The Struggle Over Offshore Wind Energy

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Within the U.S., 19.8 percent of electric power is generated from renewable energy sources; hydropower and wind account for most of the renewable share. Wind energy is a very viable option to reduce climate change but there has been resistance in wind projects in places such as Florida, Nantucket, and Massachusetts. The Vineyard Wind Farm in Massachusetts for example has seen struggles from the residents near it to the point where the Department of the Interior has had to review their permits. The Cape Wind Project was set to be one of the first offshore wind farms in the United States decades ago, but has seen almost no progress due to the local groups including Native American tribes and nearby residents. The newest offshore wind project is the Virginia Offshore Wind Farm located off the coast of Virginia Beach, Virginia. The project has built two wind Turbines with a plan of around 180 more to come. The Virginia Wind farm has gained much traction and has had significant progress. Through the analysis of this paper of comparing this particular farm to the other, failed farms, how is the Virginia Offshore Wind project different from the rest with it being successful without community backlash. Almost every wind farm project so far has had some sort of backlash either from the community or the local government. To ensure that this project is viable for the people of Virginia, it is necessary to compare this project to other successful as well as failed wind farm projects, both on land and offshore. Once the project is finished, it will also release strain on the climate through reducing the use of fossil fuels to produce energy in the Virginia Beach region. This will provide less air pollution and enhance Virginia as a leader in the sustainable energy sector in the U.S.

Background

Wind energy can serve a growing share of total energy demand. The Coastal Virginia Offshore Wind project (CVOW) off the coast of Virginia Beach is the newest development in green energy and is predicted to provide electricity to 650,000 homes by its completion. CVOW has substantial implications for Virginians including less air pollution from the burning of natural gas, Virginia's main power source. The overflow of jobs in the area will help build up the economy not only for the residents of Hampton Roads but the entire state.

Research into general wind energy has shown that there are proven benefits as well as downfalls to this type of green energy. Carstensen et al. (2006) found that the Nysted Wind Farm in Denmark harmed the local porpoise population. Hindmarsh (2014) attributed protests and lasting distrust of "big wind" in Australia to developers' failure to accommodate the populations affected. In a study of coal and wind energy in West Virginia, Collins et al. (2012) found that cumulative employment and earnings became higher when wind energy plus underground mining of coal was utilized as opposed to only coal mining.

There are many players that have a role in the construction and social implementation of the Virginia Offshore Wind project. Participants include manufacturers, trade associations, federal agencies, as well as residents of the area. Manufacturers include contractors and site developers. Dominion Energy (2020) is the leading developer of the CVOW project. Dominion is Virginia's principal electric power company. It aims to achieve net-zero greenhouse gas emissions by 2050, and CVOW project is part of this plan. Siemens Gamesa, a renewable energy company, will build the turbine blade facilities at the Portsmouth Marine Terminal, where the turbine equipment will be delivered (Siemens Gamesa, n.d.). Siemens Gamesa wind plants generate 100GW, enough power for 87 million homes (Siemens Gamesa, n.d.).

For the trade associations, the first is the Virginia Conservation Network (VCN) representing 150 advocacies committed to protecting Virginia's natural resources (VCN, n.d.). VCN's values demand that Dominion ensure that the CVOW project offers affordable power and employment opportunities (VCN, n.d.) for the Virginia area. The second participant is the Sierra Club, a national environmental advocacy group. It supports the CVOW, noting that it may provide upwards of 14,000 jobs (Sierra Club, 2016). The Sierra Club has been a large advocate of the project since the beginning stages years ago. It has helped achieve public engagement with the affected community so that the project is viewed better with the public. The Sierra Club banner is next to the Virginia flag on top of the two turbines already constructed. The main government participant is the Bureau of Ocean Energy Management (BOEM), an agency of the U.S. Department of the Interior. It reviews and approves offshore energy projects. The BOEM approved the CVOW project in 2013 (BOEM, n.d.) granting it the federal area in the ocean necessary. The CVOW project has been in the making for over a decade when it comes to the architecture, layout, and now construction and the BOEM was the first step of the road to get the project approved.

Residents of nearby Hampton Roads and Virginia Beach are divided about CVOW. Ron Spangler, a Norfolk fisherman, told a reporter he had feared the project would reduce his catch. Following the installation of the first two turbines, however, fishing improved because the turbines offer fish artificial reefs. Spangler now supports CVOW. "It's going to be unbelievable," he said (WTKR, 2021).

