



## Wind Energy Transmission

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The increasingly competitive nature of the electric power industry is changing the way utilities do business. A number of major trends can be expected to affect energy transmission and resource integration based on experience with other competitive industries. As the market is restructured and customers have the ability to choose their electricity supplier, the success of an electric company will depend on how well the company is able to meet the needs of its customers. Not only will an electricity supplier need to deliver reliable, high-quality power, but the supplier must also deliver new products and services utility customers demand. Rather than defining monopoly boundaries, the transmission grid will become the interface for buyers and sellers; technology will play a key role in developing these relationships as well as brand identity.

Other significant trends will include increased compatibility between the electric industry and the environment, improved asset utilization, and diversification of the product mix. Wind energy has the potential to contribute substantially in meeting each of these trends as utilities adapt to competition. This paper identifies and discusses transmission issues to be addressed by utilities and policymakers to help wind energy realize this potential.

### Transmission of Wind Energy

Researchers at the Pacific Northwest Laboratory (PNL) have shown that under a moderate land use scenario with full environmental exclusions, 65 percent of the total windy land area (Class 4 or above) in the U.S. is suitable for wind development, corresponding to 13.8 percent of total land area.

Estimating the potential contribution of wind power assuming a 30 meter wind turbine hub height; a minimum Class 4 wind regime (annual average wind speed greater than 14.5 mph) and PNL moderate land use restrictions, NREL researchers found more than 175,000 average MW of potential wind power development within 5 miles of existing 230 kilovolt (or lower) transmission lines; 284,000 within 10 miles, and 401,000 MW within 20 miles. However, a comprehensive assessment of available transmission and distribution line capacity in good wind resource areas is required to determine the amount of wind power in close proximity that could be accommodated without the need for extensive T&D upgrades or expansion.

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Researchers at the Oak Ridge National Laboratory (ORNL) and the National Renewable Energy Laboratory (NREL) have examined whether or not capacity is available to bring large amounts of wind energy to the market without the need for extensive upgrades or expansion of existing transmission and distribution systems. Seven utility case studies reviewed by ORNL indicated that in some cases it appears possible to accommodate required power transfers for new wind resources of approximately 50 to 100 megawatts to supply the local load in many areas, without making significant upgrades to the transmission system.

ORNL also identified other possible benefits associated with integrating wind energy into distribution systems, including deferred construction of transmission and distribution (T&D) facilities for areas requiring additional electric capacity, avoided transmission and distribution system losses, and enhanced reliability. Such benefits exist only under very specific local conditions, for example, in Seattle, Wash., a 1 MW wind farm postponed the need for costly T&D upgrades and reduced line losses due to the very strong correlation between the available wind resource and the load on the distribution system.

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### **Transmission Access, Pricing, and Regional Planning**

Changes to regulation of access and pricing principles for transmission line usage can significantly affect the choice of new resources and the feasibility and cost of wind power development. Inherent characteristics of wind-generated electricity, such as its location-specific resource, intermittent output, and low capacity factor, present unique policy issues.

The National Wind Coordinating Committee (NWCC) supports the principle that transmission customers should have the same flexibility of service that transmission owners enjoy on comparable terms, including:

- Equal treatment of all transmission users;
- Allowing reassignment of transmission capacity; and
- Requiring non-discriminatory access to the transmission system.

Policies and rate structures that allow diverse resource areas to be matched with local demand areas without the imposition of onerous access charges or conditions, as well as pricing principles reflecting the network costs and benefits of dispersed generation resources, are encouraged. To enable suppliers to meet customer demands for wind energy and other renewable resources, rate structures that reflect the cost impacts of all generation resources on the regional electric grid should be developed.

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Regional planning must be considered carefully in order for regional markets to operate efficiently and transmission projects to increase regional efficiency. Generation resources and loads to be served by transmission improvements will need to be identified, and the location of renewable resources must be considered early in the planning process.

Wind energy has the potential to play a significant role in the new competitive electricity marketplace. Research has shown that the available wind resource is not overly limited by environmental and land use restrictions or geographic factors, and that new wind resources can be integrated in some areas without extensive upgrades or expansion of the existing transmission system. One challenge that remains is to develop policies and rate structures that allow diverse resource areas to be matched with local demand areas and reflect the cost effects of all generation resources on the regional grid.

This brief was summarized by Margaret Shaheen, National Conference of State Legislatures, from a *Wind Energy Series* report by Robert J. Putnam Jr., Electrotek Concepts, Inc.

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*The Wind Energy Issue Briefs are a product of the National Wind Coordinating Committee (NWCC). The NWCC is a collaborative endeavor that includes representatives from electric utilities and support organizations, state legislatures, state utility commissions, consumer advocacy offices, wind equipment suppliers and developers, green power marketers, environmental organizations, and state and federal agencies.*

