HOPKINS STUDENT WIND ENERGY TEAM

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1.0 Executive Summary

The Hopkins Student Wind Energy Team (HSWET) has developed a 330 MW floating offshore wind farm (FOWF) approximately 70 km from Coos Bay, Oregon. The proposed site area is 25.96 km^2 and is centered at 44.03° N, 124.71° W. The farm will utilize 22 Vestas V236-15.0 MW turbines, and the net capacity factor is 55.20%. The net annual energy production is 1,595,653 MWh. Construction will begin in 2030 until the commercial operation date of January 1st, 2034, after which the farm will remain in operation until 2059. The project offers a 13% tax equity Internal Rate of Return (IRR) at flip and a 12% sponsor equity IRR. The levelized cost of energy (LCOE) of the farm is 6.48¢/kWh. Our blended offtake agreement is $81.15/MWh.

1.1 Site Opportunities and Physical Characteristics

The design of an offshore wind farm in Oregon must address environmental, political, social, and economic factors. HSWET was initially restricted within the Exclusive Economic Zone extending 200 nautical miles from the U.S. coastline, followed by bathymetrical concerns.[1] The Cascadia Subduction Zone has a steep depth gradient along the West Coast, motivating a more nearshore site selection to maintain depths supporting monopile and floating foundations (Figure 1).[2-3] A balance between limiting turbine visibility and achieving a supportable depth was met through the use of floating foundations, with the closest point to shore being 40.35 km.[4]

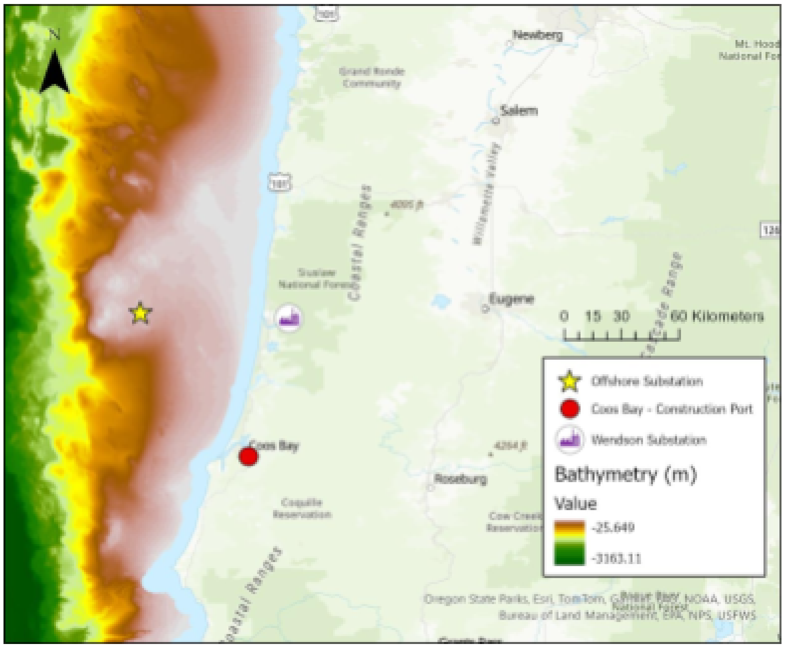


Figure 1: *Oregon Coastal Bathymetry*

In addition to minimizing turbine visibility, social considerations were addressed by reducing the impact on vessel traffic on the Oregon coast. Site selection utilized historical traffic data to exclude waters congested with vessels. Other social concerns and political instability also played a role during site selection. Public concerns were highlighted during the recent offshore wind lease bids on the Oregon coast. To avoid lease and right-of-way conflicts, the Oregon OCS-P 0566 and 0567 leases were excluded from site selection. HSWET plans to collaborate with the community of Coos Bay and local governments to ensure the project is mutually beneficial, given recent opposition to offshore wind projects.[5]

The siting process accounted for governmental and environmental restrictions. Military zones, existing gas and telecommunication cables, federally protected areas, and national park lands were rejected for site development. Similarly, environmental considerations included marine protected areas, Habitat Areas of Particular Concern, and regions with endangered species (Figure 2). The subduction zones along the coast indicate Oregon's susceptibility to natural disasters, notably earthquakes. Historical recordings of earthquakes were plotted to determine potential sites receiving a lesser frequency of earthquakes. While still relevant, wave heights pose an even greater risk for floating turbines.[6] The selected site has a significant wave height of about 2.61m, which is less than the maximum recommended height of 3.5m for semi-submersible foundations.[7] Additionally, to ease underground cable installation and further mitigate seismic effects, the team selected regions with mud-like sediments.

