

Sensor Assisted Wind farm Optimization

Publieke samenvatting / Public summary

Offshore operators have limited means for wind farm performance monitoring

Optimization of offshore wind farm performance relies on monitoring of the wind farm such as the performance of the turbines. Currently, operators have limited means to efficiently monitor the performance of their offshore wind farms, as the used methods are both based on limited information and involve large investments. Fortunately, new technologies have emerged to tackle this issue as for instance spinner sensors and nacelle LiDAR systems.

Objective

The first objective is to further develop objective methods to monitor wind turbine performance. The conventional method by using a standard meteorological mast is not suitable due to high costs. Therefore, the spinner sensor and nacelle LiDAR technology need to be further developed for individual wind turbine power performance assessment, demonstrated and implemented in standards. The second objective is to develop whole wind farm performance monitoring strategies which are currently lacking. These require the accurate measurement data. Therefore, it is necessary to develop spinner sensor and nacelle LiDAR technology-based performance assessments for waked turbines. Here, the focus is on distinct full wake, half wake and multiple wake situations. The third objective is to develop and further refine wind farm optimization strategies, capitalizing particularly on the unique and extensive sensor layout input. This latter is key in the optimization

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development. It enables to minimize yaw misalignments of the turbines and allows for advanced wake control.

Short description

- WP1 Preparation Offshore Measurement Campaign: The measurement systems are prepared in the lab and sensors are calibrated. Activities include development and improvement of calibration techniques on nacelle LiDAR and scanning LiDAR.
- WP2 Offshore Measurement Campaign: The campaign foresees in an initial, reference phase and a second phase to demonstrate the improvements, the interchangeability, etc.
- WP3 Individual wind turbine performance monitoring: Co-aligned with the measurement campaign the incoming data are analyzed and methods are further developed. The tasks focus on identifying performance gaps of individual wind turbines, further standardization of performance assessments with spinner sensors and nacelle LiDARs and developing performance monitoring techniques for waked turbines.
- WP4 Improved wind farm operation: This WP builds upon individual wind turbine performance monitoring in the free flow and in waked conditions (WP3) and comprises developing a methodology for whole wind farm performance monitoring.
- WP5 Knowledge transfer and Dissemination

Result

- Database of measurement for the performance of individual wind turbines in free and waked wind conditions.
- Internationally accepted standardization of power performance assessment using spinner sensor and nacelle LiDAR technology through standardization fora.
- Developed methodologies for waked wind turbine and whole wind farm power

performance monitoring.

- Improved wind farm performance optimization strategies using spinner sensor and nacelle LiDAR input.

Website

More information on the SAWOP project can found [on the GROW website](#).

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