Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

A low-order wake interaction model for ocean current turbine arrays operating in turbulent flow[1] PEYMAN RAZI, PRAVEEN RAMAPRABHU, Univ of North Carolina - Charlotte, MIKE MUGLIA, Coastal Studies Institute, PRASHANT TAREY, Univ of North Carolina - Charlotte — Ocean Current Turbines (OCTs), which function similarly to wind and tidal turbines, represent a promising technology for harnessing the energy from oceanic currents. The power extracted by the turbines can be significantly affected by the turbulence intensity in the upstream flow. For turbines distributed in an arrayed configuration, the highly turbulent wakes behind each upstream turbine must also be considered. In this presentation, we describe a low-order analytical wake interaction model capable of estimating the total array power of OCTs operating in any stacked configuration, and embedded in a flow with Turbulence Intensity (TI). The model incorporates both near and far-wake effects associated with each turbine, and has been validated using high-resolution Large Eddy Simulations (LES) performed using the STAR-CCM software. The simulations were driven by realistic ocean turbulence conditions derived from Gulf Stream current measurements. The analytic model was validated over a wide range of turbulence intensities and OCT array configurations, and can also be applied to evaluate the performance of wind turbine installations.

[1]This work was supported by the Coastal Studies Institute's North Carolina Renewable Ocean Energy Program.

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Date submitted: 31 Jul 2020 Electronic form version 1.4