HSWET proposes to construct a FOWF site located at 44.03° N, 124.71° W, with a staggered grid of turbines to minimize wake effects. At a height of 140 m, Oregon receives greater wind speeds at lower latitudes. The proposed site location has historically observed a wind speed of 9.31 m/s.[8-9]

1.2 Environmental Factors

HSWET examined a variety of environmental repercussions arising from FOWF development. Research predominantly centered on aquatic ecosystems, birds, and ocean floor considerations. NOAA provided spatial data for national marine protected areas, and Oregon Ocean Information provided data on the five marine reserves under the Oregon Department of Fish and Wildlife.[10-11]

The Oregon coast houses many bat and bird species, which consist of endangered populations. Using spatial data from The National Audubon Society, HSWET site selection avoided internationally Important Bird Areas.[12] In addition, HSWET will implement two avian collision mitigation strategies: painting a turbine blade black and the MERLIN Avian Radar System. Painting a turbine black significantly improves birds' ability to see turbines, reducing collision deaths by up to 70%.[13] The MERLIN Avian Radar System translates advanced radar sensing into strategic curtailment, emitting sounds deterring birds from FOWF boundaries. With a roughly 97.5% success rate, DeTect Radar Systems, the developers of the MERLIN Avian Radar System, state that utilizing these mitigation strategies can reduce bird deaths by about 33 to 53 percent.[14]