When looking at the current success of the Virginia Offshore Wind Project with two turbines already constructed, one may ask why has this project had so much success when others are failing, and what is different about it? There is an apparent lack of opposition to this project

as outlined in the introduction. Research of other, failed projects had been conducted to compare their failures and what Dominion Energy is doing differently socially, economically, as well as the construction of the farm.

The Vineyard Wind farm off the coast of Massachusetts is the first commercial-scale offshore wind project. After decades of design, permits, and setbacks, the project started in November of 2021. This, along with the Virginia Wind Project, will be the two largest offshore farms in the country. Though, the Massachusetts farm is hitting a few setbacks. The most recent comes from the Department of the Interior. During the process of presenting and applying for permits for the project, the local residents have not been completely satisfied with the impact of the project. The largest opposition the project has faced has been its potential effect on the fishing industry, which has already been lacking due to overfishing of Massachusetts wildlife and resources (Main et al., 2019). The Department of the Interior has recently decided to postpone the project and require an additional layer of review because of this fishing problem from the local residents and companies.

The last project that will be discussed is the Hornsea Project 1 off the coast of the United Kingdom. The farm is a joint venture with the company Orsted (which is involved with the CVOW project) as well as Global Infrastructure Partners. It is part of a $8.1 billion investment to transform the region it is in into a hub for the United Kingdom's renewable energy sector. The farm consists of 174 Siemens wind turbines producing 1.2 Gigawatts of power making it the largest and first wind farm to surpass the 1 GW limit. The project commenced in 2016 with the installation and construction of supporting buildings and infrastructure and was completed in October of 2019 when the last wind turbine was placed on site. The location it sits was chosen

for its favorable climate conditions as well as its water depth which lies between 20 - 40 meters. This project is the first of three projects (Power Technology, 2021).

Theory

The main participants that were chosen were the construction and management companies of the CVOW project, sustainability associations that either support or have growing concerns about the project, and government agencies such as the Bureau of Ocean Energy Management as well as the Department of the Interior. Examples explained in the later sections involve how the project has reached out and created relationships with local fishery associations and groups as well as how the three levels of government have partnered with this shared concern over the marine life around the project.

Methods

The type of research that was conducted for the essay is Documentary Research. This is research that has been conducted in order to answer the research problem examined in the introduction, and in which the answer is substantiated through evidence from primary and secondary source documentation. Firstly, research was conducted through databases including Web of Science and JSTOR. These were used to find scholarly articles on the validity of a wind farm in West Virginia vs. Coal as well as problems that European farms have faced. Regarding the Coastal Virginia Offshore Wind project, online research of primary and secondary sources were conducted including news articles and more importantly press releases.An emphasis was placed on the stakeholders as well as the government agencies and programs that are relevant to the farm. The stakeholders include companies constructing the project, environmental agencies

supporting it, and the Bureau of Ocean Energy Management. Lastly, research comparing the Virginia project to other failed wind turbine projects in Massachusetts was conducted for the final analysis on how the Virginia farm lacks opposition and if it has support in its region. These comparisons stem mostly between local participant's quarrel with the projects and with the cost analysis of each of the projects.

Analysis

The Coastal Virginia Offshore Wind project has had significantly less opposition to projects which compare similarly to it. As mentioned in the background context section, the Massachusetts farm, Vineyard Wind, has been paused due to opposition from local groups. The groups include local residents, fishermen, and an Indian tribe. These concerns have been seen by the U.S. government's Department of the Interior to the point where the regulations and permits are being reviewed to prove the validity of the project. This has caused a shiver down the wind industry, especially for the CVOW project, making it impossible to ignore these complaints. What the Virginia project is doing differently is with years of public engagement, the project area is free of conflicts with the fishing industry as well as shipping and military operations which are heavy in the area. Through Dominion Energy, the Coastal Virginia Wind Farm project team has devised various ways through federal, state, and local governments to community outreach. The largest concern for surrounding areas is fishing. Since 2009, there have been fisheries outreach through this project as well as others. The Bureau of Ocean and Energy Management established the Virginia Intergovernmental Renewable Task Force to execute two things; to process the identification of potential areas for leasing of wind farms that minimizes ecological and user sensitive areas and to receive input from stakeholders of the project and

concerned citizens (Dominion Energy, (n.d.)) . The Virginia Department of Mines, Minerals, and Energy (DMME) has founded the Virginia Coastal Zone Management (VA CZM) program to develop a process for working with commercial/recreational fisheries in which its final report was issued in 2016, prior to the commencement of the first two turbines. Through the VA CZM, port meetings about concerns on the project have been hosted across all of Hampton Roads, from Chincoteague to Virginia Beach. The project had its own Fisheries Liaison in 2018 until present who hosted port visits from different cities with presentations provided to local fishing organizations, conducted fisheries roundtable meetings for the community, and provided regular status updates on the pilot construction of the farm (the first two turbines) and survey activities (Dominion Energy, (n.d.)). All mariners were encouraged to contact the Liaison through Dominion Energy with any questions about the status of the project when it came to fishing and wildlife in the area (Dominion Energy, n.d.).

