Clean and Diversified Energy Initiative

WESTERN GOVERNORS' ASSOCIATION

Wind Task Force Report

Executive Summary
March 2006

Western Governors' Association
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The Western Governors' Association's Clean and Diversified Energy Advisory Committee (CDEAC) commissioned this task force report in February 2005. Members of the Task Force are listed below. This is one of several task force reports presented to the CDEAC on December 8, 2005 and accepted for further consideration as the CDEAC develops recommendations for the Governors. While this task force report represents the consensus views of the members, it does not represent the adopted policy of WGA or the CDEAC. At their Annual Meeting in June, 2006, Western Governors will consider and adopt a broad range of recommendations for increasing the development of clean and diverse energy, improving the efficient use of energy and ensuring adequate transmission. The CDEAC commends the Task Force for its thorough analysis and thoughtful recommendations.

Members of the Wind Task Force

Rachel Shimshak (Chair)	Renewable Northwest Project (CDEAC member)
Hap Boyd	General Electric Wind
James Caldwell	PPM (Pacific Power Marketing)
Steve Dayney/Mark McGree	Xcel Energy
Steve Ellenbecker	Wyoming Governor's Office
Robert Fullerton	Western Area Power Administration
Robert Gough	Intertribal Council on Utility Policy (CDEAC member)
Roger Hamilton	West Wind on the Wires (West)
Ron Lehr	American Wind Energy Association
Elliot Mainzer/Allan Ingram	Bonneville Power Administration
Mac McLennan	Tri-State Generation and Transmission (CDEAC member)
Lee Otteni	Bureau of Land Management
Brian Parsons/Michael Milligan	National Renewable Energy Laboratory
Kevin M. Payne	Southern California Edison
Jim Ploger	Kansas Corporation Commission (CDEAC member)
Steve Ponder	Florida Power and Light Company
Ron Rebenitsch	Basin Electric
Virinder Singh	PacifiCorp
Ronn Smith	Wyoming Outdoor Council
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Acknowledgement:
The WGA would like to recognize the contributions of Bill Schroeder of Intermountain Rural Electric Association who participated in the Wind Task Force but did not support the report's final conclusions.

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Table of Contents

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Wind resources are abundant and located throughout the WGA region. The cost of wind generation has decreased significantly due to technological innovation and economies of scale, and further decreases in costs are expected in the future. Government financial incentives have also lowered the cost of wind. In some circumstances today wind is cost competitive with conventional fuels used for electrical generation. Electric system operators are beginning to learn how to successfully integrate significant amounts of intermittent wind resources into the power system.

The potential wind resources in the WGA footprint are enormous, on the order of 250,000 MW available at under $60/MWh delivered to the existing transmission network or load centers. The Wind Task Force recognizes a number of existing state policies (i.e. renewable portfolio standards) and utility resource plans could lead to 5,000 MW to 9,000 MW of wind by 2015 toward the WGA goal. These figures are not certain, as significant near-, mid-, and long-term implementation issues related to transmission, utility incentives, and grid integration need attention. Additional wind development beyond the 5,000 MW to 9,000 MW range could become economic under specific market conditions and more aggressive policies. It is difficult to link a specific quantity of wind resources that would result from the implementation of a specific policy action. The Task Force believes that implementation of the following actions will result in far more wind development than would otherwise be the case.

Top Ten Recommendations

Financial Incentives

The Production Tax Credit (PTC) has been instrumental in encouraging investment in wind energy projects, increasing the economies of scale in the production of wind turbines, and thereby lowering the costs of production. Unfortunately, the stop-and-start nature of the PTC undercuts the incentive benefits of the PTC and undermines stable growth of the emerging wind energy industry. A long-term extension of the federal Production Tax Credit (PTC) is vital to expand the experience with integrating large amounts of intermittent resources into the power system, continue technology advances, and drive costs down through mass deployment.