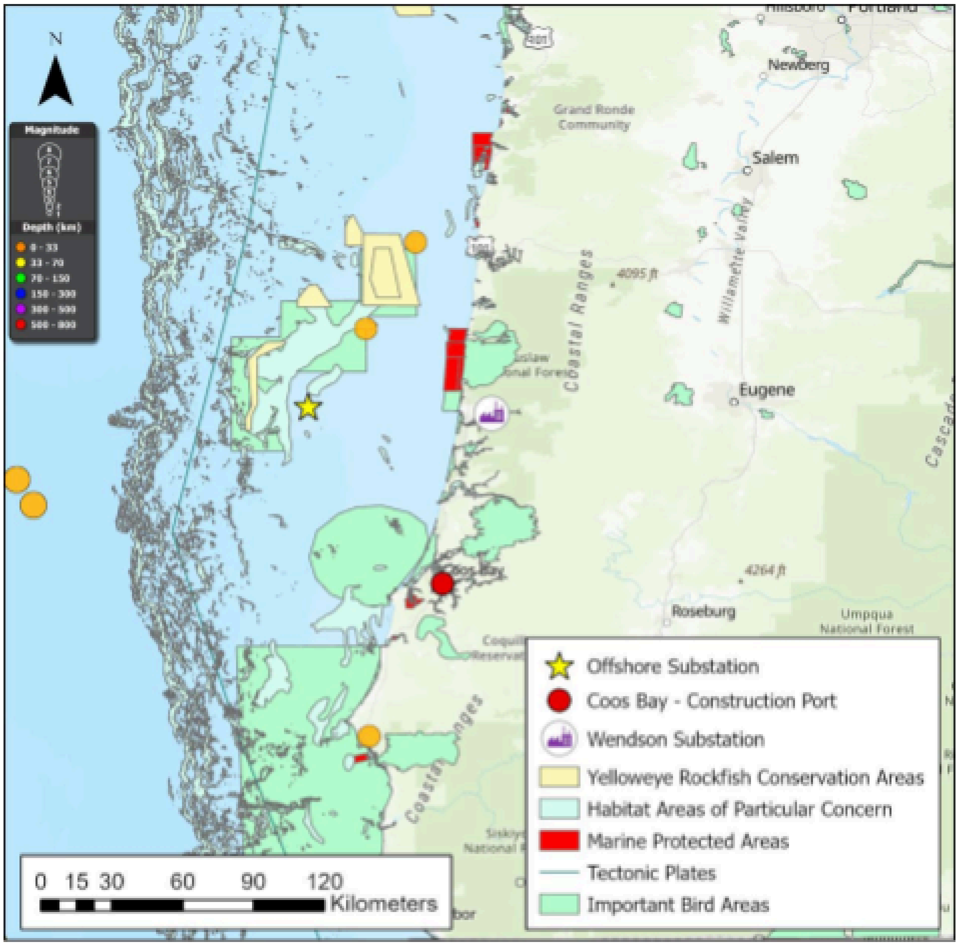


Figure 2: *Environmental considerations*

Oregon's Pacific Fishery Management Council has identified Habitat Areas of Particular Concern within Essential Fish Habitats, defined by major ecological functions, sensitivity to decline, stress from development, and rare habitats.[15] Site selection between Oregon's middle and outer continental shelves avoided construction near these areas.[16] The benthic environment of the selected area primarily consists of soft sediments with rock outcrops as a small minority, minimizing the disturbance of deep-sea corals.[16] The site is positioned outside of the nearby Rocky Reef Habitat Areas of Particular Concern in the Heceta Bank Yelloweye Rockfish Conservation Area, an area regarded by Oregon environmental institutions and individuals as particularly important to preserve.[17] HSWET's site avoided as many Essential Fish Habitats as possible, especially for high commercial-value fish species such as pink salmon, chinook salmon, coho salmon, and bluefin tuna.[18-19]

Other seafloor impacts considered were rocky reefs and methane seeps, which the buried transmission cabling paths were designed to avoid. Methane seeps in Oregon's Cascadia Margin have been principally cataloged along the 500 m contour line.[20] Since HSWET's site is at a depth of approximately 100 m, the site and transmission route will not disrupt methane seep locations.

2.1 Transmission Plan

HSWET plans to connect our proposed FOWF by following a common model for OWF technology. Inter-array cables will connect each turbine to an offshore substation, which will then use export cables to transport electricity to an onshore substation.[21] The offshore substation's role will step up the voltage from the generated 66 kV alternating current (AC). Due to the proximity to our target onshore substation, the transmission can be left in AC. High-voltage AC cables – an inexpensive alternative to low-frequency AC cables at short distances – will be laid from our farm's proposed location to the shore, connecting with the Bonneville Power Administration's Wendson substation.[22] From there, the voltage can be changed to either 115 kV or 230 kV to match the capacity of the connecting transmission lines.[22] Located approximately 60 km north of Coos Bay, Wendson is the closest substation to landfall, making Bonneville Power Administration an ideal offtaker. Should it be required due to complex terrain or lack of space for traditional wire poles, horizontal directional drilling will be used to excavate underground cavities, which will allow for the safe connection of HSWET's cables to the substation.

Several upgrades to the Wendon substation will need to be performed in a collaborative effort between HSWET and the Bonneville Power Administration. First, transformer capacity will need to be expanded to handle the increased power flow from the FOWF.[23-24] Second, switchgears will be upgraded and power compensation systems installed to manage the higher and less stable voltage. Finally, the onshore transmission will need significant upgrades to transport the larger voltage to distribution lines throughout Bonneville Power Administration's grid. To divide the costs of this infrastructure upgrade, HSWET plans on covering all of the onsite upgrades for Wendson, while reaching an agreement with Bonneville Power Administration to cover the cost of transmission line upgrades.[23-24]

2.2 Staging, Construction, and Operations and Maintenance

Musial et al. (2019) has identified the Ports of Astoria, Newport, and Coos Bay in northern, central, and southern Oregon as bases potentially able to support offshore wind farm development.[25] From these ports, Coos Bay is currently implementing the most upgrades. In October 2024, the Port of Coos Bay won the Department of Transportation Infrastructure for Rebuilding America and Consolidated Rail Infrastructure and Safety Improvements grants, guaranteeing $49 million towards their Pacific Coast Intermodal Port project.[26-27] With construction expected to take five years, the project will deepen the Coos Bay Federal Navigation Channel from 37 to 45 feet below mean lower water level. Their Federal Authorized Coos Bay Navigation Channel will also widen from 300 to 450 feet, allowing larger vessels to access the port.[28] Due to these attractive investments, HSWET will lease the 167-acre Terminal One property from Coos Bay (Figure 3) as a manufacturing site, which currently has a mean lower water level of -37 feet.[29-30] For staging as well as operations and maintenance (O&M), HSWET will petition to acquire Jordan Cove West in the Port of Coos Bay, a privately owned 200-acre lot vacated in 2021.[31]

HSWET will proceed carefully with acquiring Jordan Cove West due to previous projects failing due to not obtaining state permits, community push-back, and building on a cultural resource site.[32-33]

HSWET will utilize the Vestas V236-15.0 MW turbine model for power production. Current factories producing these turbine components are primarily located in Western Europe, with a nacelle factory to be constructed in Jeonnam Province in South Korea.[34-35] A potential method for transporting turbine components from Europe to HSWET's site could be through the Panama Canal.[36-37] HSWET also sees an opportunity to transport V236-15.0 MW turbine components through the Northern Sea Route (NSR) during the northern hemisphere summer months (Figure 3), with the route expected to be year-round navigable by 2030.[38-39] With an estimated travel distance of 14,717.7 km, the NSR has a longer path length from Jeonnam Province, Mokpo New Port Hinterland Complex to Coos Bay of 9,583.5 km.[40] HSWET will coordinate nacelle retrieval from South Korea, along with blades and towers through the NSR during summer with Maersk. This company has had prior experience supplying the V236-15.0 MW model and is currently developing the Vestas Jeonnam Province hub.[35] If NSR travel is unfeasible, HSWET will default to transport through the Panama Canal.

