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On the near-wake characteristics of a tidal current turbine model in a sheared turbulent inflow[1] ASHWIN VINOD, ARINDAM BANERJEE, Lehigh University — Tidal current turbines deployed in tidal flows can be anticipated to encounter sheared and turbulent flow environments. Therefore, a thorough understanding of the implications of such operating conditions would be valuable in optimizing the performance and operational life of the installed turbines. The ongoing experimental work at Lehigh University aims to improve the understanding of tidal turbine performance, and the mechanism of momentum transfer in its near-wake in a controlled, sheared, turbulent inflow. A 1:20 laboratory-scale tidal turbine model with a rotor diameter of 0.28m is used in the experiments. An active grid type turbulence generator consisting of a series of five stepper motor-controlled horizontal winglet shafts is employed to generate a vertically sheared, turbulent inflow. To better control the shear profile, winglets with different sizes/solidities are utilized in the active grid. All flow measurements were carried out using an acoustic doppler velocimeter. In addition to performance metrics, and mean, turbulent wake characteristics, contributions of the different terms in mean momentum and kinetic energy equations are also examined to better capture the process of wake re-energization.

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