Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Aeroelastic impact of above-rated wave-induced structural motions on the near-wake stability of a floating offshore wind turbine rotor STEVEN RODRIGUEZ, JUSTIN JAWORSKI, Lehigh University — The impact of above-rated wave-induced motions on the stability of floating offshore wind turbine near-wakes is studied numerically. The rotor near-wake is generated using a lifting-line free vortex wake method, which is strongly coupled to a finite element solver for kinematically nonlinear blade deformations. A synthetic time series of relatively high-amplitude/high-frequency representative of above-rated conditions of the NREL 5MW referece wind turbine is imposed on the rotor structure. To evaluate the impact of these above-rated conditions, a linear stability analysis is first performed on the near wake generated by a fixed-tower wind turbine configuration at above-rated inflow conditions. The platform motion is then introduced via synthetic time series, and a stability analysis is performed on the wake generated by the floating offshore wind turbine at the same above-rated inflow conditions. The stability trends (disturbance modes versus the divergence rate of vortex structures) of the two analyses are compared to identify the impact that above-rated wave-induced structural motions have on the stability of the floating offshore wind turbine wake.

Steven Rodriguez
Lehigh Univ

Date submitted: 01 Aug 2017 Electronic form version 1.4