

THE EFFECT OF CROSS-TURBULENCE ON COUNTER-ROTATING VERTICAL-AXIS WIND TURBINES, J. P. Massey, W. D. Heidorn, D. Marx*, Illinois State University, Department of Physics, Normal, IL 61761, marx@phy.ilstu.edu

When wind turbines rotate, cross-turbulence is the byproduct. The cross-turbulence, or wake, results in a non-uniform flow of the air as it reaches the next sequential turbine. If vertical-axis wind turbines (VAWTs) are in an array with symmetrical rotation, the resulting wake will be in the opposite direction of the rotation of the neighboring turbine. By having an array of counter-rotating VAWTs, the cross-turbulence produced will flow concurrently with the rotation of the subsequent turbine. The effect cross-turbulence had on the power output was examined for counter-rotating VAWTs with relation to symmetrically rotating VAWTs. The savonius wind turbine design was utilized in the examination of the effect of cross-turbulence on counter-rotation configurations of VAWTs. Results produced from the analysis of cross-turbulence acting on VAWTs will hopefully provide a better understanding about the orientation and spacing of the turbines.