utility-scale wind capacity additions in the state between 1999 and 2010. This was primarily driven by the PTC because Wyoming has a strong wind resource and capacity factors are relatively high. Respondents generally agreed that wind power would not be cost competitive in Wyoming without significant monetary incentives.

Along with energy from conventional generation, Wyoming has often been viewed as having the potential to be a significant exporter of wind energy. The favorable wind resource and availability of land make it a candidate to serve load throughout the western United States. Wyoming's export potential has been a topic in at least two high-profile studies by NREL (NREL 2012, Lantz and Tegen 2011). The existing transmission infrastructure is sometimes considered as a limiting factor for wind development, but there has been great discussion about contributing to renewable energy needs in regional states.

Interviewed market actors rated neighboring state policies as the second most influential factor on the addition of utility-scale wind capacity. At least two respondents believed that RPS policies in Oregon, Washington, and California had an influence on Wyoming's renewables landscape – especially in the long term – because they potentially open up the export market for wind in Wyoming. Overall,

interviewed respondents believed that neighboring state policies influenced about 20% of Wyoming's utility-scale wind capacity, whereas Wyoming state policies only influenced about 7%. One stakeholder said that creating a Wyoming RPS would not have been significant at all because the electricity load is so small that no significant capacity would have been added anyway.

One market actor thought that PacifiCorp's Integrated Resource Plan was the single most influential driver on Wyoming's capacity growth. That respondent considered the PacifiCorp plan to fall into the "neighboring state policies" category because a significant portion of PacifiCorp's service territory and load is located in states where RPS policies exist and load is greater than Wyoming. PacifiCorp's Integrated Resource Plan encouraged the use of wind power in the Northwest by proposing an added 1,400 MW of renewables in the first ten years of the plan. PacifiCorp PPAs subsequently accounted for roughly three-quarters of the utility-scale wind capacity in Wyoming through 2010.

According to interviewed market actors, economic and technical factors were the next most influential drivers to the utility-scale wind market in Wyoming. The small population and the utilities' willingness to sign PPAs contributed to a positive economic situation for wind development in Wyoming. Additionally, the favorable wind resource and easy access to existing transmission made wind development technically feasible in Wyoming.[49] Stakeholders indicated that WPA's state-based activities may have had about 2% of the influence for wind development between 1999 and 2010.

Table D-34 at the end of this case study summarizes respondents' average perceived share of influence for each market factor category and the specific factors or activities within that category that they mentioned in support of their assessments.

### Small-Scale Market

In Wyoming, WPA focused more heavily on the utility-scale market than the small-wind market. Most of the interviewed respondents were more familiar and involved with utility-scale wind, and only two stakeholders felt compelled and qualified to provide meaningful responses for the small-scale wind market. Given the small sample of respondents, the evaluation results pertaining to Wyoming's small-scale wind market should be considered with caution.

The WWG was administered by the Wyoming State Energy Office and the group received funding from both the federal WPA initiative and the state. For this reason, it is a challenge to determine the distribution of influence between the two entities. One respondent who was familiar with the structure of the group felt that the State Energy Office had more of an influence on small-wind development than WPA state-based activities.

Respondents indicated that workshops, outreach, and other activities that generally raised awareness were beneficial. Stakeholders indicated that the federal policies that contributed to small-scale wind development in Wyoming were ARRA funding, IRS deductions, the ITC, and the Farm Bill. Additionally, one respondent mentioned that the small-wind market in Wyoming was driven by a sociocultural mentality among a population of rural or semi-rural landowners who like to be self-sufficient. The respondent indicated that this segment of small-wind consumers was not motivated by the economics of small-scale wind because energy prices were cheap, but was instead driven by the personal goal of using domestic energy. WPA wind maps and educational materials may have enabled these people to pursue installations.

[49] The transmission constraints mentioned earlier generally refer to discussions relating to even greater wind penetration.

