DeepCwind Semi-Submersible Floating Offshore Wind Turbine Platform with Nonlinear Multi-Segment Catenary Mooring Line and Intermediate Buoy

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Abstract

In this paper, with the purpose of improving the mechanical behavior of DeepCwind semi-submersible floating offshore wind turbine (FOWT) platform mooring lines, nonlinear catenary cables of platform are divided into multi-segments and intermediate buoy. The mathematical formulations of the dynamic equation acted on the cable with buoys are described. Present study is employed to the OC4-DeepCwind semi-submersible FOWT platform. It is designed for 200-meter water depth with mooring lines consist of three catenary steel chain cables that have an angle of 120 degrees to each other. The dynamic response of multi-segment catenary mooring line with different buoys radiuses and different positions along the cables were investigated. The full-scale platform was modeled in ANSYS-AQWA software and the simulations are performed in harsh offshore. The tension, strain, anchor uplift, cable uplift for different buoy radiuses and its position along cable are presented and discussed. Moreover, platform motions at three directions (surge, heave and pitch) are also analyzed. It is concluded that by correct selection of the buoy volume and position along cable, the tension of the cable may be reduced up to 45%. By incorrect selection of the buoy, the results will cause adverse effects.

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