



Dynamics of a full-height lattice support structure for next-generation offshore wind turbines

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Description:

The increasing size of wind turbines and the need to start harnessing wind resources in deeper water sites are introducing new challenges for the offshore wind industry. Researchers are now focused on the study of so-called XXL monopile support structures. However, these structures introduce significant problems in terms of manufacturing and installation. An alternative is the hybrid jacket-tower concept. Nevertheless, this concept does not fully exploit the potential of a lattice structure and, at the same time, it still requires an expensive transition piece. Thus, there is the need to develop and investigate new support structure concepts.

To address this problem, the dynamic behaviour of a full-height lattice support structure in the offshore environment is analysed. With respect to a tubular support structure, a full-height lattice structure can lead to a significant reduction of total steel weight thanks to the fact that each member can be optimized individually along the entire height. Furthermore, the foundation piles of lattice structures are significantly slanderer than a monopile which means that soil-structure interaction is a better-understood phenomenon for this concept.

Still, many uncertainties are present as little is known about the behaviour of this type of structures as support structures for large offshore wind turbines. In particular, it is unclear which are the sensitivities of the dynamic characteristics of this type of structure and what is the resonant behaviour. In addition, the nature and magnitude of the harmonic rotor excitations coming from the currently underdevelopment 10+MW wind turbines are partially unknown.

Goal:

The goal is to understand the dynamic behaviour of a full-height lattice support structure for next generation (10+MW) offshore wind turbines and the potential contribution of this concept structure to the development of the future offshore wind energy industry. Along with this project, focus will be given to defining specific industry design standards for lattice support structures for offshore wind applications.

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