



Power curves of entire wind farms under real operating conditions

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The power generated by wind turbines is directly coupled to the wind speed via a power curve. The power curve of a wind turbine is measured according to the specifications of an industry standard (DIN IEC 61400-12-1). Under operating conditions, the wind turbines often interact with each other and across the whole farm. The individual performance of the wind turbine then depends on the location within the wind farm and on the surroundings. The produced energy of such a wind turbine is not detectable by using the individual performance curve. For a larger number of turbines the problem increases.

In practice, the energy produced by several dozen wind turbines often converges in a substation. The energy measured at these metering points within a grid, is parameterized here with the forecast hub height wind speed u in the area of the wind farm expressed by a power curve $P(u)$ for the entire wind farm.

The results can be represented in an analytical function of an exponential type, which is fitted to the measurements by means of two characteristic variables. These two parameters characterize the individual performance of each wind farm and they are used to predict the energy production of the farms.