Toward Designing an Omni-directional Vertical Axle Wind Turbine

Chen, Ting-Ru (School: Taipei First Girls High School)

Well-designed small wind turbine generators demonstrate high potential to capture turbulent wind power. We can break up the load of a large generator to many smaller ones to power local residents in urban areas. We study how to fully utilize omni-directional weak-to-medium wind foce to generate power constantly. By surrounding a Vertical Axle Wind Turbine (VAWT) with a set of guide vanes (GVs), we can build an omni directional wind turbine. For the VAWT, we reconfigure the blade setup for the wind to propel blades twice faster and can fully transform wind power from all directions to yield positive torque. Besides, we proposed to equip the VAWT blades with flaps to increase lift to propel blades from same airflow. For the GV set, we integrate both vertical and horizontal GV sets to re-direct omni-directional wind to positive torque to boost the VAWT propelling. In this project, we built a small VAWT prototype to conduct the experiments for different blade and flap conditions. Also, a full-fledged VAWT integrated with GV sets are used in the field trials. The proposed VAWT design and GV sets can work seamlessly to act as a small but high efficient electricity generator for the urban areas. This omni-directional wind turbine can be expected to be broadly used in urban areas with narrow and crowded buildings to fill up the gap of electricity generation.

Awards Won: