

Power Generation [Fox abstract]

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Since 2006 The University of Missouri has conducted wind observations on tall towers at eleven sites around the State. The research is aimed at directly measuring the winds at heights at which utility scale wind turbines operate. These heights, between 50 m and 150 m above ground level, are not commonly subject to direct observation, so this effort has produced a unique data set with which it is possible to investigate the characteristics of the wind power resource in Missouri. Some of the data collected has already been used by developers in planning the construction of wind farms in northwest Missouri.

This presentation will show the complexity involved in assessing the wind power resource and the care required in planning an energy portfolio for which wind is a component, particularly in an area of complex topography and meteorology such as Missouri. The common wind parameters used to indicate an area's suitability for wind farm development are usually observed up to a height of 50 m and then extrapolated to the heights covered by the span of the turbine blades. However, the observations taken during this project show that the wind shear parameter used is very variable with height and this increases the uncertainty in the wind resource derived from measurements at lower levels.

As wind is an intermittent resource understanding the nature of the atmospheric processes that create this intermittency is critical. Primary among these processes in the Central US is the role of the low-level jet. Part of this work has focused on how the low-level jet impacts the frequency distributions of wind speed and shear at turbine levels. The conclusion is that the jet increases not only the wind power potential of an area, but also the variability of the wind and the difficulty in accurately assessing the resource.