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Turbulent inflow and wake of a marine hydrokinetic turbine, including effects of wave motion TOBY DEWHURST, MATTHEW ROWELL, JUDSON DECEW, KEN BALDWIN, ROB SWIFT, MARTIN WOSNIK, University of New Hampshire — A research program to investigate the spatio-temporal structure of turbulent flows relevant to marine hydrokinetic (MHK) energy conversion, including turbulent inflow and turbine wakes, has been initiated at UNH. A scale model MHK turbine was deployed from a floating platform at two open water tidal energy test sites, one sheltered (Great Bay Estuary, NH) and one exposed (Muskeget Channel, MA). The inflow upstream of the turbine under test was characterized using an acoustic Doppler Velocimeter (ADV) and an acoustic Doppler current profiler (ADCP), which vary considerably in temporal and spatial resolution as well as practical applicability in this environment. The turbine was operated at previously determined peak efficiency for a given tidal current. The wake of the turbine was measured with a second, traversing ADV during ramp-up and at peak tidal current velocities, at two to six shroud diameters downstream. An inertial motion unit installed near the turbine hub is used to correct for platform motion. A platform-mounted wave-staff and an independently taut-moored pressure sensor were used to measure wave climate. Together, these data are used to validate theoretical and tank model results for utilizing surface-based platforms for MHK turbine deployments.

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