Kristin Chang

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Vineyard Wind 1 Case Study: First U.S. Large-Scale Offshore Wind Project

Introduction

Transportation and electricity generation are the two major sectors in the United States that emit the most greenhouse gases. There is a rising movement away from gas-powered cars and towards electric vehicles. However, if the electricity needed to power these "cleaner" vehicles is generated from fossil fuels like coal-fired power plants, then the movement is not as clean as it seems. Thus, it is critical that the United States transitions its energy sector away from fossil fuels and towards green sources like solar and wind. President Biden's administration is publicly in favor of both off and onshore wind as a means of cutting the nation's fossil fuel emissions in half from 2005 levels by 2030. Specifically, its goal is to produce 30,000 megawatts of offshore wind by 2030[1].

The first large utility-scale wind farms in the U.S. were installed in 1980 in California. Since then, scientists, economists and the Department of Energy have been refining wind power

[1] Davenport, Coral. "Biden Administration Plans Wind Farms Along Nearly the Entire U.S. Coastline." The New York Times, Oct. 13, 2021. https://www.nytimes.com/2021/10/13/climate/biden-offshore-wind-farms.html

and increasing its share of the nation's energy supply. In 2011, the Departments of Energy and the Interior announced a national offshore wind strategy that involved implementing three offshore wind projects as a $168 million initiative. This continued support for small-scale wind farm developments increased the nation's overall consumption of wind energy incrementally. The first grid-connected offshore wind turbine in the world was installed in 2013 by the University of Maine. Three years later, the first U.S. offshore wind farm was installed off the coast of Rhode Island as a project called the Block Island Wind Farm[2]. This leads to May 2021 when the Departments of the Interior and Commerce announced approval for the first large-scale offshore wind project in the U.S., Vineyard Wind 1, located off the coast of Massachusetts.

Background

Vineyard Wind 1 is an 800-megawatt offshore wind project that will be approximately 12 nautical miles off the coast of Martha's Vineyard[3]. The project consists of 62 wind turbines, spaced 1 nautical mile apart, each capable of generating 13 megawatts of electricity. These turbines are expected to power over 400,000 homes via two submarine cables to be installed along a designated route landing onshore at Covell's Beach in Barnstable, Massachusetts. The onshore cables will be buried beneath public roadways in Barnstable and connect to the New England grid at a substation in the village of Hyannis. This substation will be adjacent to an existing Eversource, New England's largest energy company, substation[4].

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[2] History of U.S. Wind Energy. Accessed October 21, 2021. Office of Energy Efficiency and Renewable Energy – Wind Energy Technologies Office. https://www.energy.gov/eere/wind/history-us-wind-energy
[3] Vineyard Wind 1. Accessed October 21, 2021. U.S. Department of the Interior – Bureau of Ocean Energy management. https://www.boem.gov/vineyard-wind
[4] Nation's first commercial-scale offshore wind project. Accessed October 20, 2021. Vineyard Wind – Vineyard Wind 1. https://www.vineyardwind.com/vineyardwind-1

Vineyard Wind 1 is not the first New England attempt at an offshore wind farm. In 2001, Cape Wind Associates, LLC (CWA) applied for a construction permit for a wind power facility – later known as the Cape Wind Energy Project[5]. Cape Wind was intended to be the first of its kind in the U.S., consisting of 130 turbines in the Nantucket Sound to provide energy to 200,000 homes on Cape Cod. The project was met with strong opposition from many public stakeholders and was terminated without a single turbine constructed 16 years later in 2017. One of the main reasons this project was unsuccessful was the location for the project. The 130 turbines would not only be visible to wealth waterfront property owners like Senator Edward M. Kennedy, Industrialist William I. Koch, and Philanthropist Rachel Lambert Mellon (Bunny), but caused concerns over cost and environmental hazards among local officials, business owners, fishermen, and Indian tribes and residents. These stakeholders formed The Alliance to Protect Nantucket Sound through which they were able to delay the project significantly causing CWA to ultimately relinquish its lease due to an exhausted budget and cancelled construction contracts[6].

There is a lot to learn from the challenges that Cape Wind faced. Vineyard Wind 1 is already off to a better start with its location south of Martha's Vineyard and over 15 miles away from the beaches. The next sections of this paper will detail other challenges Vineyard Wind 1 may face, potential solutions to these concerns, successes of the plan, potential gaps in the project development, and recommendations to improve the project.

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[5] Cape Wind. Accessed October 21, 2021. U.S. Department of the Interior – Bureau of Ocean Energy Management. https://www.boem.gov/renewable-energy/studies/cape-wind

[6] Seelye, Katherine Q. "After 16 Years, Hopes for Cape Cod Wind Farm Float Away." The New York Times, December 19, 2017. https://www.nytimes.com/2017/12/19/us/offshore-cape-wind-farm.html

Challenges

Vineyard Wind 1 will need to overcome obstacles similar to those presented with Cape Wind. Three of the main challenges are that of scale, environment, and politics. Considering Vineyard Wind 1 is the first large-scale wind farm in the country, one of the biggest challenges is the scale of cost and time to implement the project and maintenance to continue its success. Installing turbines can be significantly costly due to expensive materials and the amount of labor required. The project is expected to cost $3 billion total with $2.3 billion already secured for construction alone via a loan financed by nine different banks[7]. One of the challenges and weaker points of the Cape Wind project was the partial personal financing by the project's leader, Jim Gordon. As previously described, the project was eventually terminated in part due to an exhausted budget. Because Vineyard Wind 1 has already secured a substantial loan with more sophisticated financing, it is in a better position to overcome this challenge than Cape Wind. However, if the project hits any delays like Cape Wind did, additional financing strategies will be needed to complete the project as well as maintain it for its lifetime.

