Abstract Submitted
for the DFD16 Meeting of
The American Physical Society

Cross-flow turbines: progress report on physical and numerical model studies at large laboratory scale[1] MARTIN WOSNIK, PETER BACHANT, University of New Hampshire — Cross-flow turbines show potential in marine hydrokinetic (MHK) applications. A research focus is on accurately predicting device performance and wake evolution to improve turbine array layouts for maximizing overall power output, i.e., minimizing wake interference, or taking advantage of constructive wake interaction. Experiments were carried with large laboratory-scale cross-flow turbines $D \sim O(1m)$ using a turbine test bed in a large cross-section tow tank, designed to achieve sufficiently high Reynolds numbers for the results to be Reynolds number independent with respect to turbine performance and wake statistics, such that they can be reliably extrapolated to full scale and used for model validation. Several turbines of varying solidity were employed, including the UNH Reference Vertical Axis Turbine (RVAT) and a 1:6 scale model of the DOE-Sandia Reference Model 2 (RM2) turbine. To improve parameterization in array simulations, an actuator line model (ALM) was developed to provide a computationally feasible method for simulating full turbine arrays inside Navier-Stokes models. Results are presented for the simulation of performance and wake dynamics of cross-flow turbines and compared with experiments and body-fitted mesh, blade-resolving CFD.

[1]supported by NSF-CBET grant 1150797, Sandia National Laboratories

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Date submitted: 01 Aug 2016 Electronic form version 1.4