Bi-Level Decentralized Active Power Control for Large-Scale Wind Farm Cluster

This paper presents a bi-level decentralized active power control (DAPC) for a large-scale wind farm cluster, consisting of several wind farms for better active power dispatch. In the upper level, a distributed active power control scheme based on the distributed consensus is designed to achieve fair active power sharing among multiple wind farms, which generates the power reference for each wind farm. A distributed estimator is used to estimate the total available power of all wind farms. In the lower level, a centralized control scheme based on the Model Predictive Control (MPC) is proposed to regulate active power outputs of all wind turbines (WTs) within a wind farm, which reduces the fatigue loads of WTs while tracking the power reference obtained from the upper level control. A wind farm cluster with 8 wind farms and totally 160 WTs, was used to test the control performance of the proposed decentralized active power control scheme.

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