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Via E-Mail

West Wind Wires (WWW) is a project of the Western Resource Advocates in Boulder, CO. We advocate for the wind industry before transmission planning and operational entities in the Western Interconnection region. Because wind resources are usually located remote from load centers, transmission adequacy is of special interest to wind developers.

Your draft discussion paper *Transmission Adequacy Standards: Planning for the Future* correctly identifies a number of issues that are particularly important to the wind industry. We feel very strongly that physical adequacy and economic consequences should be considered together when planning for transmission expansion.

We also feel that the question of what level of reliability should be placed into planning criteria is debatable and requires input from load serving entities and wholesale and retail ratepayers as different customer classes have different tolerances for curtailments. For example, the average residential customer is much more tolerant of outages than the management of a computer chip manufacturer.

We think it is very important to use a common metric for measuring transmission performance, common to both transmission owners and customers, so that performance can be evaluated fairly and accurately.

We believe that controlled load shedding is a reasonable tool to meet adequacy standards if used fairly and judiciously throughout the region. A properly functioning RTO would go a long way to providing appropriate use of this tool.

Principles of integrated resource planning (IRP) have rarely been applied to transmission planning, but there is a need to integrate resource planning with transmission planning. Transmission planners should examine all resources including generation, transmission, demand-side management, distributed generation, load-control, and real-time metering and pricing on a least-cost and life cycle cost basis.

Market mechanisms should be fully incorporated to address congestion and market participants should be invited to fully participate in the planning process, review planning proposals, and be afforded the opportunity to bid on proposals to relieve congestion.

The issue of who pays should be examined in the light of a determination of benefits including public and environmental benefits, and the degree to which a given project will address state, regional, and national public purposes such as renewable portfolio standards, the coastal states Climate Change Initiative, state carbon reduction programs, and the western governor's goal of 30,000 new MW of renewable resources. Costs should be socialized to the extent that the benefits can be demonstrated to extend uniformly over the wider region.

To further elaborate on these issues and the principles that underpin the opinion of the wind industry we are sending separately the National Wind Coordinating Committee (NWCC) document *Transmission Planning Principles* published in February of 2004 and an NWCC position paper *Transmission Planning and Wind Energy* published in August 2004.

Sincerely,

Roger Hamilton
West Wind Wires
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February 2004

TRANSMISSION PLANNING PRINCIPLES

BACKGROUND

The following principles have been discussed and deliberated by a group of stakeholders at a meeting convened by the National Wind Coordinating Committee and co-sponsored by Portland General Electric Company (PGE) in Portland, Oregon on June 3 and 4, 2003. The NWCC is a multi-party collaborative organization formed in 1994 to support the development of sustainable markets for wind power. PGE is the utility serving the Portland area and surrounding region. Persons attending the meeting included representatives of energy resource developers, utility and transmission owners, consumer and environmental groups, power marketers, transmission planning experts, and other interested parties.

Wind generation is an environmentally attractive electric power source with increasingly competitive economics and growing market acceptance in most regions of the United States. Over 4742 (www.awea.org/projects) MW of wind generation have been installed in this country (at August 13, 2003). Wind is an intermittent resource, available only when the wind is blowing. In addition, wind resources are often most plentiful in remote areas. While these constraints may prove challenging for developing wind projects, wind resources can be built and dispatched in very short time frames compared to other electric power resources. These characteristics, as well as time frames for needed transmission upgrades, make transmission planning a very important issue for wind. At a meeting in Salt Lake City in January NWCC members identified a common agreement on transmission planning principles as essential to winning public acceptance and regulatory approval of needed transmission additions and upgrades.

These principles address transmission planning issues that affect all power resources; they do not provide for special treatment of wind as a specific fuel source. The NWCC members believe they reflect mainstream views of many stakeholders, and that their adoption would benefit all energy market participants. They also believe they are consistent with the 1992 Energy Policy Act's integrated resource planning requirements, and FERC Order 2000. A FERC white paper discussing wholesale market design was published on April 28, 2003. This paper proposes a requirement that regional transmission organizations file a transmission plan that includes evaluating the impact of new generation, transmission, energy efficiency, and demand response on regional reliability and resource adequacy. The white paper also calls for responsible planning entities to be independent. These principles are consistent with the proposed requirements.

