Advanced numerical methods for optimisation of next generation wind turbine support structure

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Introduction

Targets for renewable energy have yielded significant investments in offshore wind because of their benefits compared to onshore wind turbine and other renewable energy technologies. Different types of support structures for OWTs are available for deep water deployments and a number of criteria should be investigated for optimum decision making. Considering that nearly 25% of capital cost of an OWT is related to the support structure [1], optimisation in this section is an efficient way to decrease the cost of OWT. In this project, The main purpose of this research is to produce cost effective support structures with optimised geometries by considering design drivers of fatigue and natural frequency.

Aims and objectives

The main aim of this project is to develop an advanced framework for the optimisation of typical support structures of OWT based on combination of structural models and appropriate methods for optimisation such as Genetic Algorithms.

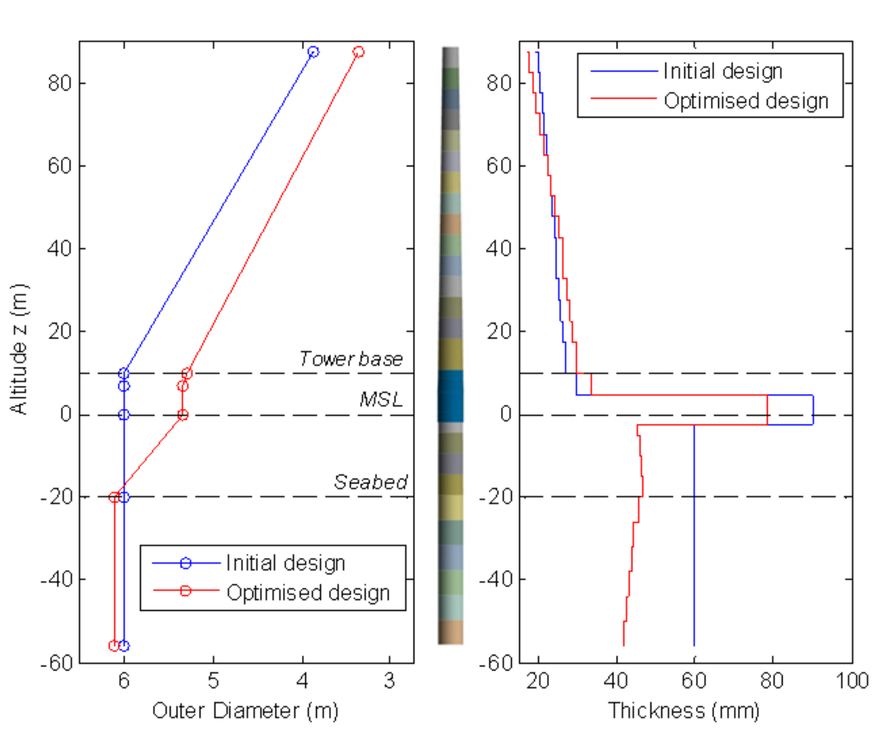

Figure 1 The comparison between initial and optimised design [1]

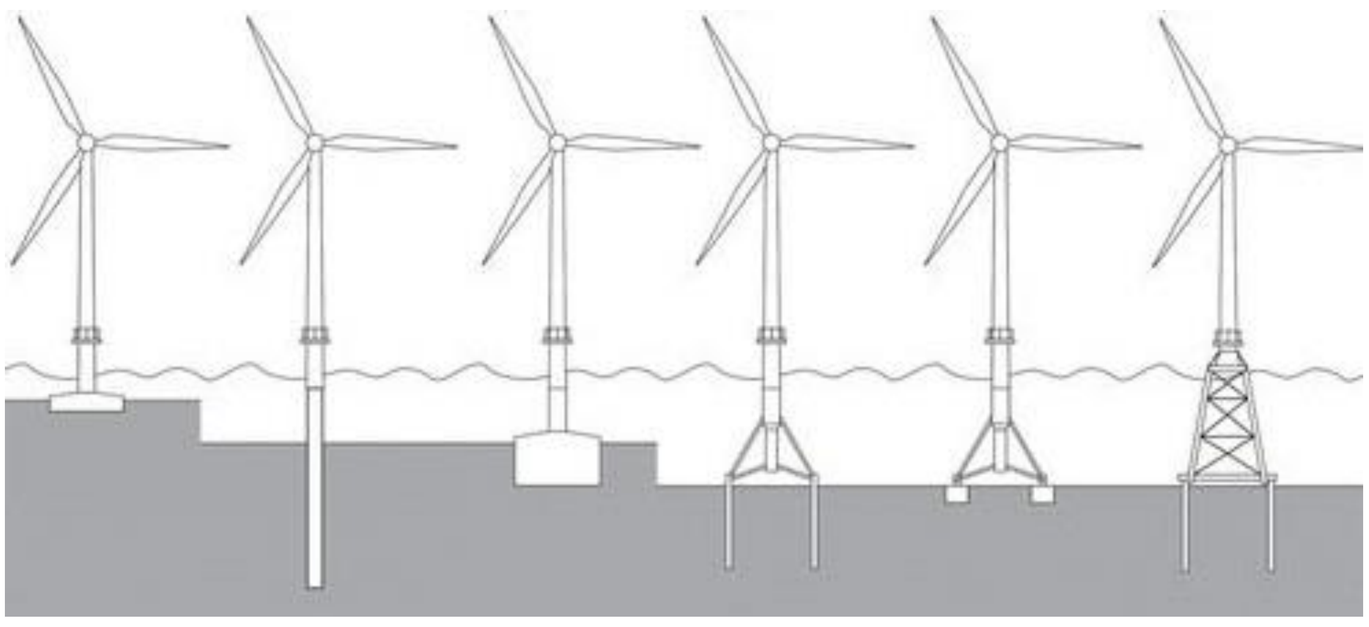

Figure 2 Typical foundation concepts [1]

Figure 3 Tower and support structure production [2]

References:

[1] Gentils, T., Wang, L. and Kolios, A., 2017. Integrated structural optimisation of offshore wind turbine support structures based on finite element analysis and genetic algorithm. *Applied energy*, *199*, pp.187-204.

[2] Worldenergy.org. 2019. World Energy Council. [online] Available at: https://www.worldenergy.org