I. Design Objectives and Components

The objective of our turbine design team was to create a turbine that performed well in the CWC test environment. The turbine had to fit within the bounding box shown in Figure 1. The bounding box is a 45 cm cube mounted on a 15 cm diameter cylinder which extends downwards to the underwater foundation attachment resting on the 24 × 25 × 15 cube of water immersed in sand. The turbine blades needed to be completely enclosed in the cube. The turbine was supposed to start at the lowest wind speed possible, then produce power of varying levels until wind speeds of 11 m/s and respond to load disconnect scenario in a controlled manner. All turbine components were to be designed to withstand wind speeds of 22 m/s. The electrical system needed to work with an out of box motor to be used as a generator. The motor produced AC power which needed to be converted to usable DC power. A system to adjust resistance on the circuit to maintain optimal power output during the variable conditions needed to be designed. Finally, a control system needed to be designed to adjust pitch based on rotational speed of the turbine and maintain maximum torque generated from the wind.

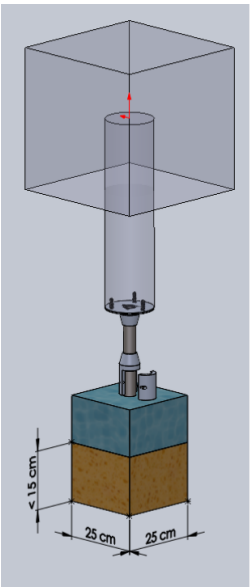

Fig. 1: Design constraints