nabla wind hub

GIGAN – EUROSTARS PROJECT

GiGAN-2. 3 in 1 sensor of blade deflections, loads, and wind conditions for high-performance wind turbines

Eurostars file number E114201

CDTI file number CIIP-20202014

ANI file number E114201

What is GIGAN: GIGAN is an innovative combination of optical fiber sensors inside the wind turbine blades, plus aeroelastic models, which turns the entire turbine into a gigantic anemometer capable of monitoring simultaneously and accurately wind conditions but also the structural loads and fatigue of all its critical parts. It will turn every wind turbine into an advanced sensor and monitoring system, to extend turbines' lifespan up to 40 years, improve performance up to 4%, and reduce OPEX by 5%.

Why GIGAN: Currently, the average lifespan of some critical parts of wind turbines, particularly, the gearbox, are seriously underperforming vs. the certified value, and the problem is worsening as larger the turbines are built. This increases maintenance expenses and erodes the economic sustainability of wind energy. Accurate measurement of wind conditions and structural loads will enable to maximize performance and the lifespan of these critical parts by identifying and minimizing risks.

Goal of the project: obtain a 3 in 1 sensor that will provide:

- Blade deflections
- Loads across the entire wind turbine
- Wind Conditions
- Interaction with the WTG controller for optimised operation

Outcome: The outcome of this project will be an easy to install, widely tested and certified prototype. Nabla wind hub will install the sensors aiming to obtain high accurate data on wind conditions which will enable the client with more efficient control and management of the turbines.

The system will be suitable to measure wind conditions and structural deflections initially for turbines ranging from 80m rotor diameter to more than 100m rotor diameter, which amounts to 57% of all horizontal-axis turbines currently installed. Our goal, however, is to adapt GIGAN for larger offshore turbines, which is a strategic segment growing at 19,4% CAGR. Furthermore, GIGAN is suitable for both new turbines and installed ones, since its installation is simple and inexpensive.

Wind farm details where the project will take place:

- In Italy
- In total 39 Nordex N90 2.5MW HS TWR80
- 1 prototype will be installed

Time schedule of the project:

- Overall duration of 18 months

Work packages:

- WP1: Customizing the aeroelastic model for a Nordex N90 2.5MW turbine model

Customize the main components of the GIGAN, the aeroelastic model and the shape sensors. Site visit for inspections and measurements.

- WP2: Installation of sensors with reference systems, analysis and transfer function development

Installation of all the hardware system that will provide the datasheet to develop the transfer function through the analysis of this data.

- WP3: Improvement of the control system to maximize wind turbines' performance and lifespan

During this work package, the N90 controller will be adapted to GIGAN system

- WP4: Final validation of GIGAN system

This WP completes GIGAN's development process by obtaining its final validation as a new system capable of measuring accurately wind conditions, structural loads, and fatigue for wind turbines. We will also validate that it is capable to improve wind turbine's operational performance in a wide range of variables, from energy production to reduction of vibrations and structural fatigue.

Co-funded by EUREKA member countries and the European Union Horizon 2020 Framework Programme