A new method to estimate the uncertainty of AEP of offshore wind power plants applied to Horns Rev 1 - DTU Orbit (04/11/2019)

The present article proposes a framework for validation of stationary wake models that wind developers can use to predict the energy production of a wind power plant more accurately. The application of this framework provides a new way to quantify the uncertainty of annual energy production predictions. Additionally, this methodology enables the fair comparison of different wake models. Furthermore, the methodology enables the estimation of how much information can be obtained from a measurement dataset to quantify model inadequacy. In the present work, the proposed framework is applied to the Horns Rev 1 offshore wind power plant. The model uncertainty of a modified N. O. Jensen wake model under uncertain undisturbed flow conditions was studied. Evidence of model inadequacy is found in terms of a bias in the predicted AEP distribution. It was found that the use of the official power curve compensates the errors in the wake model, as a consequence a larger uncertainty of the overall model is predicted. Furthermore, a study of wake model benchmarking based on filtered flow cases indicates that measurement uncertainty in the wind speed and wind direction is large enough to obtain any evidence of model inaccuracy even for the simplest wake models.

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