PURPOSE

The purpose of these principles is to suggest to existing or future transmission planning entities standards and criteria that will attract widespread public and regulatory support for their transmission expansion and upgrade proposals. The principles are designed to help maintain a reliable, efficient, and environmentally friendly electric power system. They are intended to

promote a number of attributes not yet considered in current regional planning processes and to have universal applicability in all regions. It is hoped that the development and dissemination of these principles at stakeholder meetings and conferences will encourage useful debate. It is also hoped that transmission planning entities such as RTO's, utilities, PMA's, and regional governing bodies, that have the authority to compel and fund planning results, will consider these guidelines.

Stakeholders attending the meeting recognized that there are at least three specific levels of planning that should be distinguished from one another:

- the technical level relating to utility-specific transmission functions and requirements;
- the energy resource level that includes the integration of transmission, generation, and other resource options; and
- the electric power system level that considers the broader interconnected grid.

Stakeholders generally recognized that transmission planning should be performed on a broad geographic basis in order to capture all physical and commercial impacts and interactions in the interconnection. They also recognized that planning should be proactive in order to ensure timely system adjustments, upgrades, and expansions.

Some stakeholders believe the capacity of the existing grid is underutilized and that there is a need to make the "best use" of the current transmission system. They differentiate between public and private values when determining the "best use" of the system. Other stakeholders believe certain transmission paths are over-utilized, causing new generation to be tripped by system operators to prevent cascading outages. These stakeholders generally believe that a need for expansion of the system will require an explanation of benefits to regulators, rate payers, and the affected public.

Resource value, supply and demand side considerations, and new metrics for non-traditional and external costs are proposed as issues for consideration in planning. Good examples are PacifiCorp's Integrated Resource Planning, the Bonneville Power Administration, the NWPPC regional plan, and PJM's regional expansion plan. There is general agreement that planning processes should facilitate market-driven enhancements to relieve congestion and provide a reasonable level of reliability as interpreted on a regional basis but at a minimum as defined by NERC planning standards. While transmission systems may have the character of natural monopolies, competitive bidding processes and competitive market signals should be incorporated in the planning for upgrade, expansion, and selection of non-transmission alternatives.

The NWCC believes these principles will provide guidance to planners and planning authorities called upon to navigate through existing issues, including the ones identified at the meeting, and any future problems encountered in the transmission planning process.

NWCC TRANSMISSION PLANNING PRINCIPLES[1]

Authority

1. Transmission planning entities should be independent and publicly accountable.

Explanation. In order to eliminate the reality and appearance of conflicts of interest, the planning entity responsible for assessing needs and options for addressing them should not be controlled by parties with a private financial interest in the results of the planning process. Transmission utility interests and other regional planning interests may not be identical. Transmission utilities are accountable to their regulators to plan and implement plans to fulfill these obligations.

2. The transmission planning entity should have the responsibility to identify needs and the authority to provide incentives for or directly implement solutions that may or may not be available to the market.

Explanation. Stakeholders involved in the planning process should have assurances that their input and participation in deliberations will result in a plan that can be implemented at the appropriate local or regional levels. The planning entity's authority can range from having its plan be the rebuttable default in regional regulatory processes, to the authority to allocate costs and order construction. Planning without implementation is an empty process that will not be taken seriously or funded adequately. Examples of such entities may be RTO's, transmission companies, utilities, PMA's, and multi-state governing bodies. Stakeholders should also be assured that the planning process leading to transmission upgrades or expansion is consistent with the following principles. Planners should recognize that certain system needs may not have market solutions.

Scope

3. Transmission planning should be integrated with resource planning.

Explanation. This principle underlies all other principles that follow. Electricity industry restructuring in some states and regions has resulted in the separation of transmission planning from generation and distribution planning, and in some areas regulated transmission and generation planning has been disconnected from unregulated generation development. Because electric resources of all types must be integrated in interconnected grids to assure reliability and economic efficiency, separating transmission planning from generation planning creates both reliability and economic risks.

4. Transmission planning should be done on a broad, regional basis.

Explanation. Broad-based wholesale markets can create impacts over wide geographic areas not previously considered comprehensively in power system planning. Grid modifications in a single control area often affect the performance of the grid in other areas, and such modifications can have significant economic impacts on market participants outside the control area. Thus, planning entities should be organized on a

[1] *Note: For the purpose of developing this set of principles, the group agreed to define a principle as a standard, criterion, or value by which needs, goals, objectives, and action options are evaluated.*

regional multi-state basis in order to assess needs, evaluate impacts, and provide effective interregional coordination.

