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Advanced tool to optimize the O&M activities for offshore windfarms

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Abstract

Offshore wind is one of the most promising maritime sectors, in fact it shows one of the highest grow rates of the blue economy. Because of that, floating technologies are nearly to become a commercial alternative. However, in order to maintain and fulfill the market expectations for the next decades, deep water sites need to be explored.

O&M is crucial for floating technologies, in fact the floating structures imply that the accessibility rates may become difficult, increasing the OPEX costs and therefore increasing the LCOE. Thus, O&M may play a significative role in the cost of the energy produced in floating offshore wind farms.

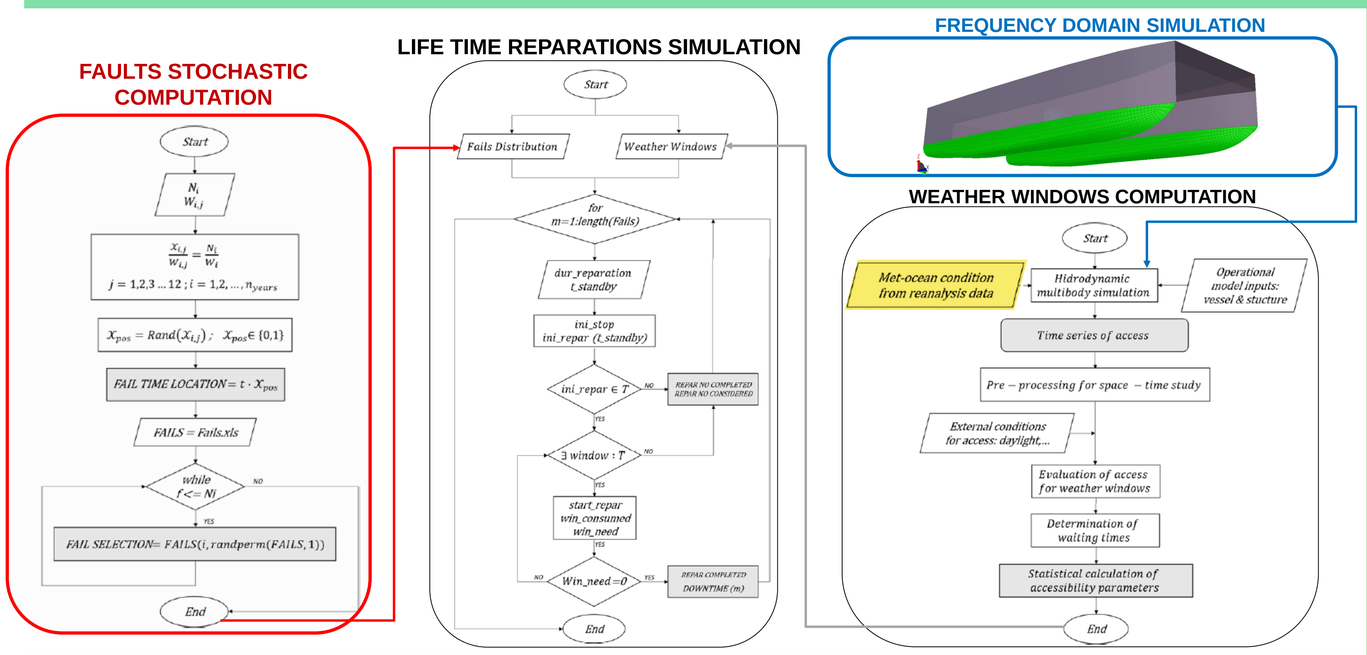
Usually, the evaluation of accessibility indicators is based on the definition of safety thresholds associated to specific metocean parameters, where captain of the vessel often influences decisions during personnel-transfer operations. Such decisions are based on his experience. However, the risk associated to personnel transfer and the number of incidents occurred during marine operations in offshore wind depend directly on the interaction fluid – vessel – structure.

This work presents an advanced methodology that combines hydrodynamic numerical models which simulate the personnel-transfer between vessel and floating structure with complex mathematical algorithms and long term metocean data bases, which allows to simulate the marine operations associated to O&M from a long-term perspective. Based on this methodology, O&M strategies have been calculated from a regional perspective (North Sea) and have been optimized focusing on the risk-reduction related with the personnel-transfer operation.

Objectives

The aim was to **develop an O&M simulation tool**, useful both for the strategic positioning of INGETEAM in the windfarms maintenance business and for the development, improvement and optimization of new concepts, considering O&M strategies from early design stages.