As mentioned in an earlier paragraph, the Virginia Turbines are even helpful for the ecosystem, creating undersea structures for marine life and coral to live on. A similar concern with the project is not only during its 30 year span, but also during its construction, and how it will affect the marine mammals with all of the noise pollution in the ocean from machines. The fix to this issue is that the construction companies decided to use the concept of a “bubble curtain” at the base of a turbine in construction to muffle noise and reduce interference with the wildlife (Main et al., 2019). These programs have been aimed for the local community, but the federal and state governments have also involved other sources of aid including the Marine Mammal Commission, the US Fish and Wildlife Service, and US Army Corp. of Engineers on the federal side. Within Virginia, the Virginia Departments of Historic Resources, Environmental

Quality, and the Virginia Marine Resources Commission on the state government side (Dominion Energy, (n.d.)).

The other chief complaint of the Cape Wind farm in Massachusetts was from the wealthy residents in the area. They did not want the view from the beach to include this offshore farm, which would have decreased housing prices. How the CVOW learned from this was simple, put them further away. The Cape Wind project is located between four to 11 miles off of the coast, while the Virginia project is at 27 miles. While this seems like an easy fix to the problem, it also means that the Virginia project is and will be allocating more funds to traveling that larger distance by water as well as making the turbines themselves deeper to reach the ocean floor. When it comes to physical, or non-monetary budgeting, the project has learned from failed farms and has decided to locate the Virginia farm far enough away as to not obstruct the beach view from residents while still providing clean energy to the community.

The third largest problem facing the CVOW farm is its related costs. In early November, Dominion Energy's CEO stated that the previous estimation of $7.8 billion will climb to approximately $9.8 billion, roughly a 25% cost increase (Sidersky, 2021). This is a large price tag for a project whose life expectancy is 30 years with maintenance and produces concerns of where Dominion will pull the money from. Overall though, when completed, it should only cost residential customers using the wind energy about $4 more per month over what they are already paying for energy. The failure of the Cape Wind project led to millions being spent only for one weather turbine being built. This is the nightmare of the wind industry, where costs overcome the project, making the owners abandon it. On the proponent side, the project will create around 900 jobs and generate about $5 million dollars per year in local and state tax revenue and then another $143 million in economic benefits annually during its construction (Sidersky, 2021). But

this still does not show short term benefits. Stephen Haner, a former Virginia Lobbyist stated, “The biggest problem with this is the idea of putting all the risk on the backs of just Dominion ratepayers" (Richards, 2021). The cost in total, including equipment rental and material could be closer to $17 billion, without Dominions profit. As much as the project will be helping climate change, it also must benefit the people who are receiving the energy. If the project has rising costs, the more it will cost the residents using its energy, harming those who may not be able to afford the electricity cost increase. Time and time again, the U.S. has wind projects that fail due to the lack of funding, which could happen with this ambitious Virginia project.

The framework of this research paper questions why the CVOW project has not had as much opposition. Through analysis, the main reason is because of the engagement the project managers, company, and state have had with local residents, fishing associations, and the overall community.

Conclusion

The Coastal Virginia Offshore Wind (CVOW) project has been and will continue to be a massive success for the clean energy industry with its sights set on becoming the largest offshore wind farm in the United States. Throughout the history and developments of the wind industry, there have been many successful projects such as the Hornsea 1 project in the United Kingdom, as well as failed projects such as the Cape Wind project in Massachusetts. As these projects keep being created and implemented, the new ones must learn from the old one in a technical and monetary sense, but equally as important, in a social sense. The social aspect of the projects refers specifically to how the project will affect the local communities including groups, citizens, and the marine wildlife in the ocean. Since the beginning of the CVOW project, there seems to

have not been much backlash of the new development, and this paper examines reasons for this. The companies involved with the CVOW farm, specifically Dominion Energy, have community outreach programs, examined in the analysis section, even before construction of the turbines began. With systems to prevent harm to marine life during construction, Dominion Energy is protecting the environment throughout the entire process of implementation and later maintenance. Additionally, they are providing ways for local fisheries to still be able to use the area during the construction of the entire farm. Through investigating other projects and how they have reacted to residents' complaints, it is clear that through outreach connected to the Virginia Farm, there has been increasingly less complaints or audits to the project, from groups and the state and federal governments. Lastly, even though the Virginia project is still requiring more funds than what was originally proposed, the continual support for the farms ensures that Dominion Energy will continue and plans to complete the project from what they have planned for decades ago.

References

BOEM. (n.d.). Coastal Virginia Offshore Wind Project (CVOW) | Bureau of Ocean Energy Management. https://www.boem.gov/renewable-energy/state-activities/coastal-virginia-offshore-wind-project-cvow.

Carstensen, J., O. D. Henriksen, and J. Teilmann. (2006). Impacts of Offshore Wind Farm Construction on Harbour Porpoises: Acoustic Monitoring of Echolocation Activity Using Porpoise Detectors (T-PODs). *Marine Ecology Progress Series* 321 (2006): 295–308.

CCES. (2021, Oct. 27). Center for Climate and Energy Solutions. Renewable Energy. https://www.c2es.org/content/renewable-energy/.

Chakrabarti, Subrata, John Halkyard, and Cuneyt Capanoglu. (2005). Chapter 1 - Historical Development of Offshore Structures. In *Handbook of Offshore Engineering*, edited by SUBRATA K. Chakrabarti, 1–38. London: Elsevier, 2005. https:/doi.org/10.1016/B978-008044381-2.50004-7.

Collins, A. R., Hansen, E., & Hendryx, M. (2012). Wind versus Coal Comparing the Local Economic Impacts of Energy Resource Development in Appalachia | *Energy Policy*. https://doi.org/10.1016/j.enpol.2012.08.001.

Dominion Energy. (n.d.). Dominion Energy | CVOW Mariners and Fisheries. https://coastalvawind.com/partnerships/supporting-fisheries.aspx.

Dominion Energy. (2020, June 29). Dominion Energy Completes Construction of First Offshore Wind Project in U.S. Federal Waters - Jun 29, 2020. https://news.dominionenergy.com/2020-06-29-Dominion-Energy-Completes-Construction-of-First-Offshore-Wind-Project-in-U-S-Federal-Waters.

Dominion Energy. (September 30, 2020). Welcome to the Coastal Virginia Offshore Wind Project Roundtable. https://cdn-dominionenergy-prd-001.azureedge.net/-/media/pdfs/global/projects-and-facilities/2020-09-30-virginia-coastal-wind-update-roundtable-slides.pdf?la=en&rev=c90f868604534605b6d7a0f5d0ae84b4&hash=8263A503D684B3FD4B4F1290B7F6C07E

Hindmarsh, R. (2014). Hot Air Ablowin! 'Mediaspeak', Social Conflict, and the Australian 'decoupled' Wind Farm Controversy. *Social Studies of Science* 44, no. 2 (2014): 194–217.

Main, Ivy. (2019, Nov. 4). Virginia Is All-in on Offshore Wind but Dominion's Decision Raises Questions about Cost, Competence. *Virginia Mercury* (blog), https://www.virginiamercury.com/2019/11/04/virginia-is-all-in-on-offshore-wind-but-dominions-decision-raises-questions-about-cost-competence/.

Power Technology. (2021, Oct. 14). Hornsea Project One, North Sea. https://www.power-technology.com/projects/hornsea-project-one-north-sea/.

Richards, Heather. (2021, Oct. 20). 'Bloody Expensive.' Major U.S. Offshore Wind Plan Hits Obstacles. E&E News. https://www.eenews.net/articles/bloody-expensive-major-u-s-offshore-wind-plan-hits-obstacles/.

Sidersky, Robyn. (2021, Nov. 5). Dominion Offshore Wind Farm Cost Climbs to $9.8B. *Virginia Business* (blog). https://www.virginiabusiness.com/article/dominion-offshore-wind-farm-cost-climbs-to-to-9-8b/.

Siemens Gamesa. (n.d.). Global Leadership Grows: Siemens Gamesa Solidifies Offshore Presence in U.S. with Virginia Blade Facility. https://www.siemensgamesa.com/en-int/newsroom/2021/10/offshore-blade-facility-virginia-usa.

Sierra Club. (n.d.). Offshore Wind. https://www.sierraclub.org/virginia/offshore-wind.

VCN. (n.d.). Our 2022 Common Agenda - VCN Environmental Briefing Book. *Virginia Conservation Network* (blog). https://vcnva.org/our-common-agenda/.

WTKR. (2021, Aug. 20). How the Coastal Virginia Offshore Wind Project Is Affecting Marine Life. https://www.wtkr.com/news/how-the-coastal-virginia-offshore-wind-project-is-affecting-marine-life.