5. Transmission plans should fully integrate planning for reliability with planning for competitive markets.

Explanation. Reliability requirements have a significant effect on how power markets function and, thus, must be taken into consideration in power market design and operation. In addition, buyer and seller actions in power markets can significantly affect grid reliability. Thus, it is critical that a regional planning entity consider both reliability and competitive impacts when assessing regional needs and evaluating resource options.

Process

6. Transmission planning processes should be transparent and facilitate the input of all stakeholders in the region.

Explanation. In order to ensure that all regional values and public purposes are incorporated in transmission plans, all planning activities should be public and transparent with adequate notice, posting of agendas and reports, and full provision for consideration of inputs. Active participation by local, state, and federal officials, including environmental and rate regulators, should be facilitated by the planning entity.

7. Transmission planning should be based on an appropriate planning horizon and be proactive and responsive to needs of market participants.

Explanation. Transmission planning processes should be flexible enough to be responsive to emerging conditions. These planning processes should incorporate adequate scenario, uncertainty, and risk analyses over a long term. Proactive planning should also consider expectations for increased transfers of energy and guidance for optimal location of new resources, not just responses to interconnection requests.

8. Transmission planning should consider on an equal basis all types of resources available to meet planning goals and to address system resource needs and problems.

Explanation. Intermittent resources, energy efficiency, load management, demand-side bidding, and distributed resources, in addition to traditional generation and transmission resources, are all potentially cost-effective means of meeting system needs. Non-traditional resources may be less expensive and easier to site than central power stations or new transmission lines. These considerations should also create greater certainty and rate stability for investors and consumers.

9. Electric system plans should be based on a life-cycle least-cost standard including external costs such as environmental and societal impacts.

Explanation. A principal criterion for selecting a solution that receives socialized support should be whether or not it is the lowest cost, reasonably available solution to an unmet system need. These solutions should be considered on a total cost basis in both the short-term and the long-term.

10. Transmission planners should use explicit, standardized methods and assumptions for evaluating all resources, including demand-side and intermittent generation technologies.

Explanation. Standardized metrics would help assure fair and impartial evaluation of all types of resources. Because non-traditional resources have significant potential to meet regional needs, transmission planners should work with stakeholders to identify ways to standardize methods across various studies so that resources may be fairly compared.

11. Planning results should clearly identify system needs, benefits, and resource options so that market participants have the opportunity to propose and implement viable solutions.

Explanation. Regional planning entities should develop the information needed for the market to propose investments that address grid congestion, reliability, and efficiency needs, and identify local and system benefits. The entities should evaluate market proposals and publish their assessments for stakeholder review and input.

NWCC Members and Associate Members include representatives from:

Consumer Groups

Economic Development Organizations
Agricultural Interests
Rural Development

Electric Power
Co-operatives
Investor Owned Utilities
Public/Municipal Utilities

Environmental Organizations
Conservation/Wildlife Groups
Renewable Energy Advocates

Federal Government
Bureau of Land Management
Department of Energy
Fish and Wildlife Service
National Renewable Energy Laboratory

Green Power
Marketers
Traders

State Government
Legislatures
State Energy Offices
Regulatory Agencies
State Environmental Agencies

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August 2004

TRANSMISSION PLANNING AND WIND ENERGY

Issue Brief

ISSUE DESCRIPTION / PROBLEM STATEMENT

Changes over the past decade in the electric power industry are making transmission planning more challenging and complicated. In some regions, generation, transmission and system operations are becoming unbundled. Generation is becoming competitive, but transmission and system operations are still regulated. Bulk power wholesale transactions have steadily increased in volume, leading to new demands on the transmission system.

Yet investment in transmission capacity has lagged behind growth in electric load. While transmission capacity increased slightly faster than summer peak demand between 1979 and 1989, this trend sharply reversed during the 1990s, and new transmission capacity is expected to lag behind load growth for this decade as well. One report suggested that as much as $56 billion may be needed this decade to preserve transmission adequacy at its present level.[1]

These changes are leading to a re-examination of transmission planning and how best to conduct transmission planing in this new and changing market environment, not only from the perspective of adding new transmission capacity, but also from that of making the best use of existing transmission capacity and incorporating non-transmission alternatives.