This project also faces a variety of environmental challenges. One common challenge with wind energy is that it is intermittent. In other words, the wind may not always be blowing at a consistent speed to provide the appropriate amount of power at all times of day, making the grid slightly unreliable. While the location of Vineyard Wind 1 was determined considering wind speeds, the project does not seem to address a secondary source of energy for a scenario where

[7] Groom, Nichola. "Vineyard Wind secures $2.3 bln loan, allowing construction to start. Reuters, September 15, 2021. https://www.reuters.com/business/energy/vineyard-wind-secures-23-bln-loan-allowing-construction-start-2021-09-15/

wind speeds are lower. The project may have difficulty in achieving its goal of powering 400,000 homes without consideration of a secondary source.

Another common public concern with wind turbines is the threats they pose to natural wildlife. Onshore wind farms are dangerous when placed in flight zones of both birds and bats. One study found that 140,000 to 328,000 birds are killed by wind turbines annually in the U.S[8]. Offshore wind farm projects must consider the additional threat to marine life. Whales and seals are two of the more prominent species the project will need to plan around in the waters surrounding Martha's Vineyard[9]. Environmental impacts such as these were one of the reasons why the Cape Wind project was continually delayed. CWA had to pause their construction efforts in order to conduct further reports or analyses and ensure they were not harming natural habitats. A thorough environmental impact report for Vineyard Wind 1 will allow the project to continue smoothly on its timeline. Additionally, wind farms are often designated as off limits to fishing. In some cases, this may actually offer some protection to wildlife; however, the restriction raises concern for another group of challengers – fishermen.

Political challenges are the most significant reason why Cape Wind was unsuccessful. The Alliance to Protect Nantucket Sound had politically powerful members with the means to delay the project by leveraging genuine public concerns for the environment and the Cape Cod community's livelihood. Vineyard Wind 1 faces a similar challenge. While public opinion of the project seems relatively positive, the Responsible Offshore Development Alliance (RODA) has

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[8] Hogan, Brianne. "Is it possible to build wildlife-friendly windfarms?" BBC – Future Planet, March 2, 2020. https://www.bbc.com/future/article/20200302-how-do-wind-farms-affect-bats-birds-and-other-wildlife

[9] Beach Management – Marine Mammals. Accessed October 22, 2021. Dukes County -Natural Resources. https://www.dukescounty.org/natural-resources/pages/marine-mammals

issued a negative statement on behalf of fishermen in the area. The concern is that the 1 x 1 nautical mile spacing between the turbines is unsafe to fishermen and their vessels at the scale along the coast. RODA further states that the process in determining this spacing did not incorporate historical community knowledge from the fishermen and their experience in these waters. The Bureau of Ocean Energy Management responded that the spacing was determined by the Coast Guard following an elaborate study they conducted[10]. The disproval from the fishing community is an unresolved conflict that could be a long-lasting tension if left unaddressed. The fishing community may take a hit in yield and profits while Vineyard Wind 1 generates jobs for a different set of skills both during its construction period and in the years after its established. RODA, unlike the opponents of Cape Wind, seem to have a smaller chance at delaying Vineyard Wind 1 to the same extent because there are not currently any single powerful individuals who are members of the organization. The main members are fisheries, fishing vessels, and shipping companies who will likely need to go through a more democratic process before lobbying against the project further. Nonetheless, it is important for developers to be aware of the potential challenge of tension with the fishing community surrounding the project site.

Solutions

Vineyard Wind 1's plans contain some solutions to the potential challenges of scale and environmental impact addressed in the section above. Successes from past projects can be implemented to overcome these challenges as well. Firstly, the project details that $15 million is

[10] Saltzberg, Rich. "Vineyard Wind 1 is a go." The Martha's Vineyard Times, May 11, 2021. https://www.mvtimes.com/2021/05/11/vineyard-wind-1-go/

earmarked for workforce development, offshore wind industry development, and protection of marine mammals by establishing three funds: Windward Workforce Fund, Offshore Wind Industry Accelerator Fund, and Marine Mammals and Wind Fund. By establishing these funds and setting aside money early to address environmental efforts and logistical maintenance and development of the project will help keep the construction moving in the scenario that any roadblocks come up. This is perhaps a lesson learned from Cape Wind.

