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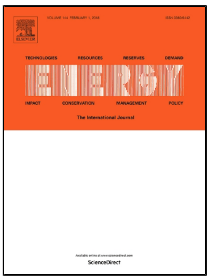

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The Data-driven Schedule of Wind Farm Power Generations and Required Reserves

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Abstract

In this paper, a double layer wind farm and power reserve operational framework is introduced to develop the data-driven scheduling model for operating wind power generations and required power reserves. In this framework, data-driven approaches are applied to model real operational characteristics of wind power generation processes of individual wind generators (WGs) based on supervisory control and data acquisition (SCADA) data. The considered optimization objective in scheduling is to minimize the total wind power generation cost under the worst wind power generation scenario. Constraints considered include the wind power supply commitment and power supply reliability. By integrating the data-driven wind power models, multiple uncertainty sets, the cost objective function and reliability constraints, a data-driven scheduling model is formulated. Due to the complexity of the scheduling model, a two-level heuristic solution method is proposed to solve it. Two traditional power reserve approaches are regarded as the benchmark to evaluate the performance of the data-driven scheduling model. A comparative analysis is conducted to study the effectiveness of the solution method as well as the impact of different uncertainty sets and reliability constraints on the scheduling solutions.

Keywords: *wind energy; data-driven; SCADA data; scheduling optimization; reliable power production.*