[1] Hirst, Eric and Kirby, Brendan. 2001. *Transmission Planning for a Restructuring U.S. Electricity Industry*. Edison Electric Institute, Washington, D.C.

ISSUE IMPORTANCE

Generally, transmission planning has been conducted to meet local needs in accordance with planning standards of the North American Electric Reliability Council (NERC), such as frequency or reactive power standards, or to interconnect generators to the grid. In recent years, the Federal Energy Regulatory Commission (FERC) has been pushing transmission operators to expand transmission planning to enhance competitive bulk power markets, in addition to maintaining electric reliability and interconnecting generators.[2] In Order 2000, the proposed Standard Market Design (SMD) rule, and the April 2003 "White Paper," FERC required regional transmission organizations (RTOs) or independent system operators (ISOs) to be responsible for regional transmission planning, as well as any necessary transmission expansions, additions or upgrades for maintaining reliability and to increase access to lower cost generators.[3]

[2] See, for example, FERC's order of December 19, 2002, that approves PJM as a RTO. *Order Granting PJM RTO Status*, Dockets No. RT01-2-001 and RT01-2-002, December 19, 2002. Available at http://www.pjm.com/documents/downloads/ferc/2002docs/december/20021219-pjm-rto-order.pdf.

[3] For Order 2000, see *Regional Transmission Organizations*, Order No. 2000, Docket No. RM99-2-000, issued December 20, 1999. Available at http://www.ferc.gov/Electric/RTO/post_rto.htm. For SMD, see *Standard Market Design*, Docket No. RM01-12-000, issued July 31, 2002. Available at http://www.ferc.gov/Electric/RTO/Mrkt-Strct-comments/smd.htm. The FERC White Paper, issued April 28, 2003, is available at http://www.ferc.gov/Electric/RTO/Mrkt-Strct-comments/White_paper.pdf and

Transmission planning is especially important for wind. Some of the best wind development sites are in remote areas where the transmission infrastructure is either nonexistent or will need some upgrades. And although wind will need transmission, because it is an intermittent resource, it will not need it all the time. Because wind is new, it must compete for transmission with established generators. Also, wind development may occur very quickly and outstrip transmission planning processes. Wind projects may be developed in a matter of months, whereas new transmission capacity may take years to develop. For instance, in Texas, nearly 1,000 MW of wind was brought on-line in 2001, outstripping available transmission capacity. For all of these reasons, transmission is important to wind, and failure to resolve the transmission issues in a satisfactory manner could create serious impediments for future wind development.

The emergence of RTOs and ISOs could broaden transmission planning to a regional effort, rather than being performed on a utility-by-utility basis; allow other stakeholders to participate in the transmission planning process; and could potentially incorporate non-transmission alternatives into the transmission planning process. Yet this also makes transmission planning more challenging, not only because more stakeholders may be involved, but also because any proposed transmission expansion may need the approval of multiple state regulatory authorities.

Other difficulties arise from transmission planning because the transmission system comprises a network that is a common resource and affects multiple parties. Furthermore, the flow of electric power is not precisely controllable but is governed by the laws of physics; what happens in one part of the grid can affect other parts of the grid. The creation of RTOs also means that transmission planning is changing, from individual utilities planning for their system to meet customer demands, to regional planning conducted by RTOs. RTOs must plan not only to ensure regional electric service reliability, but also to ensure a thriving regional bulk power market. This transition raises important questions and illustrates several issues that sometimes work in opposition to each other. Some of these issues include the following:

- *Regional Impacts*—Congestion in one part of the transmission system will affect potential power transfers in another part of the transmission system. Similarly, transmission upgrades may also affect power transfer capabilities throughout the transmission system.

- *Multiple Interests*—Transmission operations affect several entities. For example, transmission expansion may increase market opportunities for certain generators or threaten existing generators with competition from lower-cost generators.

- *Lumpy Investment and Long Operating Life*—Transmission is a long-lived and lumpy investment with low operating costs. This can result in free rider problems, in which market participants are interested in using transmission but are not interested in paying for transmission additions.

