Vortex wake models in wind turbine design

Publieke samenvatting / Public summary

Background

ECN, WMC, DNV-GL and GE are participating in the project “Vortex Loads”, to reduce uncertainty in wind turbine design load calculations. The computational effort for these design loads calculations is more extreme than it is for other applications (e.g. aerospace) which necessitates the use of efficient but low-fidelity models. Traditionally the Blade Element Momentum (BEM) method is used to resolve the rotor aerodynamics loads for this purpose, as this method is fast and robust. With the increasing rotor size, and consequently large and flexible blades, a need has risen for more accurate rotor aerodynamics. Previous work has demonstrated large improvement potential in using vortex wake models together with a manageable penalty in computational effort.

Objective

The project consortium will work towards making vortex wake models ready for application to certification load calculations.

Short description of activities

The reduction in fatigue loading using a vortex-wake model instead of the blade element momentum model will be evaluated. Improved modeling and a potential aerodynamic load reduction result in reduced blade mass and/or further upscaling perspective leading to a reduction in LCOE.

Results

The result is a database with results of turbulent inflow CFD test cases and validated vortex-wake models for the design of load calculations of wind

Projectinformatie / Project information

Projectnummer / Project number
TEWZ117007
Subsidiebedrag / Grant amount
€ 320.571,00

Algemene informatie / General information

Penvoerder / Secretariat
Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek TNO

Publicaties en materialen / Publications and attachments

- **12.08.2021**

  Eindrapport TEWZ117007

Links

- VortexLoads: vortex-wake models in wind turbine design (ECN part of TNO)

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turbines by the industry. The vortex-wake models are implemented in the aeroelastic codes for wind turbine design by the industry. Finally, for Dutch offshore wind farm developments the improved reliability of the aerodynamic models is important for future design and application of wind turbines larger than 10MW and for the design of the support structure, where the rotor loads are introduced at the lower top.

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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