

"Do Higher Wind Power Penetration Levels Pose a Challenge to Electric Power Security? : Evidence from the Forecasting Wind Generation in the ERCOT Power Grid in Texas"

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Abstract: Avoiding the high societal costs of blackouts requires that the amount of power generation in a balancing authority area match exactly, on a near-instantaneous basis, the system load, net of losses and interchange with other balancing authority areas. This paper presents econometric evidence that wind power increases this challenge in the ERCOT power grid in Texas. Specifically, the paper presents evidence that changes in wind energy production in ERCOT from one 15 minute market interval to the next are significantly offset by deployments of regulation power by the system operator. Evidence is also presented that the wind forecast errors in ERCOT are biased, very large, and have consequences for ERCOT's deployments of balancing power to relieve market shortages. The errors are also found to have implications for the deployments of reserve power. The forecast errors are found to be statistically related with the hour of the day and the forecasted level of wind energy. The paper also reports evidence that the prices in ERCOT's day-ahead market for ancillary service reflect the anticipated adverse impact of the forecast errors on power grid operations