- *Regulatory Uncertainty and Complexity*—Transmission planning and investment are generally public processes. These can be quite time-consuming, and investors may be unlikely to invest in transmission projects until they are certain they will recover their investment.

- *Public Attitudes Towards Transmission*—Public opposition has emerged to new transmission because of concerns about

http://www.ferc.gov/Electric/RTO/Mrkt-Strct-comments/White_Paper_Appendix_A.pdf.

property values, environmental impacts, and potential health effects caused by electromagnetic fields.[4]

Complicating all this is that transmission planning is a data-intensive process, especially if transmission planning is done on a regional basis. Large amounts of detailed data are required on transmission, generation and load. Yet in a more competitive environment, this kind of data is getting more difficult to obtain.

Case Studies of Wind and Transmission Planning

Because wind development can outpace the addition of new transmission capacity, a case-by-case approach to wind and transmission planning, such as through generator interconnection, may not be effective because the first wind developer may get saddled with paying for the incremental transmission upgrades needed to bring additional wind projects on-line. For these reasons, more focused regional wind development and transmission plans may be more successful. Examples of such plans are provided below.

Midwest:

Wind on the Wires (WOW), in conjunction with the American Wind Energy Association (AWEA) and various wind energy companies, looked at utility transmission queues and surveyed wind energy companies in the region to derive estimates of potential wind development within the Midwest ISO (MISO).[5] The purpose was to submit the results to MISO for input into MISO's regional transmission expansion planning process.

WOW prepared a "high wind" scenario of 10,000 MW for MISO's regional transmission expansion plan, as a means of driving the discussion of what transmission infrastructure would be necessary to deliver that amount of wind to market. Over 800 MW of wind is operational in the Midwest, with another 1,000 MW in near-term development, which is defined by WOW as identified projects with identified sites, owners and customers who have agreed on price, timing and quantity of power. According to WOW, there is currently about 5,000 MW of new wind power in the regional interconnection queues.

In June 2003, MISO's Board of Directors approved the 2003 MISO Transmission Expansion Plan (MTEP). The high wind scenario put forward by WOW and AWEA was included as one of four transmission scenarios and 11 transmission concepts. MISO determined that under the high wind scenario, lower marginal costs of wholesale energy may be realized as long as additional transmission investment is made, and that the cost-benefit ratio of that potential investment warranted additional study. The MTEP also included several exploratory transmission scenarios that will be subject to additional study to determine whether it is worthwhile to move forward with certain new transmission additions or expansion. One such scenario is the northern Iowa-southern Minnesota exploratory transmission scenario, which will be important if planned wind projects in those two states or in North Dakota and South Dakota are going to come to fruition.

Also, states in the MISO region have chartered a new Organization of MISO States (OMS) to bring state utility commissions together in their response to the regional planning underway in MISO. With its own small staff, bylaws, and a large

[4] Hirst and Kirby, op cit.
[5] American Wind Energy Association and Wind on the Wires. *Midwest Wind Development Plan*, June 1, 2002. Available at http://www.solpath.com/luna/admin/documents/MidwestWindDevPlan.pdf.

contingent of volunteers from state commissions, OMS is intended to coordinate the information needs and state responses to MISO regional transmission plans.

WEST:

The California electricity crisis of 2000-2001 prompted the Western Governors' Association (WGA) to conduct an ad hoc study of potential transmission enhancements that may be necessary over the next decade, as well as alternatives to transmission expansion such as emerging technologies, more efficient use of electricity that reduces demand, peak load management and distributed generation located at or near the customer load.[6]

In fall 2002, AWEA collaborated with Western Resources Advocates and wind developers in the West to devise a wind development plan.[7] At the time of the plan, 2,254 MW of wind power were operational, with another 48 MW under construction and 1,142 MW planned. The organizations predicted another 8,000 MW of new wind projects could come on-line by 2007 and perhaps another 12,000 MW by 2013, for a total wind capacity of just over 23,000 MW by 2013.

