Influence of model parameters on the design of large diameter monopiles for multi-megawatt offshore wind turbines at 50-m water depths

Relevant modelling approaches towards the design of a large diameter monopile for 10 MW offshore wind turbines at 50m water depths are considered to evaluate their respective impacts on the structural integrity. The analysed models or model parameters include soil structure interaction, construction errors, and damping. The study is conducted on a reference structure verified with respect to fatigue, ultimate (strength, stability, and soil capacity), and serviceability limit states after fully coupled load simulations. Models and their parameters are carefully obtained in line with the case in hand. Perturbation analysis is used to assess the impact of the soil model, the geometric imperfections, and the damping on the structure safety and robustness. Results show that all of them significantly influence the fatigue lifetime, the geometric imperfections and the soil model impact the ultimate stresses, and the soil model affects the deformations of the final design, from which guidance on the optimal selection of these parameters leading to material savings is made.

General information
Publication status: Published
Organisations: Wind Turbine Structures and Component Design, Department of Wind Energy
Contributors: NJOMO WANDJI, W., Natarajan, A., Dimitrov, N. K.
Number of pages: 19
Pages: 794-812
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Wind Energy
Volume: 22
Issue number: 6
ISSN (Print): 1095-4244
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
Original language: English
Keywords: Construction errors, Damping, Deep water, Large diameter monopile, Large wind turbine, Perturbation analysis, Soil-structure interaction model, Structural design
DOIs:
10.1002/we.2322
Source: PublicationPreSubmission
Source-ID: 169154252
Research output: Contribution to journal › Journal article – Annual report year: 2019 › Research › peer-review