O&M of Future Offshore Wind Farms

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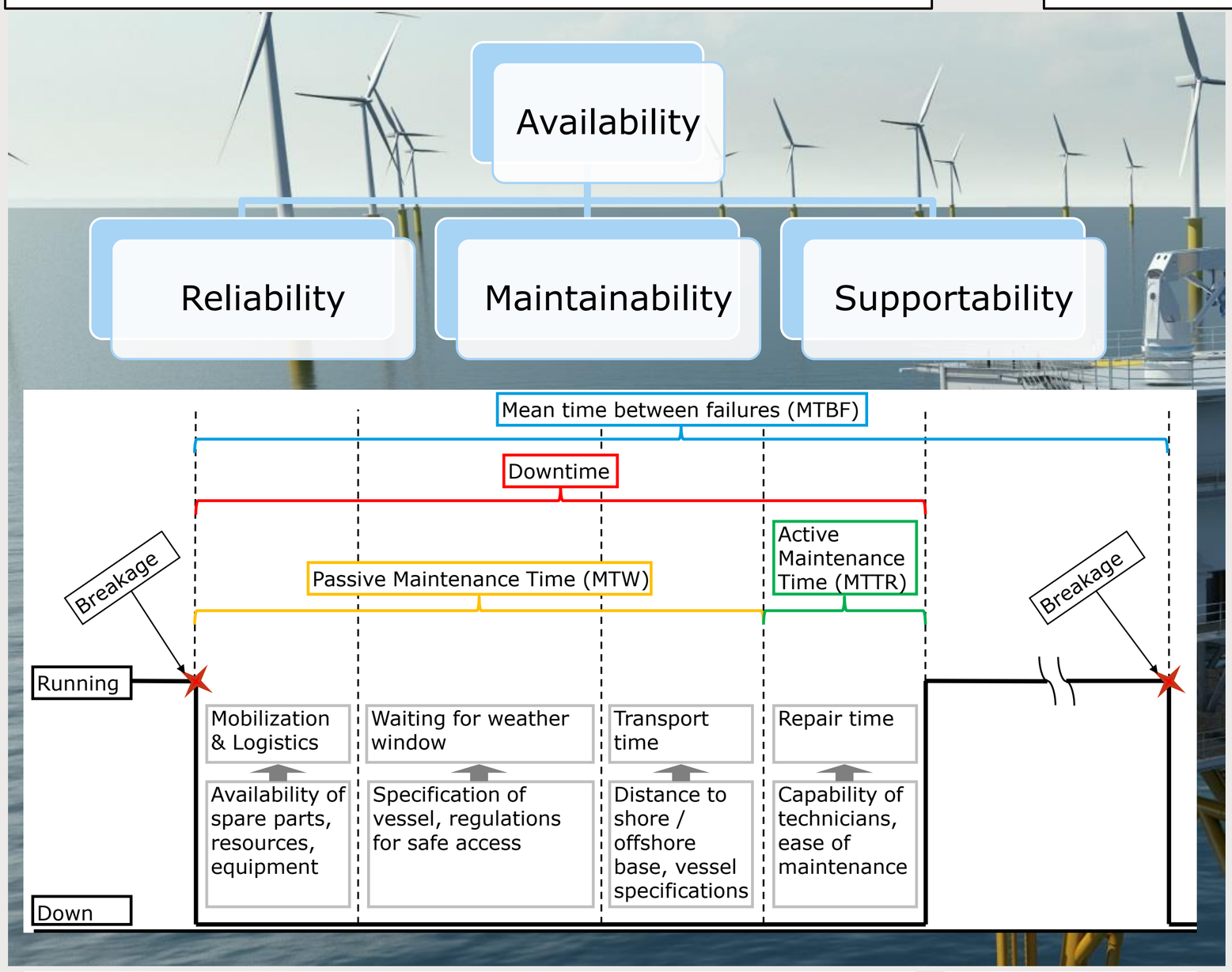
Overall Aim
Improving the risk-return balance within the application of wind power plants by enhanced modelling and simulation of operating scenarios.