> *RECOMMENDATION 1: Enact a long-term extension of the federal Production Tax Credit (PTC), and comparable incentives that would be useful to non-profits, tax exempt entities, public utilities, and tribes. Alternative financial incentive policies include the use of tax exempt bond financing, tradable tax credits, and partnership sharing of tax credits for certain entities such as tribes.*

Efficient Use of the Existing Transmission System

Transmission is a critical limiting factor in the deployment of wind resources. The Wind Task Force has identified numerous opportunities where changes to tariffs, policies and operations would lead to a more efficient use of the existing transmission system. These short-term reforms could enable wind energy, which can be deployed in as little as 18 months, to expand in advance of major transmission additions.

RECOMMENDATION 2: Implement a conditional-firm, redispatch, and related tariff reform transmission products where feasible and consistent with ISO or RTO policy. Support the review and reasonable assessment of Available Transfer Capability (ATC) on existing transmission paths.

RECOMMENDATION 3: Reform imbalance penalty policy based on cost-causation principles and link to near-term scheduling and wind forecasting.

Transmission Expansion

Future wind energy development necessary to attain the WGA 30,000 MW goal in a cost effective manner will require expanding the existing transmission system. Numerous existing barriers hinder future transmission expansion. The Wind Task Force recommends following mid- and long-term reforms to ensure a more rational approach to transmission expansion consistent with developing wind and other clean energy resources.

RECOMMENDATION 4: Urge state commissions, state legislatures, and FERC to encourage expanded transmission services and facilities for wind resource development areas to meet RPS, IRP and state goals. Such actions should, build upon recent Texas and Minnesota legislation and the renewable trunk line (Tehachapi) model for new transmission to major wind resource areas.

RECOMMENDATION 5: (A) Enhance regional transmission planning capabilities to better identify beneficiaries of transmission expansion, recognizing that some benefits of transmission expansion are widely distributed; (B) urge Public Utility Commission (PUC) findings that transmission projects to support meeting Renewable Portfolio Standards (RPS) requirements are a public benefit and should be granted rolled-in rates/cost recovery; and (C) coordinate federal-state-local-tribal siting for transmission and wind projects, and develop transmission corridors on federal lands.

Integration Costs and Reliability

A growing body of studies and experience in different parts of the world confirms that large amounts of wind can be integrated into utility systems without detrimental effects on system reliability. The evidence suggests that the cost of integrating wind generation increases as the percentage of wind in the system increases. However, on

average the cost of integrating wind at levels of 10-20 percent of system capacity is small compared to the price of power according to studies performed to date. The ability to integrate large amounts of wind depends on many factors, including the size of control areas (or virtual control areas), the commitment and skill of system operators, the other types of generation in the system, and the implementation of storage.

RECOMMENDATION 6: Support studies of integration costs for higher levels of wind penetrations and allow utility cost recovery of such study costs. Such studies should examine how choices of other generating resources affect the ability to incorporate large amounts of wind resources.

RECOMMENDATION 7: Support studies of opportunities for federal Power Marketing Administrations to integrate large amounts of wind into the power system.

RECOMMENDATION 8: Support studies and R&D to develop storage and generating options that can complement the intermittency of wind generation.

Regulatory and Procurement Policies

State government through its utility regulatory policies and procurement policies has the capability to significantly increase the deployment of wind resources. Many Western states have adopted Renewable Portfolio Standards and System Benefit Charges that provide incentives for additional wind generation. Other states have provisions for regulated utilities to provide their PUCs with utility resource plans indicating the preferred mix of generating resource additions.

RECOMMENDATION 9: Require that state utility commissions implement incentives for regulated utilities that make new wind resource acquisitions a profitable course of action through performance based regulatory systems. For municipal and cooperative utilities, seek revisions to federal and state financing tools or tax structure to provide financial incentives encouraging increase use of wind energy.

RECOMMENDATION 10: Governors can take the following government procurement steps to support wind energy: (a) Direct state agencies and public educational institutions to procure wind energy through green power marketing and purchasing programs and/or by acquiring Renewable Energy Certificates. A minimum 10% of a governmental entity's electricity requirements is recommended as a goal; (b) Encourage tribal and local governments to procure wind energy through green power marketing and purchasing programs and/or by the acquisition of Renewable Energy Certificates. A minimum 10% of a governmental entity's electricity requirements is recommended as a goal; (c) Pursue smaller-scale wind projects for self-generation through the use of net-metering, wheeling of power, or other available mechanisms. A commitment of

funding and governmental technical assistance is critical to the success of most such projects.

