

Energy and Telecommunications Interim Committee

January 2008



Montana Wind Power Variability Study

Phoenix Engineering Inc.

Major Funders

- NorthWestern Energy
- Governor's Office of Economic Development
- MATL
- WAPA

Wind Developer Participants

- Chafin
- Gaelectric
- Horizon
- Invenergy
- Naturener
- Oversight Resources
- Wind Hunter

Purpose of Study

- Montana stakeholders interested in an assessment of the magnitude and frequency of change in power output over periods of 10 min to 120 min from geospatially separated wind farms
- The variability stream will be utilized to quantify Control Performance Standard 2 (CPS2) and Operating Transfer Capability (OTC) violations

Purpose of Study

- These results will be correlated with other grid variability factors to predict net influence of wind's variability
- This net influence will assist NorthWestern in forecasting necessary reserves and or mitigating solutions required to maintain balance.

Study Background

- Concept initiated in May 2006
- The total cost should be around \$110K.
- Due to be completed this spring

Scenarios Modeled

- Three scenarios to be created - 500MW, 1000MW, 1500MW
- Name plate capacity of 2030 MW for the wind farms participating in the study, including existing Judith Gap wind farm (all other wind participating wind projects are proposed)

What to Expect ?

- Wind developers are very interested to see the effects of geospatial separation of wind farms
- One developer we have worked with has shown that geospatial separation of wind farms over a large area could result in estimated wind capacity factors near 70%
- Determination of the most cost effective way to integrate wind

2004 AESO Integration Study Conclusions

- The magnitude of power fluctuations caused by wind speed variations was seldom extreme even though wind power fluctuations were random in nature.
- The effect of geographically separated wind farms was shown clearly by the measured and simulated wind power data

2004 AESO Integration Study Conclusions

	10	minute	1	minute
	Measured	Simulated	Measured	Simulated
WPF1	14.6	12.5	2.6	3.1
WPF2	18.3	21.1	3.8	4.9
WPF3	17.2	17.1	5.4	4.2
WPF4	16.1	19.9	5.1	4.7
Aggregate Scenario	8.4	8.5	1.7	2.1

Normalized 97.5 Percentiles of the Measured and Simulated Fluctuations

Why Develop Montana Wind?

- **Greatest Wind Resource in the US** - 116,000 MW potential
- **Climate Change** – no GHG's
- **National Energy Security** – increasing demand for electricity, further increased by ideas for more electrification of the transportation system (PHEV's)
- **Economic Development** – Judith Gap doubled local tax base plus efforts are underway to bring wind turbine manufacturing and R&D to the state (Fuhlander/Chafin and Vestas)



Marty Tuttle – Division Administrator
Tom Kaiserski – Program Manager

Chantel McCormick – Energy Development Officer
Kevin Furey – Energy Development Officer
Sarah Trueax-Desmond – Program Assistant

406-841-2030 www.commerce.mt.gov/energy