

Turbine Improvements for Additional Energy

Publieke samenvatting / Public summary

Aanleiding

Larger rotors of wind turbines are the key enablers for high annual energy production (AEP) and low levelized cost of energy. The efficiency and power production of a wind turbine rotor blade must be further improved in order to achieve the cost reduction for offshore wind energy. To achieve these goals, ECN part of TNO, GE Renewable Energy and LM Wind Power will optimise the wind turbine blades to increase the overall efficiency of a wind farm by increasing the performance of each individual turbine and potentially by reducing the wake effects behind the wind turbines. Project TIADE achieves this with add-on solutions like blade root spoilers and blade improvements such as new tip designs. These solutions can be applied to newly manufactured wind turbines in the factory, but they can partly also be retrofitted to existing offshore wind farms. Having both options available, the implementation of the technology in offshore wind farms can be done already from 2023.

Doelstelling

The goals of the project are: 1. INNOVATIONS: The objective of project TIADE is to increase AEP by increasing rotor performance by 2%, resulting in a 1% reduction in LCoE by implementation of developed and validated wind turbine blade improvements and add-ons. 2. R&D TURBINE: To realize a full-scale (3.8MW), state of the art wind turbine at the EWTW test site in the Wieringermeer for industrial research and testing, with which the impact and performance of the innovations can be validated in field conditions. The tests additionally lead to improved design models and further

Projectinformatie / Project information

Projectnummer / Project number

TEHE119018

Subsidiebedrag / Grant amount

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Algemene informatie / General information

Penvoerder / Secretariat

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iterations in the innovative add-ons and tips. The majority of technologies developed are currently at Technology Readiness Level 5 (TRL5). Through project TIADE, these will be matured to TRL8. Since project TIADE will build upon existing theory, the expected impact on energy targets can be implemented shortly after the end of the project and well before 2030. The development and validation of the design tools used in project TIADE will have immediate impact on innovations that come to the market before 2030 and have additional impact on aerodynamic designs after 2030.

Korte omschrijving

The innovation activities in the project are: - Innovative tip with new airfoils for high-performance (LM) - Vortex generators in combination with turbulator and a tip with pressure sensors (TNO) - Innovative tip in combination with innovations in root area (GE/LM) - Innovative tip with aero-elastic tailoring (LM/TNO) - Long-term measurement of loads, power, aerodynamics for validation purposes - Measurement of meteorology and wake characteristics for validation purposes - Demonstration of innovative sensing technologies - Dedicated experiments such as large yawed operation, measurement of rough blade-surface conditions and vortex induced vibrations experiments

Resultaat

This project has a clear target of increasing rotor performance by 2%, leading to 1% cost reduction by increasing power output of offshore wind turbines without excessive increase in mechanical loads. This target is reached by achieving the following results at the end of the project: • A series of innovative blade add-ons are designed for offshore wind turbines: o Aero-elastic tailored tip o High-performance tip o Dedicated aerofoil design for tips o Turbulator o Root spoiler • These innovations are tested and validated at 3.8MW scale. • Validated design guidelines to design blade add-ons. • Improvements and validations to design tools. • R&D Wind Turbine and infrastructure with innovative measurement techniques.

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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