Other Recommendations

- Regional transmission planning efforts need to be closely linked to the resource acquisition plans of load serving entities (LSE) and the plans of generators.
- States should take steps to coordinate their respective regulatory reviews of multi-state transmission projects in a manner that builds upon existing regulatory principles and respects the public interest of individual states.
- States and federal regulators should extend a rebuttable presumption of prudence for multi-state project proposals that have been endorsed as an economically efficient investment based on a detailed economic assessment by the regional planning entity.
- Support of future research on turbine design, wind farm layout features, animal vision, hearing and other senses will yield additional information on how to reduce wind farm risk to birds and bats.
- States should establish a working group of state agencies concerned with energy resources including, but not limited to representatives from the Governor's office, energy office, state siting authority, fish and wildlife agencies, and public utility commission. The goal of the group would be to insure that the actions taken by each agency are consistent with state energy policy on energy resources, and coordinated consistently between the agencies.
- Reforms in the utility regulation and planning area that (1) account for natural gas price risk in assessing resource options; (2) provide rate of return incentives for power purchase of renewable contracts; and (3) develop policies that include renewable energy in future cap-and-trade programs via state implementation of such programs, channel a portion of funds from violations of environmental laws to renewable energy, such as through supplemental environmental projects, and include renewable energy as a control measure in SIPs.

Discussion of the Recommendations

Technical Feasibility: The Wind Task Force finds all the recommendations technically feasible.

Cost: The two-year extension of the federal Production Tax Credit for all renewable energy fuels enacted by Congress in 2005 is estimated to cost $3.2 billion. Other recommendations will lower costs, such as the implementation of conditional-firm transmission service to more fully utilize the existing transmission system. More importantly, the Task Force believes that the recommendations will lower the cost of wind generation to the point that it may be the lowest cost generating resource in the

West when considering total costs including environmental impacts.[1] This will result in significant savings for Western electricity consumers. Additionally, large scale deployment of wind (as with other non-gas-fired generation) will put downward pressure on natural gas prices that will benefit consumers.[2] Generation of electricity from wind has no national energy security costs.

Environmental Impacts: The environmental impacts of wind are overwhelmingly positive. No water is used in generating electricity from wind. No criteria pollutants, mercury or carbon dioxide are emitting from wind generation. See Table 1 below.

Table 1. Comparison of Annual Air Emissions from Wind Energy Generation with Different Generation Methods[a] per Average Megawatt[3]

	Air Emissions (tons/MW)					
	SO_2	**NO_X**	**CO_2**	**Particulates**	**CO**	**PAHs[b]**
Wind	0	0	0	0	0	0
Solar	0	0	0	0	0	0
Geothermal	0.8	0	700.8[d]	0	0	0
Coal	8.6	21.6	8,843	1.3	1.5	+[e]
Natural Gas combined cycle	0.05	0.7	3,542 – 5,142	0.03[d]	0.7 – 3.8	+
Oil combined cycle	2.4[f]	1.8[f]	6,220[e]	1.4[e]	NA[g]	+
Nuclear	0	0	0	0	0	0
Wood-fired	0.5	9.0	11,959	1.7	17	+
Solid-waste-fired	13.6	70.2	13,256	3.0	2.7	+

Source: Bureau of Land Management, Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States, 2005 ("BLM PEIS"), Table 6.4.2-2, p. 6-23.

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[1] For example, a number of load serving entities in the West (e.g., PacifiCorp, Idaho Power, Avista, Puget Sound Energy, Xcel, Portland General Electric) have developed resource plans that explicitly quantify the costs of air emissions. Bolinger, Mark and Ryan Wiser, "Balancing Cost and Risk: The Treatment of Renewable Energy in Western Utility Resource Plans," Lawrence Berkeley National Laboratory, 2005, pages 55-64.

