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STS 4600

## Socio-technical Synthesis: Floating Wind Turbines

The focus of my works for the year were floating wind turbines. Floating wind turbines are energy generating devices that are placed offshore on platforms that float on top of water, primarily the ocean. My two works seek to explore two aspects of these turbines. My technical work focuses on designing an active stabilization system for the turbines in order to keep them upright in varying conditions. My research focuses on the impacts of a wind turbine project completed by the Japanese Government in the 2010s and how its removal has failed the people of Fukushima. Together, these works provide a unique perspective and design possibility for bringing these turbines into society. Considering technical and ethical issues are crucial when creating a new product and my papers seek to address both issues.

The goal of my technical project was to design a scale-model of a floating wind turbine base which used active methods for maintaining its stability. Introducing active stabilization to a floating wind turbine design provides the unique ability to reliably counteract forces acting upon the structure from wind, waves, and currents. The active stabilization method had to be designed considering constraints of codes, constructability, cost, functionality, maintainability, sustainability, standards, and more. Following a meticulous design process, I was able to assemble a physical prototype of an active stabilization method and test its effectiveness in water.

My research paper focuses on the care ethics associated with the Fukushima Offshore Floating Wind Turbine Farm in Fukushima, Japan. This wind farm was created in 2013 and

removal was started in 2018. The project was designed as a symbol of hope for the citizens of Japan and to provide necessary power after the loss of the Fukushima Nuclear Power Plant, however, the project failed to exercise care to the people of Japan. Based on Carol Gilligan's Care Ethics with a revision by Elisa Warford, it can be found that the turbine project failed to meet the ethical goals of attentiveness, responsiveness, and competence associated with care for the people of Fukushima.

Working on these projects together dramatically changed how I approached my view of engineering and changed my analysis of my work. Engineering involves not only designing products but also considering their impact on society once released. By performing an analysis of a project that employed the technological components I was researching, I was able to gain a deeper understanding of the potential short- and long-term implications of a project on people. On the other hand, seeing how one project failed a group of people influences design when proposing and implementing new ideas. Overall, this process had added to the experience of intense technical design as well as understanding the implication of a design on society.

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