Increased Power Capture by Rotor Speed–Dependent Yaw Control of Wind Turbines

When extracting energy from the wind using upwind, horizontal-axis wind turbines, a primary condition for ensuring maximum power yield is the ability to align the rotor axis with the dominating wind direction. Attempts have been made to improve the yaw alignment of wind turbines by applying advanced measurement technologies, such as light detection and ranging systems. However, application of advanced measurement equipment is associated with additional costs and increased system complexity. This study is focused on assessing the current performance of an operating turbine and exploring how the yaw alignment can be improved using measurements from the existing standard measurements system. By analyzing data from a case turbine and a corresponding meteorological mast, a correction scheme for the original yaw control system is suggested. The correction scheme is applied to the case turbine and tested. Results show that, with the correction scheme in place, the yaw alignment of the case turbine is improved and the yaw error is reduced to the vicinity of zero degrees. As a result of the improved yaw alignment, an increased power capture is observed for below-rated wind speeds.

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