

## Executive Summary

This report summarizes collective knowledge and documents to date practical results in the field of wind power generation, achieved by WSU-EvCC cross institutional team. Additionally, a portion of this work concerning electrical engineering, signify a senior capstone project achievement for the WSU electrical engineering team. Current academic year's success recognizes and builds on the previous year's wind energy team's extensive research and is grateful for their intellectual legacy. This year, the team has taken a top-down approach in research and development of the prototype. It was decided to avoid extensive fundamental research and study of competitors achievements. Design priority was given to the commercially available components based on a trial-and-error approach. This permitted relative freedom from the burdens of predisposition to operate in the wake of someone else's success, allowing more experimental courage and satisfaction with the accomplishments. This year, the team has returned to the traditional horizontal-axis wind turbine design with autonomous pitch, yaw, and load control. Although autonomous yaw control was beyond the CWC requirements, the design experience was determined to be beneficial to the achievements within the scope of the senior capstone project, and perhaps future teams' research. The electrical team has expanded on the previous year's turbine and load control component ideas and developed its own robust approach to power management, voltage regulation and generator selection. The mechanical team had less luck with previous year's work since very few design solutions of last year's vertical-axis turbine design were applicable in the horizontal-axis design. After initial experiments and conceptual deliberation, the control team has settled with selecting the rotational speed of the machine as the primary pitch control input and wind speed as primary load control input, implementing separate controllers for each device connected via communication bus. Additionally, beyond the CWC requirements scope, some team member's time was ded-

icated to the development of the HMI, data acquisition and live power output monitoring systems, this was done with consideration for broader wind farm project development. For this purpose, MakerPlot software was chosen, and a suitable application was developed, however because of limited competence in this field of work and limited human resources it was not integrated into the final design. The immediate state of the prototype and the project progression is determined satisfactory. The team was able to achieve its selected objectives in control of the turbine and power generation. Work is continuing to finalize turbine-load communication, final blade, and foundation design along with revisions to the pitch actuator mechanism.