

OROWSHI

Offshore wind turbine design including joint wind-wave information in standard for hurricane-exposed sites

DURATION: 36 months (2022-2025) | BUDGET: €1,700K

CONTEXT

The industry target areas that are currently highly exposed to tropical cyclones (Asia-Pacific, French overseas territories) or that could become more exposed due to climate change. Because they are rare events, the definition of the extreme wind value is based on Monte-Carlo type approaches which provide reliable statistics. Meanwhile, the standard recommendation regarding extreme wave relies on the classical long term extrapolation method, based on a sample of wave observations or model output, commonly used for mid-latitude conditions. **This leads to inconsistencies in the definition of the 25-year metocean conditions to be considered for the design of offshore wind turbines.**



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TECHNOLOGIES



STAGES OF THE VALUE CHAIN



Preparatory studies

Design

OBJECTIVES

To define a consistent method to assess the joint extreme wind and waves extreme statistics to optimise the design of offshore wind turbines exposed to tropical cyclones

MAIN ACHIEVEMENTS

- Creation of a database of existing observations on winds and waves associated with tropical cyclones
- Development of a new hub height parametric wind model
- Development of software to compute joint extreme statistics of wind speed and wave heights for site exposed to tropical cyclones and incorporating the contribution of extratropical swell weather systems
- Recommendation for the assessment of the extreme wind and wave conditions regarding the design of offshore wind turbines exposed to tropical cyclones

CONCLUSION

Several major progresses have been made regarding wind and wave modelling in tropical cyclone conditions. These have been validated using a comprehensive database of observations from a wide range of sensors (floating lidar, sail drones, satellite radar). A software incorporating these various innovations has been developed. It enables rapid and accurate assessment of extreme wind and wave statistics at offshore wind farms exposed to cyclone risk. The associated methodology provides a solid basis for defining new international standards in this field.

MAIN OUTPUTS

TAIFU-WindWaves© Integrated software enabling fast computations of the joint 50 and 500y extreme wind speed and wave height at site exposed to tropical cyclone risk, and including contributions from extratropical conditions

PARTNERS



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