Another lesson learned from the U.S.'s first offshore wind farm, Block Island in Rhode Island, addresses grid reliability. Vineyard Wind 1's plan suggests the wind farm can power 400,000 homes without a back-up source, which can be problematic given potentially unpredictable wind patterns or the unforeseen failure of this new technology being produced at such a large scale. Block Island was shut down early in 2020 due to required cable alteration. The cables were not buried deep enough in the original construction, causing a shutdown for several months[11]. Vineyard Wind 1 should make active efforts to not repeat this mistake. This scenario further emphasizes the need for a secondary source of power in the event of unexpected shutoffs.

Successes

Vineyard Wind 1 succeeds in the various benefits it will bring to the Massachusetts area as well as the precedence it will set for the rest of the country in the offshore wind industry. Main project benefits include eliminating carbon emissions, creating local jobs, powering homes,

[11] Lee, Andrew. "America's first offshore wind farm faces shutdown after cables 'not buried deep enough'." Recharge News, February 10, 2020. https://www.rechargenews.com/wind/americas-first-offshore-wind-farm-faces-shutdown-after-cables-not-buried-deep-enough/2-1-753419

ratepayer savings, and long-term economic development. This wind farm is projected to eliminate 1.68 million metric tons of carbon dioxide emissions each year and save $3.7 billion in energy-related costs over the lifetime of the project.

This project will create thousands of jobs throughout its construction and its lifetime. The Windward Workforce program is starting with $2 million to recruit, mentor, and train southeast Massachusetts residents for careers in the offshore wind industry. The objective of this program is to establish partnerships with vocational schools, community colleges, and other organizations like Fishing Partnership Support Services to ensure local residents benefit from the specialized training. A specific goal is that 100% of Vineyard Wind 1's operations and maintenance staff will be Martha Vineyard residents within five years of the project being operational. This program is a success of the project's plan because it prioritizes local recruiting, which will prevent displacement and potentially ease any political tension among interest groups. Further, it shows that the project's developers are thinking about the long-term lifespan of the wind farm which is crucial to ensuring its effective success in aiding the country's transition to renewable energies.

A most notable success of this project is the obstacles it overcame during the Trump Administration that favored the oil and gas industry. At the end of final reviews for Vineyard Wind 1, the Department of the Interior stated that there were new environmental concerns for the project. While it is not unusual for environmental impact reviews to be ongoing, this request seemed targeted at the wind industry because oil and gas companies were not under the same

level of scrutiny[12]. This situation where environmental concerns are utilized as a political tool to stall the project parallels the delays that took place for Cape Wind. Despite the threat to crush supply chain and construction progress, the project survived this limbo period and was jumpstarted by President Biden's strong support for wind energy.

Potential Gaps

Three potential gaps of Vineyard Wind 1 stem from environmental concerns. The project has undergone intensive environmental impact reviews, but harm to the natural environment is not a guarantee. Because this is the first large-scale wind farm there is potential for unpredictable effects to take place, which Vineyard Wind 1 should prepare an emergency fund for beyond the Marine Mammals and Wind fund. The project should consider advocating for government subsidies to provide money for this fund.

A government subsidy could also address the project's lack of details of which homes or buildings will be powered by the wind farm. There is currently a lack of market reward for building owners to opt in for renewable energy aside from the cost of savings. This is one of the largest obstacles in mitigating greenhouse gas emissions[13]. A tax credit could incentivize residents of Martha's Vineyard to be connected to the wind farm grid.

Lastly, Vineyard Wind 1 does not describe the protection strategy of the wind farm against intense storms or extreme weather events. Again, because this is the first wind farm at

[12] Wasser, Miriam. "After Years of Uncertainty, Expected Decision on Vineyard Wind Could Launch New Industry." NPR – WBUR News, April 19, 2021. https://www.wbur.org/news/2021/04/19/boem-record-of-decision-vineyard-wind-preview

[13] Daniels, Tom. The Environmental Planning Handbook (2014). 115 – 126.

this scale, and climate change is expected to create even more unpredictable weather events, the project is subject to damage from intense storms or hurricanes. Unaccounted for damage taken by the wind turbines could be costly or even cause portions of the farm to shut down. This would require additional funding and maintenance.

Additional Recommendations

Thus, I would recommend that Vineyard Wind 1 set up an emergency fund to prepare for scenarios where extreme storms may damage wind turbines unexpectedly, political tensions may cause construction delays, or unaccounted for negative impacts harm the natural environment. Additionally, Vineyard Wind 1 should collaborate with the fishing community in order to gain local traditional knowledge of the environment that goes beyond data that has already been collected. This would allow more preventative measures to be taken to avoid harm and also ease tensions with fishermen who have already expressed opposition to the project. Keeping in mind the challenges presented by the scale, environment, and politics of the project will increase the project's likelihood of success as the nation's first large-scale offshore wind farm.

Conclusion

Vineyard Wind 1 is a remarkable project that has the potential to spark a great transition in the United States from coal-based power to renewable energy. The project faces many challenges at such a large scale but has past projects to reference and learn from. By preparing for unexpected emergencies and collaborating with local stakeholders, Vineyard Wind 1 has the potential to be extremely successful. Success is crucial as the U.S. will need roughly 38 wind farms of this size by 2030 in order to achieve its goal of 30,000 megawatts of offshore wind.