[2] For an analysis of increased wind energy development on natural gas prices, see Ryan Wiser, Mark Bolinger and Matt St. Clair, "Easing the Natural Gas Crisis: Reducing Natural Gas Prices Through Increased Deployment of Renewable Energy and Energy Efficiency," Lawrence Berkeley Laboratory, January 2005 (http://eetd.lbl.gov/ea/EMS/reports/56756.pdf).

[3] References

(a) Information modified from DOE/BPA (2003), unless otherwise noted.
(b) PAHs = polycyclic aromatic hydrocarbons.
(c) Minor amounts of particulates and NOX emissions would occur at wind energy projects from construction equipment and vehicles, and during O&M activities.
(d) Source DOE/BPA (1993).
(e) Present in emissions from incomplete fuel combustion.
(f) Source Gipe (1995).
(g) NA = not available.

A 100 MW wind farm typically extends across 4,942 acres with between 50-67 towers. The actual amount of land displaced, however, only covers about 148 acres accounting for the wind towers, roads and ancillary facilities.[4] The remaining acreage can be farmed, ranched or used for open space. The wind energy land impacts for the three scenarios described in this report, under the most expansive land use assumptions, are summarized in the Table 2 below. A more complete assessment of land impacts under alternative assumptions and units of measure is presented in Appendix G. A comparative analysis of land disturbance from wind energy and other energy sources is presented in Appendix H.

Table 2. Land Impacts of Wind Energy Scenarios

Scenario	MW	Towers (1.5 MW /Tower)	Wind Farm Gross Area		Net Land Displacement	
			Acres	% of WGA States	Acres	% of WGA States[5]
1	9,175	6,117	453,436	0.020%	13,603	0.001%
2	25,266	16,844	1,248,667	0.055%	37,460	0.002%
3	53,424	35,616	2,640,259	0.117%	79,208	0.003%

Avian mortality from wind generation has been a problem for early wind development. However, more recent wind development has been preceded by studies to avoid areas that could cause significant bird mortality and the blades of new, larger wind machines rotate more slowly thereby reducing mortality. Thus far, bat mortality issues have largely been raised in the East. Given the remote location of most wind development in the West noise impacts have been minimal.

Political Feasibility: The Wind Task Force believes that most of its recommendations are demonstrably feasible by virtue of past and current actions. For example, extension of the Production Tax Credit is a key element of the Energy Policy Act of 2005 and has been supported by Western Governors. Conditional-firm transmission service and reform of imbalance penalties are being implemented by some major control areas in the West.[6] The concept of renewable energy trunk line has been proposed to FERC. Although it was not accepted by FERC, there was significant dissent from the majority opinion and the issue may be revisited. Regional transmission planning has been institutionalized in parts of the WGA footprint (e.g., Midwest ISO, Southwest Area Transmission study, Northwest Transmission Assessment Committee)

[4] Land impact calculations assume the wind farm gross impact is 5 MW per 1 square km, the net land displaced is 3% of the gross area, the number of towers is based on 1.5 to 2.0 MW per tower, and 1 sq mile = 640 acres = 2.59 km.

[5] Total land area of the WGA states is 2,263,222,000 acres.

[6] Bonneville Power Administration (BPA) has proposed a conditional firm and redispatch transmission service product. The Western Area Power Administration (Western) has developed another long-term non-firm product for one path and plans on expanding the concept in other areas. BPA, Western, California Independent System Operator, and PacifiCorp have all introduced new approaches or modified their imbalance penalty structure.

and such planning is examining the transmission necessary to support substantial wind development. Western Governors have signed a Transmission Permitting Protocol with four federal agencies to coordinate the reviews of permits for new interstate transmission lines. Under the Energy Policy Act of 2005, the BLM and Forest Service have a renewed statutory mandate to designate transmission corridors, but not the resources to implement the requirement. Several utilities (e.g., Xcel, PacifiCorp) are conducting or have conducted studies of how to integrate significant amounts of wind into their systems. WAPA has conducted some limited scale study of transmission required to move more wind from the Upper Great Plains east and BPA is participating in on-going work by the Northwest Transmission Assessment Committee on integration of 5,000 MW of wind in eastern Washington and Oregon. Most Western states have adopted some type of incentives for the deployment of wind. Thus, the Task Force believes the recommended regulatory incentives are politically feasible.