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## *Application*

# Wind Farm Monitoring

### **Situation**

As the cost of traditional energy supplies climbs, utilities and research organizations are intensifying their pursuit of alternate fuel sources. Generating electricity from wind farms is attracting particular interest. Over the past 20 years, the cost of wind energy has declined from 40 cents/Kwh to about 5 cents/Kwh.

Although wind energy holds great promise as an adjunct to traditional power supplies, its utilization poses unique challenges for power generators and distributors.



Part of the US Department of Energy, the National Renewable Energy Laboratory (NREL) is the nation's leading center for renewable energy research. Wind energy is a key resource for our future.

*Wind energy holds great promise but provides unique challenges for power generators & distributors*

### **Signature System Benefits**

Electrotek Concepts® was selected by NREL to perform a three-year investigation that centers on the collection of electric and meteorological data from wind farm operations throughout the upper Midwest region of the US. The wind farms represent a range of geographic locations, wind-resource types, and sizes, for a total capacity of 360 megawatts. The data will be used by the utility industry in several ways:

- To evaluate the results of power fluctuations associated with wind power
- To help design wind-farm power control mechanisms
- To evaluate the feasibility of wind-farm participation in the wholesale power markets
- To develop interconnection and mitigation strategies to optimize wind resources on the electric grid

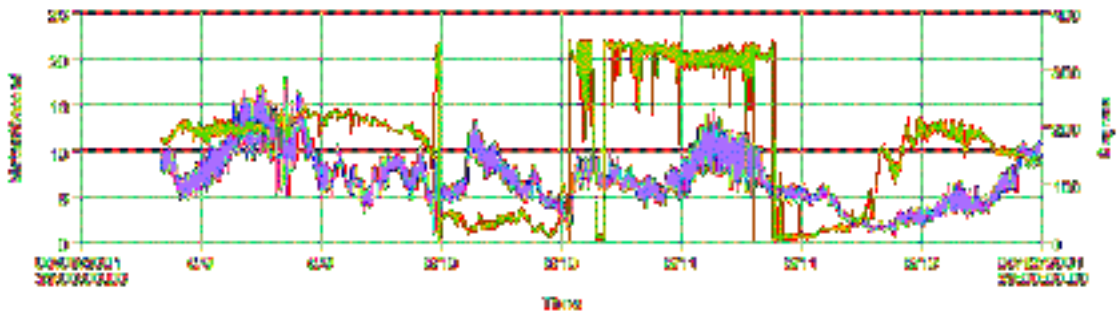
The cornerstone of the project is the Signature System, which is used to simultaneously collect data on power quality, energy and physical parameters including wind speed, direction, temperature and barometric pressure.

## Results

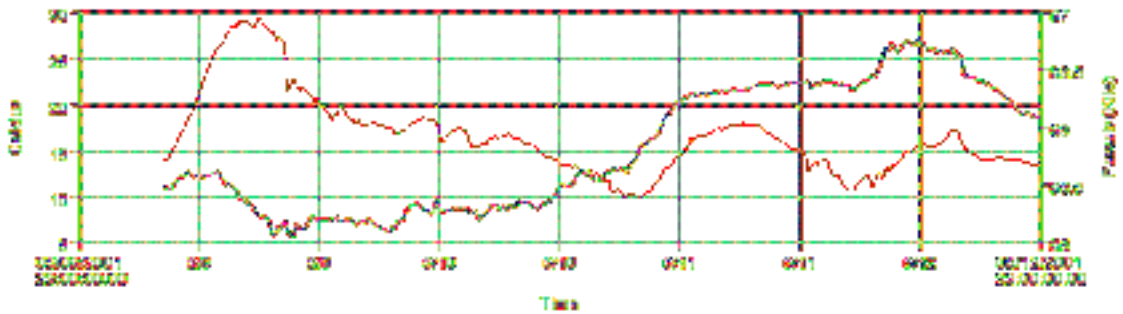
The data gathered by the Signature System will be used to characterize wind plant output, leading to a better understanding of the potential impacts on the bulk transmission system and identifying opportunities for improved integration of wind energy with transmission systems.

Electrotek has performed numerous projects related to wind energy, including serving as administrator of the Utility Wind Interest Group:

- Several investigations on the integration of wind-generation facilities into existing transmission systems, totaling >200 MW
- Determining the impact wind generation has on the need for spinning and operating reserves on the utility network
- Investigating ways to improve the operation of isolated power systems with high penetrations of wind-turbine capacity
- Evaluation of transformer capability under the unique conditions of delivering energy to the grid from several hundred wind turbine systems



Measured wind speed and direction



Measured temperature and barometric pressure