

Offshore Wind Turbine Restated Scope and Project Plan Report



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January 16, 2014

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1. Overview

Offshore wind turbine (OWT) defined: The purpose of our design project is to design a wind turbine that can successfully operate offshore without connection to the sea floor, while reducing construction cost. Additionally, the team has added the dimension of autonomy to the design, which will allow the floating turbine to self-navigate to its selected location and self-orient, as necessary. With the final design selected, the processes of detailing design, component analysis, materials procurement, and construction scheduling have been planned and partially completed. Each component of the final design, including the turbine blades, generator, tower, foundation, and electric motors need to be scaled down to a tangible model with dimensions of 1 meter by 1 meter by 2 meters. Furthermore, a few more specific criteria have been added to prove the team's engineering ability. These will be further explained in the next section.

Revised Scope: The current scope requires production of a scaled model of the floating wind turbine designed last semester. This scaled model should be able to perform its task in shallow water on a lake, under the natural conditions present. The scaled model should adhere to the newest design requirements and be able to perform its tasks while under those constraints.

Revised Major Goals and Objectives: To provide a scaled model of the floating wind turbine designed last semester to present to the judges and prospective investors. Presentations using this scaled model can serve as an inspiration, a research opportunity, or a business idea. Our job as a team will be to construct the most complete and functional form of our design. The final product should include innovative elements of the design while meeting power production and functionality goals and staying within budget.

2. Modifications to Fall final report

In regards to modifications since the previous semester's final report, some changes have been made in order to have a successful Spring semester. Due to issues that were encountered at the beginning of the semester, the scope/goal of the project changed slightly with a new focus on design criteria and metrics to be accomplished. This question was brought to our attention at the final presentation in the fall. A senior design project requires implementing the knowledge learned in the classroom and applying it to major design project of value to our sponsor, the College of Engineering. This challenge is something that the Offshore Wind Turbine team is already addressing. There will be objectives and obstacles that the scale model will need to be able to pass when the testing session towards the end of the semester. Currently, the main design criteria that will be tested include:

1. Turbine will maintain ability to remain "static" in one area when placed
2. Turbine will produce X energy, with X efficiency
3. Turbine will have a limit of 0.5% maximum displacement and adhere to Det Norske Veritas design code

The group will soon decide on quantitative values for radius size of floating zone, efficiency, and wind speeds. These criteria's have already been approved and reviewed by the team's sponsor. Criteria #3 will most likely be the most difficult challenge to achieve and overcome, due a limit known as Serviceability Limit State, which guarantees satisfied operating conditions of the wind turbine. Calculations for the full scale model will need to be computed, to ensure that the scaled model prototype will function properly.

3. Midterm corrections

Throughout this project, many changes have occurred which continue to vary the future outcome. The team has continually adapted to each of these changes to the best of ability and will continue to do so. The aim of the prototype was to incorporate as many features (autonomy, power generation, pitch control, sensors, etc.) of our design possible in the allotted time frame to represent the full scale model. To achieve this, the team structured them to categories from basic to complex operation. Based on difficulties as we progressed would dictate the allowable options to be presented. As of now there are no expected changes to our schedule.

The sponsor has made some requests that haven't necessarily changed this direction but rather reinforced the focus of priority with the prototype. A primary concern we were unable to address in detail was the anchoring system. When the team demonstrates the function, the ability to remain in one location, or rather a radius, will be included. Other important factors from the project objectives including structural stability, power generation, and various operating conditions will be scientifically shown to perform as expected.

4. Newly developed concerns

Right now we have not encountered many problems that were unseen. As the focus shifts from the design of the full scale model to the prototype, the team's only running into issues about testing. For example, we had some problems when trying to figure out the location of testing and how to control the parameters of what conditions need to be tested. Ideally the location would be open water using GPS signals to control the prototype, however due to problems in controlling the wind speed and wave activity the testing site has been moved to a small pool. As a result, the programming will be done using timing delays to simulate the movement. Right now the wind turbine is on schedule, and any new problems will be documented accordingly.

5. Updates on Procurement

At the moment, no materials have been ordered, but the group has been approved by the sponsor to make two orders during January. All finalized items and materials will be ordered between the two submissions. Since the group is using University Research funding, the group must utilize a specific mandated order placement. The group must first receive a quote for all materials to be ordered. The quote is then brought to Mrs. Booker in the Civil Engineering Department, who will then order the materials. It is imperative that the businesses are registered in FSU's purchase list in order to save time. As of right now, the selected businesses in which materials will be acquired from maintain the credentials with FSU to have smooth transactions. Orders are expected to be put out by January 31, 2014. All associated businesses are local and thus, we should receive the items within a week of placing the purchase order. There are no foreseen circumstances that will delay the schedule provided below. Please refer to Gantt Chart on next page.

6. Ghant Chart