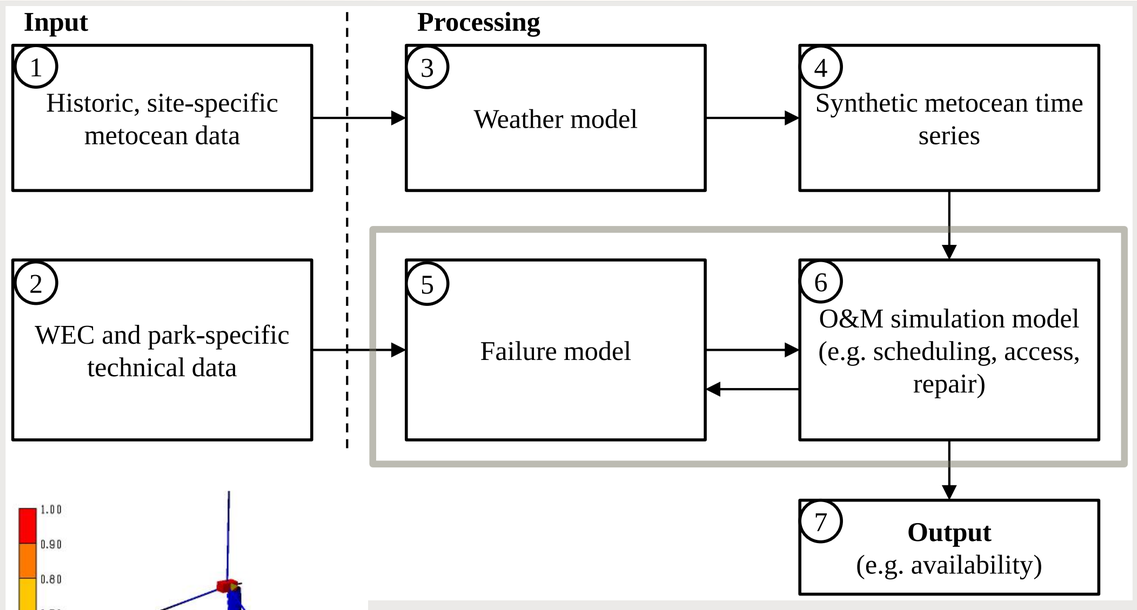
Key Words
O&M, floating offshore wind energy, stochastic modelling, Monte Carlo simulation, availability, supportability, accessibility, maintainability, sea sickness, body motion

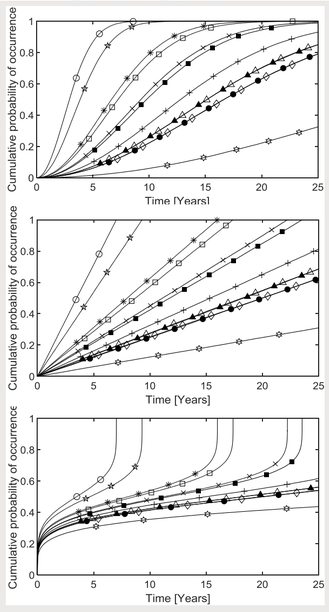


Predominating Asset Performance Measure
Asset availability is the target performance indicator used in this project. It is the predominating measure for quantifying risks and performance within the industry.

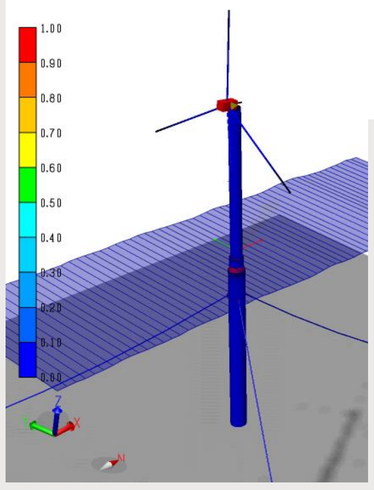
Influencing Factors
Three factors are enabling availability: reliability, maintainability and supportability. They describe how often an item breaks, how well it can be repaired and if it can be reached at the right time with the right tools and competencies.

