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Interactive comment on "Effect of the Foundation Modelling on the Fatigue Lifetime of a Monopile-based Offshore Wind Turbine" *by* S. Aasen et al.

Anonymous Referee #1

Received and published: 9 January 2017

This paper studies the effects of different soil-foundation models on the fatigue damage of a OWT with monopile foundation. The results show that both stiffness and damping properties have a noticeable effect on the fatigue damage.

The comments are as follows.

1. Introduction

a) A paragraph reviewing methods used for modelling soil-solid interactions, such as p-y curve method and 3D (three-dimensional) FEA (finite element analysis) method, should be added.

b) A review on relevant studies, such as fatigue assessment of OWT (offshore wind

turbine monopile), should be added.

c) It would be appropriate to present the outline of the paper at the end of the introductory section, making the structure of the paper clear.

2. Section 3.1

Please give more details about how the wind and wave loads were applied on the monopile. Were they applied as point load or distributed load?

3. Section 4.1

Please give the thickness of the monopile used in this study.

4. Section 4.2

For soil profile, please present the p-y curves for three types of sands used in this study, i.e. loose, medium and dense sands.

5. Section 4.3

Please present some load calculation results of both wind and wave loads, e.g. the load calculation results for Load Cases 5 and 6.

6. Section 4.4.3

Please give more details about the FE model, such as types of elements, mesh size, displacement boundary conditions, the amplitude of the horizontal load H, and contact type between the soil and pile. Were mesh sensitivity exercises performed?

7. Section 4.5

Please justify why DNV F3 in-air S-N curve was chosen in this study. Please give details how the wind and wave load period were determined for the fatigue analysis.

8. Section 5.3

According to Figs. 17 and 19, LC1 (load case 1) has a high impact on the total fatigue

damage. This seems unreasonable, as the both wind and wave loads are relatively low. Authors state “with little aerodynamic damping, the tower is free to oscillate at its first natural frequency, leading to high load amplitudes at the mudline”. Can authors compare the load calculation results for LC1 obtained from 3Dfloat against the results obtained from other aero-hydro-elastic codes, e.g. NREL FAST, to confirm this?

Interactive comment on Wind Energ. Sci. Discuss., doi:10.5194/wes-2016-37, 2016.