Figure 3: *Transporting turbine components to Port of Coos Bay*

To combat Oregon's earthquakes, HSWET would have preferred to employ spar-buoy floating substructures that provide greater stability over semi-submersible floaters.[42] However, the proposed depth site averages 122.4 m, which cannot support a spar buoy's minimum depth of 135.7 m.[43-44] The proposed site may also reach a maximum significant wave height of 13.2 m.[45-46] A tuned mass damper will be installed atop each turbine's tower to maintain structural integrity.[47-48] HSWET will purchase fourth-generation WindFloat semi-submersibles from Principle Power, which can support rated capacities greater than 15 MW.[49-50] The exact semi-submersible model will be determined after assessing the stiffness of the V236-15.0 MW towers.[51-52] Turbine assembly will occur on top of fully constructed semi-submersible platforms through the use of onshore cranes.[53-54] Towing the assembled turbine from the Port of Coos Bay to the offshore site will require a Jones Act-compliant Anchor Handling Tug Supply vessel.[55] The current lack of this Jones Act-compliant vessel can be mediated by chartering vessels from the Gulf of Mexico.[56-57] The U.S. Customs and Border Protection ruled in H300962 and H322233 that the Jones Act does not apply to cable-laying vessels.[58-59] Thus, the Dutch company Van Oord's *Nexus* will be contracted for Twentsche Kabelfabriek to install HSWET's inter-array and export cables.[60-61] Twentsche Kabelfabriek is currently under contract to deliver inter-array cables at the Inch Cape offshore wind farm utilizing the V236-15.0 MW model.[62] O&M transport will use the Jones Act-compliant *VARD 4 07 US WINDFARM SOV*, provided by the Fincantieri Marine Group in Wisconsin, if the Port of Siuslaw can support a vessel of this size.[63-65] During construction, acoustic deterrents will be employed to prevent collisions with marine species, and areas disturbed by cable laydown will be restored and revegetated post-construction to minimize environmental impact.[66] Lastly, HSWET has identified 17 national, 7 state, and 6 municipal permits, approvals, and bills to be addressed (Table 1).[67-90] The proposed project timeline is indicated in Figure 4.

