Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Blade Resolved Wind Turbine Simulation with the Hybrid Time-Averaged Model Split Turbulence Model[1] JEREMY MELVIN, The Oden Institute, University of Texas at Austin, MARC HENRY DE FRAHAN, SHREYAS ANANTHAN, GANESH VIJAYAKUMAR, National Renewable Energy Lab (NREL), ROBERT MOSER, The Oden Institute, University of Texas at Austin — Blade resolved numerical simulations of wind turbines are an essential tool to help guide turbine design and placement in wind farms. Due to the high Reynolds number of these flows and the complex geometry of the turbine, a computational approach utilizing Reynolds Averaged Navier Stokes (RANS) or hybrid RANS/Large Eddy Simulation (LES) turbulence models are needed for computational feasibility. However, typical turbulence modeling approaches struggle with the complex flow characteristics present in flow fields around wind turbines. The newly developed Time-Averaged Model Split (TAMS) hybrid RANS/LES approach described by Haering et al. (AIAA Scitech 2019 Forum, AIAA 2019-0087, 2019) has shown the potential to resolve many of the issues with existing hybrid approaches for these complex flows. In this talk, we discuss efforts to conduct a blade resolved wind turbine simulation with the TAMS model. We integrate TAMS with a base SST RANS model, and conduct both airfoil and turbine simulations to compare performance and efficiency with standard DES hybrid approaches. We highlight the advantages of TAMS and discuss a path forward for additional improvements.

[1]Exascale Computing Project (17-SC-20-SC), U.S. Department of Energy's Office of Science and National Nuclear Security Administration

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Date submitted: 01 Aug 2019 Electronic form version 1.4