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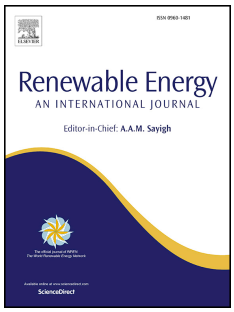

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Using high-frequency SCADA data for wind turbine performance monitoring: a sensitivity study

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Abstract

Intensive condition monitoring of wind generation plant through analysis of routinely collected SCADA data is seen as a viable means of forestalling costly plant failure and optimising maintenance through identification of failure at the earliest possible stage. The challenge to operators is in identifying the signatures of failure within data streams and disambiguating these from other operational factors. The well understood power curve representation of turbine performance offers an intuitive and quantitative means of identifying abnormal operation, but only if noise and artefacts of operating regime change can be excluded. In this paper, a methodology for wind turbine performance monitoring based on the use of high-frequency SCADA data is employed featuring state-of-the-art multivariate non-parametric methods for power curve modelling. The model selection considerations for these are examined together with their sensitivity to several factors, including site specific conditions, seasonality effects, input relevance and data sampling rate. The results, based on operational data from four wind farms, are discussed in a practical context with the use of high frequency data demonstrated to be beneficial for performance monitoring purposes whereas further attention is required in the area of expressing model uncertainty.

Keywords: Wind turbine, Power curve, High-frequency data, Performance

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