Identifying and characterizing the impact of turbine icing on wind farm power generation -
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Identifying and characterizing the impact of turbine icing on wind farm power generation: Impact of turbine icing on wind farm production

Wind park power production in cold climate regions is significantly impacted by ice growth on turbine blades. This can lead to significant errors in power forecasts and in the estimation of expected power production during turbine siting. A modeling system is presented that uses a statistical modeling approach to estimate the power loss due to icing, using inputs from both a physical icing and a numerical weather prediction model. The physical icing model is that of Davis et al., [1] with updates to the simulation of ice ablation. A new approach for identifying periods of turbine blade icing from power observations was developed and used to calculate the observed power loss caused by icing. The observed icing power loss for 2 years at six wind parks was used to validate the modeling system performance. Production estimates using the final production loss model reduce the root mean squared error when compared with the empirical wind park power curve (without icing influence) at five of the six wind parks while reducing the mean bias at all six wind parks. In addition to performing well when fit to each wind park, the production loss model was shown to improve the estimate of power when fit using all six wind parks, suggesting it may also be useful for wind parks where production data are not available.

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