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## Beneficial role of diurnal smoothing for grid integration of wind power

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Smoothing of wind generation variability is important for grid integration of large-scale wind power plants. One approach to achieving smoothing is aggregating wind generation from plants that have uncorrelated or negatively correlated wind speed. It is well known that the wind speed correlation on average decays with increasing distance between plants, but the correlations may not be explained by distance alone. In India, the wind speed diurnal cycle plays a significant role in explaining the hourly correlation of wind speed between location pairs. This creates an opportunity of “diurnal smoothing”. At a given separation distance the hourly wind speeds correlation is reduced for those pairs that have a difference of +/- 12 hours in local time of wind maximum. This effect is more prominent for location pairs separated by 200 km or more and where the amplitude of the diurnal cycle is more than about 0.5 m/s. “Diurnal smoothing” also has a positive impact on the aggregate wind predictability and forecast error. “Diurnal smoothing” could also be important for other regions with diurnal wind speed cycles.