In October 2003, the Seams Steering Group for the Western Interconnection (SSG-WI), using data provided by AWEA and Western Resource Advocates, issued a report outlining a framework for expanding transmission in the interconnection.[8] The report modeled transmission congestion in 2008 and 2013 using a variety of generation and load scenarios, and assuming that generation with the lowest operating cost would be dispatched first. The 2008 part of the study is considered the base case and only includes generation and transmission infrastructure that will likely be in operation by 2008. The 2013 part of the study considers three scenarios: gas-fired, coal-fired and renewables. The renewables scenario assumes that 72 percent of new generation added between 2008 and 2013 will be from renewables. For the renewables scenario, SSG-WI estimated that over 3,000 miles of new transmission would need to be constructed, at a cost of about $7 billion, but annual production cost savings (as compared to the 2008 base case) would range from $3.65 billion to $6.1 billion, depending on natural gas prices and hydroelectric availability. These findings led to the formation of the Rocky Mountain Area Transmission Study group that is focused on Utah and the states adjacent to Wyoming. The study is intended to determine if transmission constraints can be overcome in order to access the region's coal, natural gas, and wind resources.[9]

OPTIONS FOR RESOLVING THE ISSUE

These relatively broad and conceptual studies illustrate what is necessary to bring large quantities of energy resources, such as wind, onto the grid as well as the benefits and market savings that could accrue if transmission is expanded and lower-cost resources can be accessed. The next step after these studies is to create sub-regional groups to focus on more detailed proposals, to identify potential beneficiaries of these proposals and to address and re-

[6] Western Governors' Association. *Conceptual Plans for Electricity Transmission in the West*. August 2001. Available at http://www.westgov.org/wga/initiatives/energy/transmission_rpt.pdf.

[7] American Wind Energy Association. *WECC Wind Development Plan*, September 5, 2002. Available at http://www.solpath.com/luna/admin/documents/WECC_Wind_Development_Plan.pdf.

[8] Seams Steering Group Western Interconnection. *Framework for Expansion of the Western Interconnection Transmission System*, October 2003. Available at http://www.ssg-wi.org/documents/316-FERC_Filing__103103__FINAL_TransmissionReport.pdf.

[9] For more information, see http://psc.state.wy.us/htdocs/subregional/home.htm.

solve issues such as cost recovery, financing and potentially, incentive proposals.

There are other important issues that also need to be considered in transmission planning. The NWCC has undertaken an effort to identify a common set of principles that underlie a robust regional transmission planning process. These include the following considerations:

- *Transmission planning entities should be independent*: To eliminate the potential of conflict of interest, parties with a financial interest in the outcome of the planning process should not have control of the transmission planning entity.

- *Transmission planning entities should have overall responsibility for regional planning and identifying needs*: RTOs and ISOs, in particular, are well suited to consider regional needs and to devise a regional transmission plan.

- *Transmission planning should be transparent and include regional stakeholders*: Active public involvement should be encouraged to ensure that all regional values are incorporated in the transmission plan.

- *All resources should be considered when preparing a transmission plan*: In addition to traditional generation and transmission resources, demand-side resources, distributed generation and intermittent resources should be considered.

- *Congestion costs should be considered*: Transmission congestion, either measured through locational-based marginal prices or by the number of calls for requested transmission loading relief (TLRs), is illustrative of where the transmission system is undersized relative to demand.

- *Potential generator market power should be accounted for*: Transmission congestion can reduce or even stop potential market transactions from taking place. Depending on the circumstances, it could potentially increase a generator's ability to charge above-market prices. In contrast, additional transmission capability can access lower-cost generation and potentially reduce generator market power.

- *Transmission planning should comply with operating and planning standards*: Clearly, an important part of a transmission plan is to ensure that the transmission entity complies with all NERC operating and planning standards, and that non-standard technologies such as wind energy are considered.

A more complete discussion of the transmission planning principles is provided in the NWCC consensus document on the web at www.nationalwind.org. At the end of the day, it must be recognized that the transmission planning process can be very contentious, and must consider the viewpoints of a broad cross-section of society. Ultimately, the success of a transmission plan will depend not only on how well the plan is developed, but also on whether the recommendations of the plan can be implemented.

Kevin Porter, Exeter Associates, Inc., author

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Public/Municipal Utilities

Environmental Organizations
Conservation/Wildlife Groups
Renewable Energy Advocates

Federal Government
Bureau of Land Management
Department of Energy
Fish and Wildlife Service
National Renewable Energy Laboratory

Green Power
Marketers
Traders

State Government
Legislatures
State Energy Offices
Regulatory Agencies
State Environmental Agencies

Tribal Governments

Wind Industry
Developers
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