Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

CFD Simulations of Floating Offshore Wind Turbine Platform[1]

MOSTAFA ELASKALANY, MAYSAM MOUSAVIRAAD, University of Wyoming

— Computational modeling of offshore wind turbines imposes significant challenges due to the multiphysics nature of the system that involves both the turbine and the support structure. To provide reliable experimental data for validation of simulation tools, the OC5 DeepCwind floating semi-submersible wind system was designed and tested through DOE support. The purpose of this work is to develop and validate a high-fidelity computational solver for floating offshore platforms that is capable of modeling incident waves, sea current, hydrodynamics, mooring dynamics, and foundation dynamics. The high-performance fluid solver is based on URANS CFD methods, is capable of modeling incoming waves, including stochastic/random ocean waves based on specified spectrum, and resolves the nonlinear wave dynamics. Validation studies are presented for free decay as well as wave-only excitation in regular waves free to surge, heave, and pitch motions. Further computational studies are carried out in unidirectional irregular stochastic waves, including uncertainty quantification (UQ) for random input wave parameters. Future studies will include coupling with fully resolved turbine blades modeling, as well as stochastic optimization studies for improved hydrodynamics and aerodynamics.

[1]This work was supported by DOE EPSCoR GrantDE-SC0012671 under administration of Dr. Timothy Fitzsimmons.

Maysam Mousaviraad
University of Wyoming

Date submitted: 01 Aug 2019 Electronic form version 1.4