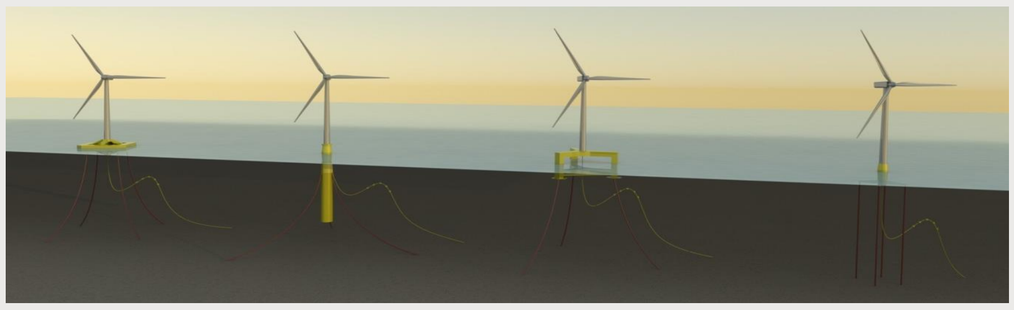
Required Representation in Simulation
Simulation tools are used to model and simulate operating scenarios in the offshore wind industry. Those tools must reflect all factors influencing asset performance accurately in order to enable valid predictions. A simplified illustration is shown on the left to illustrate the main steps required to be represented in a simulation tool. Novel technologies, such as condition monitoring systems or the application of floating offshore wind turbines remain to be modelled adequately.





Approach and Methodology
A fully probabilistic simulation tool is developed within this research project. It is capable to represent environmental site conditions as well as asset specific characteristics accurately in individually developed modules. The tool architecture is illustrated in a simplified way on the left.

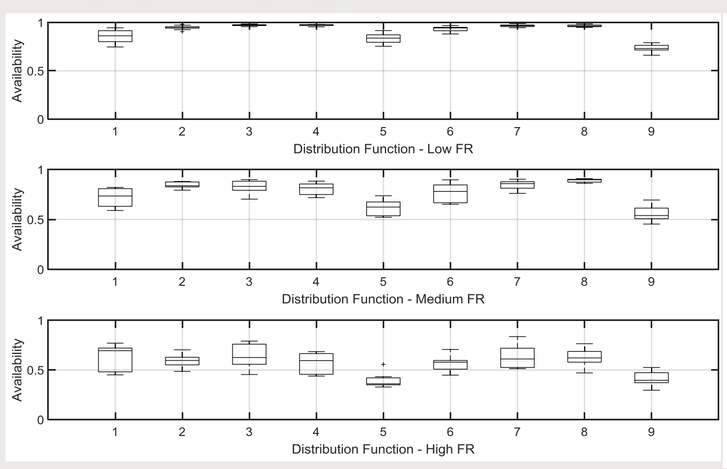


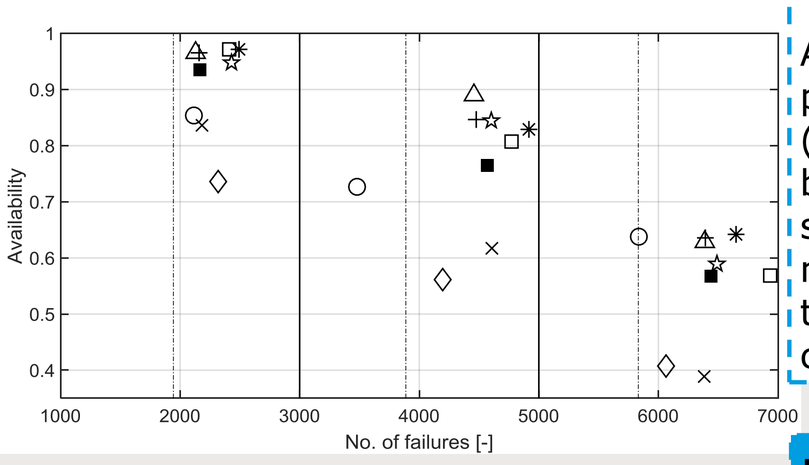


Floating Offshore Wind Technology
In order to include floating offshore wind technology, a significant amount of open questions are evident. Two of those are covered within this research:

1. Are motions of the structure influencing well-being of personnel on the asset during maintenance work?
2. Which specific access conditions are relevant for operating floating structures in contrast to fixed-bottom ones?

A substantial set of simulations of the four predominating floating structures applied today (tension leg platform, semi-submersible, spar, barge) is done. Access by crew transfer vessels, service operating vessels and helicopter is modelled. Conditions on different positions on the platform are assessed towards motion criteria standards classifying working limits.





Results
A realistic performance estimate of floating offshore wind turbines is possible. Knowledge about technology-specific characteristics and behaviour is enlarged significantly, closing a current gap in research.

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