

STATISTICAL ANALYSIS AND DATA MINING

Research Article

Using data mining to enable integration of wind resources on the power grid

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Abstract

As renewable resources, such as wind, start providing an increasingly larger percentage of our energy needs, we need to improve our understanding of these resources, so we can manage them better. The intermittent nature of the power generation makes it challenging for control room operators to schedule wind energy while balancing the load on the grid. Forecasts of the energy to be generated by a wind farm in the hours ahead tend to be inaccurate, even under normal conditions. The problem is exacerbated during ramp events, where the generation changes by a large amount in a small time. In this paper, we analyze historical data to determine ways in which data mining techniques can enable the integration of wind energy into the grid. Our results indicate that we can use feature selection methods to identify important weather variables associated with ramp events and inaccurate forecasts, thus reducing the number of data streams an operator must monitor. In addition, we can use ensembles of decision trees to predict days likely to have ramp events or inaccurate forecasts, thus providing grid operators additional information they can use to make well-informed decisions on scheduling wind energy. © 2012 Wiley Periodicals, Inc. Statistical Analysis and Data Mining, 2012

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