

Public Abstract

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This work focuses on rapid increases and decreases in wind speed that produce “ramps” which affect wind power calculations and planning. Average wind speeds are predicted with a high level of accuracy; however variable winds that contain ramp events are not represented very accurately. To better understand variability in western Missouri a statistical analysis was conducted to identify ramp events in various capacities based on time and strength. 10 minute average wind speeds were collected at 7 sites on the western half of Missouri. From these wind speeds applicable wind turbines were selected to represent realistic conditions for comparative analysis. Ramp events were identified with 30 minute, 1 hour, 2 hour, and 4 hour temporal scales and 20%, 30%, 40%, and 50% power difference scales between rated turbine power and actual power output. To reflect the available wind power in Missouri the 30% power change and 1 hour counting was implemented. Results were broken down by season, month, day, and time of day. For this region of Missouri seasonal and time of day effects are evident. The winter and spring months and the time period of 0-12Z produce the majority of events. The Low Level Jet was assumed to be the largest contributor of up ramp events during the evening hours and was verified with a 68%-92% correlation for all sites using a comparative analysis of Low Level Jet days and times.