Methodology



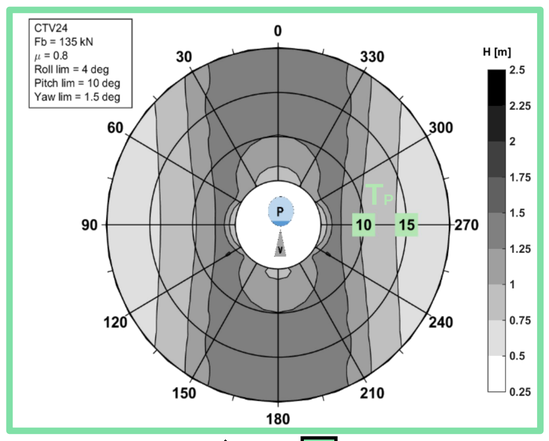
The methodology is based on the combination of **long-term met-ocean databases**, a **multi-body hydrodynamic model** to understand the dynamics between vessel and platform, and Offshore wind farm model which includes the O&M intelligence.

The personnel-transfer model is a rigid multi-body frequency domain model, built over the assumption of linear force-displacements relations. Based on this model a set of transfer functions were built to identify the short-term dynamics of the marine operation [1,2].

The O&M simulator starts with a **fault model** which predicts the farm failures at a component level. The failure rates were given by INGETEAM to provide realism to the system. The O&M simulator combines the failure model with an operational decision support system, based on the transfer functions and metocean databases already created [3].

Results

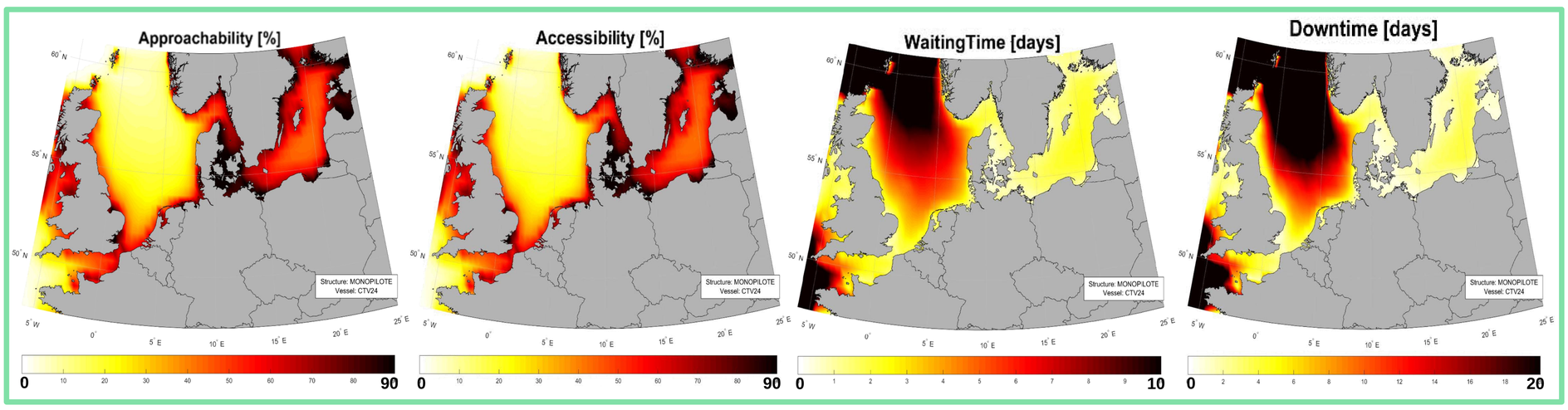
LIMITING WAVE HEIGHT ROSE



FREQUENCY DOMAIN ANALYSIS RESULTS

WEATHER DATA-BASE

O&M CHARACTERIZATION ATLAS



Conclusions

This research piece attempts to develop an O&M advanced tool to help in the O&M strategy design. The main difference with other methodologies is that it includes an advanced hydrodynamic model to integrate the vessel-platform interaction. It is specially devoted to floating platforms, but it can be applied to bottom fixed structures too. Therefore, it is a unique method to design reliable O&M strategies based on long term met-ocean data bases. It contributes to the risk reduction of personnel-transfers maneuver, which is a major challenge in the offshore wind industry. In addition, the possibility to evaluate different strategies for O&M, will allow to select the best support vessels (CTVs, SOV…), base ports, etc., with the aim of improving the windfarm accessibility.

References

1. T. Ogilvie, «Recent Progress Towards the Understanding and Prediction of Ship Motions,» de 5th Symposium on Naval Hydrodynamics, Bergen, Norway, 1964.
2. Babarit and G. G. Delhommeau, "Theoretical and numerical aspects of the open source BEM solver NEMOH," in *Proceedings of the 11th European Wave and Tidal Energy Conference*, Nantes, France, 2015.
3. Guanche, R., Martini, M., Jurado, A., Losada, I.J., (2016) Walk-to-work accessibility assessment for floating offshore wind turbines, Ocean Engineering, Volume 116, 1 April 2016.

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