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PRESENTED BY THE WATERLOO INSTITUTE FOR SUSTAINABLE ENERGY

Thursday September 20, 2018
10:30 – 11:30 am
E6-4022

THE NEW FAST.FARM:
WIND FARM DESIGN & ANALYSIS

Jason Jonkman, Senior Engineer, NREL

FAST.Farm is a new mid-fidelity, multi-physics engineering tool for modeling the power performance and structural loads of wind turbines within a wind farm, including wake and array effects. FAST.Farm is based on the principles of the Dynamic Wake Meandering (DWM) model, but addresses many of the limitations of previous DWM implementations. Previous calibration of the tunable model parameters of FAST.Farm has shown that its prediction of wake dynamics for a single wind turbine across different atmospheric stability conditions and nacelle-yaw errors matches well with high-fidelity large-eddy simulation, at a small fraction of the computational expense.

This talk presents a validation of FAST.Farm against large-eddy simulation for a series of cases—independent from those used to support the calibration—considering single turbine and small wind farm scenarios, both subject to variations in inflow and control.

The validation has demonstrated that FAST.Farm accurately predicts (1) thrust and power for individual turbines both in isolation and down the row of the small wind farm, (2) wake meandering behavior across different atmospheric conditions and (3) averaged wake-deficit advection, evolution and merging effects. The validation also highlights potential physics that could be improved in FAST.Farm in the future.

Biography

Dr. Jason Jonkman is a Senior Engineer at NREL, which he joined in 2000, and leads the wind turbine engineering tool development activities, including the FAST software for modeling the dynamic response of land-based and offshore wind turbines.

Jason currently co-chairs an IEA Wind research task on developing, verifying, and validating simulation models for offshore wind turbines. He also is a U.S. representative on the IEC working group to develop an international technical specification for the design of floating offshore wind turbines. He holds a Ph.D. in Aerospace Engineering Sciences and an M.S in Mechanical Engineering from the University of Colorado, and a B.S.E. in Mechanical Engineering from Dordt College in Sioux Center, Iowa, United States.

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