

Abstract Submitted
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Wake visualization behind multiple VAWTs in a wind tunnel using sPIV COLIN PARKER, MEGAN C. LEFTWICH, George Washington University — This work visualizes the wake behind multiple vertical axis wind turbines (VAWTs). The flow is visualized in a wind tunnel behind scaled model VAWTs driven at constant rotational velocity. The wake is visualized using stereo particle imaging velocimetry (sPIV) at the mid-plane downstream of the turbines. Syncing the sPIV system with the rotation of the turbine allows images to be taken at known phase angles. These images are then averaged to see the phase-averaged wake behind the VAWTs. Moving downstream, the averaged wake structure can be tracked by phase matching. Initially, data was taken in the near wake behind a single VAWT. As the blade turns normal to, and then back towards the free-stream, a vortex structure is shed into the wake and moves downstream. The out-of-plane velocity corresponding to this vortex pair shows the structures to be highly three-dimensional. Phase averaged wakes show distinct structures behind the turbine that move downstream with the free stream. Next, we measured the wake interactions behind a two turbine system. In this setup, a pair of counter rotating VAWTs is placed in the wind tunnel. We can vary the spacing and orientation between the counter rotating pair to compare changes in the downstream wind profile.

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