

WindTrue

Publieke samenvatting / Public summary

Aanleiding

A reliable prediction of the service life of an offshore wind turbine design is needed for a cost-optimal, well-dimensioned design, i.e. a design which is not too heavy and at the same time has an efficient energy production. However, the prediction of the wind turbine response and energy production is performed with models that contain several uncertainties, for example due to the stochastic nature of wind and waves. This means that it is not known exactly how reliable the model predictions are. For this reason the quantification of uncertainty in models and the propagation of uncertainties through the calculations is an active field of research.

Doelstelling

The main objective of this project is to develop calibrated aerodynamic models with a quantified level of uncertainty for optimal design of the next generation of offshore wind turbines. To reach this goal: 1. The main uncertain factors and model parameters in existing aerodynamic models (input parameters, model parameters, etc.) are obtained and their effect on the model response (such as fatigue loads) is investigated. 2. The identified uncertain model parameters are calibrated by using measurement data from the DANAERO project.

Korte omschrijving

Recently two developments took place in the wind turbine research society which form the motivation for the present project. Firstly, within an international cooperation project from the International Energy Agency (IEA) (IEA Task 29)

Projectinformatie / Project information

Projectnummer / Project number

TEWZ118005

Subsidiebedrag / Grant amount

€ 319.918,00

Algemene informatie / General information

Penvoerder / Secretariat

Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek TNO

Publicaties en materialen / Publications and attachments

- 14.08.2019

Windtrue (Presentation at the Matchmaking Day 2019)

- 31.01.2022

Eindrapport TEWZ118005

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unique high quality aerodynamic measurements from the Danish DANAERO experiment as carried on a 2MW turbine will be made available to the Dutch partners of the present project. Secondly, within the NWO-TTW project EUROS, fundamental research on uncertainty quantification is carried out. Within the present project, results of the NWO-TTW EUROS project will be combined with the DANAERO measurement data to calibrate wind turbine models, leading to practical methods to be used in industrial wind turbine design.

Resultaat

The project will result in calibrated aerodynamic models with a quantified level of uncertainty, indicated by probability density functions or confidence intervals on the model outcomes. These models enable the designer to obtain wind turbine designs in which uncertainties are taken into account in a structured way, giving a more reliable prediction of turbine design life. This in turn makes probabilistic risk assessments for financing future offshore wind farms more precise, and consequently lowers the cost of energy. Our models with a quantified level of uncertainty will also be key in constructing digital twins of wind turbines, a novel modelling paradigm in which models and data are seamlessly integrated into a virtual environment as for example WindGemini by DNV GL.

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.

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