

PRecipitation atlas for Offshore Wind blade Erosion Support System

Publieke samenvatting / Public summary

Aanleiding

Offshore wind turbine design lifetime is currently 25 to 30 years. However for wind turbine blades, as critical components of the wind turbine, lifetime and performance are two central concerns for wind farm owners/operators and OEMs. Leading edge erosion (LEE) has been identified as the main factor to substantially reduce both blade lifetimes and energy output over time. Severe consequences of LEE effects are linked with blades' lifetime reduction, reflected on increasing the levelised cost of energy (LCoE) and higher CO2 emission rates at initial stages of the supply chain, involving more frequent blade repairs, inspections and early replacements. Without the suitable information on LEE events, the decision making strategies on LEE measures, operational and maintenance activities are insufficient and the LCoE will continue increasing on this front. At the wind farm planning stage, the lack of validated methods to estimate the overall cost of erosion causes uncertainty in the investment decisions. Wind farm developers currently have access to detailed data on seabed and wind conditions though virtually no useful information on offshore precipitation.

Doelstelling

The goal is to lower the cost of damage caused by LEE. Offshore precipitation will be measured in detail for the first time and accurately correlated the precipitation to other weather data over the Dutch North Sea. It can be used for existing wind farms and to strengthen the site surveys for future wind

Projectinformatie / Project information

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HER+-00900701

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Algemene informatie / General information

Penvoerder / Secretariat
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farm deployments. Sub-goals: 1. Establish and execute a monitoring system network for LEE characterization: Identification of the optimum weather monitoring strategy over offshore wind farms to characterize erosion events and properties affecting blades. 2. Model precipitation prediction correlated with LEE at high resolution over the Dutch North Sea: Development of enhanced precipitation models capable of assimilating RADAR images to create a long-term erosion classes linked with severity of the precipitation and wind conditions. 3. Assess AEP losses and O&M future needs related to LEE: Through coupling the erosion atlas and O&M planning tool to evaluate the likely cost of maintenance with a certain coating choice in different parts of the Dutch North Sea and to estimate the expected AEP losses due to LEE at high resolution by selecting sites over the Dutch North Sea.

Korte omschrijving

This project consists of five work packages: WP1: Monitoring system network for LEE characterization: instrumentation and monitoring campaign execution with precipitation sensors. Coupling information with existing weather stations across coastal and offshore locations to correlate weather related variables with LEE. WP2: Modelling precipitation prediction correlated with LEE: generate short- and long-term prediction based on the erosion rates found in WP1 at difference sites to have a large spatial coverage over the Dutch North Sea and a long-term data. WP3: O&M and AEP assessment related to LEE: implement existing O&M cost model with the erosion atlas to create the investment decision support system. WP4: Knowledge dissemination and exploitation: promote the erosion atlas with AEP and O&M assessment related to LEE applicable for wind farm operators, internationalization and standardization. WP5: Project Management: manage and align the approach and results of the individual work packages and activities. Administrate and report time and budget and take corrective actions if necessary.

Resultaat

The project will provide a reliable source of information that can be used by multiple players in the wind industry such as OEM's, utilities, blade manufacturers and coating developers that will:

- Build intelligence on precipitation characterization related to LEE over the Dutch North Sea
- Improve accuracy of erosion models that predict the leading-edge blade coating systems
- Enable reliable decision-making on LEE mitigating measures
- Optimize operational and maintenance activities to reduce LCoE
- Support the estimation of the overall cost of erosion to reduce uncertainty in the investment decisions at the wind farm planning stage
- Provide an upfront assessment of wind sites regarding the risk for LEE, and inform wind farm operation to optimize blade lifetimes (i.e. reduce rotational speed or even shut down under certain weather conditions, or consider different LEE protection systems)
- Model developments on precipitation patterns simulations at finer resolution using micrometeorological models and RADAR systems are a step beyond the state-of-the-art for other sector applications.

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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