



# Reliability of Structural Health Monitoring Technologies for Offshore Wind Turbine Support Structures under Uncertainty

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## Introduction

The number of offshore wind turbines (OWTs) continues to grow, moving further into deeper waters with larger and more complex support structures, which require complex sensing networks to monitor their behaviour, condition, and plan operations and maintenance (O&M) activities.

## Aims and objectives

To improve the reliability of SHM technologies for OWT support structures by identifying, quantifying and controlling uncertainty-induced errors through a framework, supported by a numerical reliability model and validated by real operating data.

## Results and discussion

- Offshore wind faces challenges with cost, efficiency, and reliability of SHM technologies.
- The reliability of sensing networks is impacted by uncertainty, causing discrepancy between measured values and model predictions.
- There is a lack of understanding of uncertainties affecting OWT support structures: their sources, modelling, and quantification.
- Data-driven condition monitoring is currently developing rapidly for electric and mechanical components of WTs. More focus is needed for support structures to catch up.

## Conclusions

The use of predictive analytics in SHM of OWT support structures is a promising area that can improve their reliability, optimise their design, assist operators with O&M planning and drive the levelised cost of electricity (LCOE) down.

## Future work

More research is required in developing and testing frameworks and algorithms to optimise SHM technologies and sensor distribution on OWTs.