### D.17.3 Summary of Wind Powering America Activities and Influence

Overall, interviewed respondents credited WPA and the WWG with a very small share of influence on Wyoming's utility-scale wind capacity additions, lower than all but one other state in the target sample. WPA's share of influence on small-scale capacity was near the middle of the range, although the numbers came from only two respondents and they were contrastingly different. Wyoming was not a priority state for WPA, and its activity started in the state when the anemometer loan program was launched in 2006. WPA began holding workshops and webinars between 2006 and 2008, and the wind working group was not active in Wyoming until 2008. One market actor thought the group was too late to have much influence on key drivers like policy. This respondent viewed the WWG as "reactionary" to specific topics like the Sage Grouse controversy and a growing anti-wind culture. Another respondent echoed this theme by stating that the group's formation was timely in that it helped to push back against some counter-wind culture that existed in the state during the latter part of the decade.

Interviewed respondents did indicate that the Wyoming WWG may have contributed to improving the public perception of wind power in the state. Citizens know that the state is windy, and the WWG's efforts to promote wind power as a means to achieve energy independence and economic benefits may have contributed to a more receptive sociocultural environment and may have eased some concerns relating to noise and visual impacts of wind turbines. Also, wind maps were mentioned by two market actors as being a useful tool for both utility-scale developers and parties interested in small-scale installations.

From a process standpoint, the Wyoming WWG was faced with the challenge of operating in a state with sparse and dispersed population and history of a highly conventional energy generation market. One respondent indicated that the group was effective by assembling a diverse group of stakeholders into meeting forums where issues could be discussed. However, that same respondent also stated that it was difficult to discern whether efforts of the WWG were centered around the personal agendas of a few individuals, whether they represented the best interest of local stakeholders, or whether they stemmed from a broader DOE effort. There did not seem to be much cohesion among the WWG and other stakeholders like environmental groups and utilities, but one respondent believed the group was generally seen as a credible source of information. One respondent indicated that an industry-led group has since taken over the WWG efforts since funding ceased, although the group's focus is now centered around the industry stakeholder interests and the public education component no longer exists.

**Table D-34. Market Factor Average Perceived Share of Influence on Installed Capacity and Supporting Comments: Wyoming**

| Market Factor | Share of Influence on Installed Capacity[a] | | Capacity Equivalent (MW) | | Activities Mentioned in Supporting Comments |
|---|---|---|---|---|---|
| | Utility | Small | Utility | Small | |
| WPA State-Based Activities[b] | 2% | 18% | 27 | 0.45 | **Utility-Scale:** Meetings, education and outreach, wind resource map, anemometer loan program<br>**Small-Wind:** Workshops and outreach, raising awareness |
| Other WPA Activities | 2% | 3% | 20 | 0.06 | **Utility-Scale:** N/A<br>**Small-Wind:** Technical information |
| Other Groups' Activities | 6% | 33% | 67 | 0.84 | **Utility-Scale:** Wyoming Power Producers Coalition, AWEA, NWCC, WAPA<br>**Small-Wind:** State Energy Office |
| State & Local Policies | 7% | 18% | 79 | 0.45 | **Utility-Scale:** Tax exemption/abatement, ease of permitting<br>**Small-Wind:** Sales tax exemption, net metering |
| Neighboring State Policies | 20% | 0% | 225 | - | **Utility-Scale:** RPSs in Pacific Northwest states, California<br>**Small-Wind:** No influence |
| Federal Policies | 30% | 18% | 337 | 0.45 | **Utility-Scale:** PTC<br>**Small-Wind:** ARRA funding, Farm bill, ITC |
| Economic Factors | 16% | 5% | 180 | 0.13 | **Utility-Scale:** Utilities willingness to sign PPAs (particularly PacifiCorp); overlaps with federal policies<br>**Small-Wind:** Low electricity rates (negative) |
| Sociocultural Factors | 2% | 3% | 20 | 0.06 | **Utility-Scale:** Public support (particularly from agricultural community)<br>**Small-Wind:** Early adopters looking to reduce environmental impact, using small-scale wind for education |
| Research & Development | 1% | 3% | 11 | 0.06 | **Utility-Scale:** Technology improvements<br>**Small-Wind:** Pilot and demonstration projects, technology improvements |
| Technical Factors | 14% | 3% | 157 | 0.06 | **Utility-Scale:** Wind resource, access to transmission<br>**Small-Wind:** Wind resource |
| **Total** | **100%** | **100%** | **1,124** | **2.60** | |

[a] Percentages based on simple averages of utility-scale (n=6) and small-wind (n=2) respondent estimates.
[b] This simple average does not account for the uncertainty ranges provided in the next step of respondent input.
Source: Navigant analysis