**Thesis Project Portfolio**

**Harnessing the Power of the Seas When Generating Sustainable, Floating Wind Power**

(Technical Report)

**The Social Acceptance of Wind Energy**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

**Kyle Dana**

Spring, 2021

Department of Mechanical Engineering

## Table of Contents

## Sociotechnical Synthesis

Wind energy is one renewable which can facilitate the acceleration of clean energy production. However, some changes to the existing technology and public perception of wind energy must be made because the not in my backyard (nimby) movement has set up road blocks for the existing structure. The challenge of my thesis projects is making developments to decrease nimby resistance and increase the implementation of wind turbines to produce green energy. My technical and STS research focuses on this issue through the testing of floating wind turbine bases and analysis of the nimby movement, respectively.

The technical research project consists of developing a floating wind turbine base that is stable and economical. This research is important to the increased acceptance of wind energy because the ability of floating wind turbines to be implemented at far distances in deep water eliminates the major issues the public and nimby movement have with turbines, which are the disturbing sight and sound of them. We set out to find what the most stable floating wind turbine base would be by comparing two different bases which we designed and 3-D printed. These were the Principle Power Base with and without chains and the Naturally Pressurized Base. It was found that the Principle Power Base with chains was most stable.

The STS research project is focused on the social acceptance of wind energy and the nimby movement in the digital era. I set out to find why the nimby movement is so influential and what the steps forward are to improve the social acceptance of wind energy. I found that the nimby movement has armed themselves through the use of online forums to spread their opinions on renewables and shut down projects. Through my research, I found that the most important action for wind energy developers to take is to combat these strengthened nimby

groups with their own online presence. This can increase public trust and knowledge in wind energy, which is crucial to wind energy success.

Through my research, I was able to achieve my goals of finding technical and social solutions to increase the implementation of wind energy. I learned how to work with a dynamic team and we were able to delegate duties, work together, and also work independently. I believe that the projects were fruitful since we have ended with results, however, I know that there are still unanswered questions regarding the technical project. A more thorough testing involving wind speeds and a more precise economic analysis would help to provide a more complete model to compare with existing technologies. Researchers should continue studying the development of nimbys online for developers to adapt to the changing roadblocks presented to wind energy.

I would like to thank Dr. Momot and Professor Ferguson for their guidance throughout my research, Dwight Dart for his help at the rapid prototyping lab, and the MAE department for funding and testing facilities. I would also like to thank my capstone group for their contributions to this project.