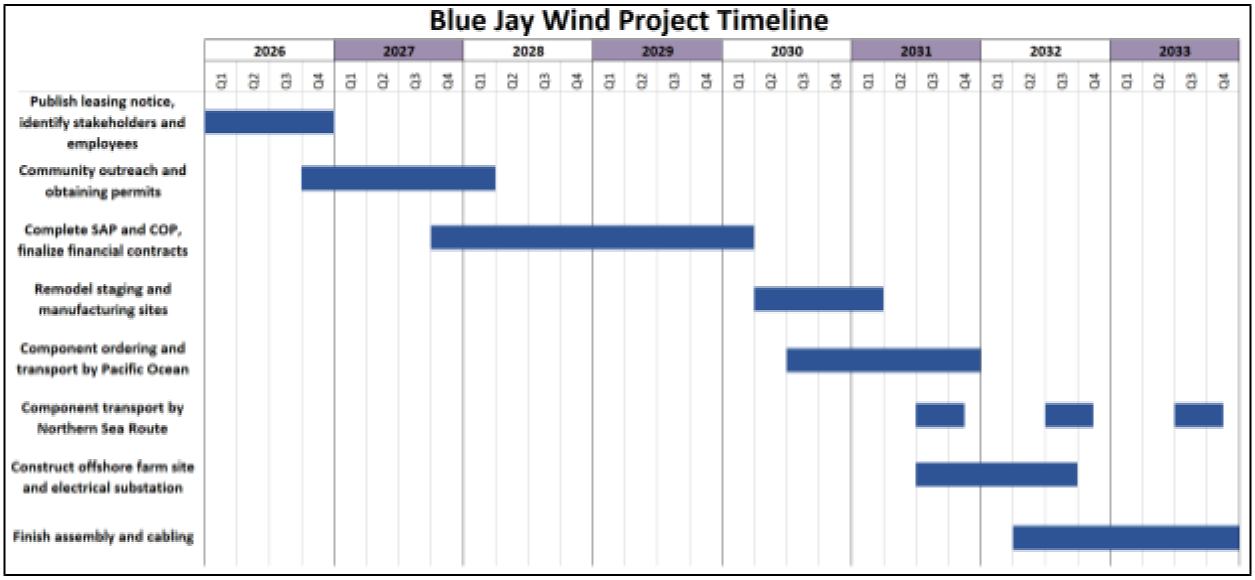


***Figure 4**: Blue Jay Wind Project Timeline*

Because the typical expected service life of wind turbines is 25 years, HSWET forecasts beginning to decommission the offshore wind farm around 2058, partnering with Principle Power or a similar decommissioning agency.[91] Depending on the condition of the electrical system (cables and substations), repowering is a viable option. The conditions of the turbines would either entail partial repowering (replacing minor components such as rotors, blades, gearboxes, drivetrains, power electronics and/or towers), or full repowering (replacing old turbines with newer, bigger units). If the farm is not repowered, HSWET will begin a full decommissioning over 6 to 24 months.[92]

HSWET plans to recycle the aluminum, steel, copper, and iron of the turbine tower and nacelle components, which make up 85% - 90% of the turbine's mass (excluding the foundation, underground wiring, and other project-related infrastructure), in Portland with Schnitzer Steel Industries.[93] The remaining elements of the turbines are composite components (blades, nacelle covers, rotor covers) which take special measures to recycle. HSWET plans to contract with B&K Auto Salvage and Recycling in La Grande, OR, to cut up composite components in preparation to be shipped to the Veolia facility in Louisiana, MO, which currently has the capacity to mechanically recycle 3,000 blades/year.[94] During decommissioning, HSWET plans to leave some below-ground infrastructure (foundations and cabling) in place to avoid further negative environmental impacts associated with complete removal.[95]

Overseeing Authority	Permit(s) or Approval(s)	Objective
National		
Bureau of Ocean Energy Management	Site Assessment Plan	Preliminary analysis of lease area before management of any activities.
Bureau of Ocean Energy Management	Construction and Operations Plan	Asserts compliance with National Environmental Policy Act and identifies impacts of the proposed project.
Bureau of Ocean Energy Management	Outer Continental Shelf Lands Act	Establish right-of-way, right-of-use and easement, and lease issuance in the Outer Continental Shelf.
Bureau of Safety and Environmental Enforcement	Oil Spill Response Plan	Organization of the vessel and facility equipment required for an oil spill response.
U.S. Environmental Protection Agency	Clean Air Act Outer Continental Shelf Air Permit with Section 328 compliance	Requirements for air pollution control.
Federal Aviation Administration	Form FAA 7460-1, Notice of Proposed Construction or Alteration Form FAA 7460-2	Notification of construction greater than 200 feet in height that may affect navigable airspace.
U.S. Fish and Wildlife Services	Endangered Species Act Migratory Bird Treaty Act	Prohibits the take of species identified as protected.
U.S. Fish and Wildlife Services	Bald and Golden Eagle Protection Act Eagle Conservation Plan Guidance	Right-of-way application of permits for offshore wind farms that may result in eagle take.
U.S. Coast Guard	Private Aids to Navigation Authorization	Facilitates safe navigation operations.
U.S. Coast Guard	Ports and Waterways Safety Act	Establishes supervision of vessel traffic service/separation schemes for ports experiencing congested vessel traffic.
U.S. Coast Guard	Local Notice to Mariners	Weekly publishing of changes and deficiencies in aids to navigation.
U.S. Army Corps of Engineers	Section 408 Rivers & Harbors Appropriation Act Section 10 Individual Permit	Requires permission for structural modification of navigable waters.
U.S. Army Corps of Engineers	Clean Water Act with Section 404 compliance	Requires permission for deposition or discharge of dredge and fill material into navigable waters.
State		
Oregon Coastal Management Program	Coastal Zone Management Act	Requirements for coastal environmental
Oregon Legislative Assembly	HB2816	Requirements for meeting greenhouse gas emission quotas in regards to electricity usage.
Oregon Legislative Assembly	HB4080	Facilitates efficient communication of offshore wind energy development with the Oregon
Oregon Legislative Assembly	Submersible & Submerged Lands with Chapter 274, Section 720 compliance	Requirements for air and water pollution control.
Oregon Department of Environmental Quality	Clean Water Act with Section 404 compliance	Requirements for proper management of water quality.
Oregon Department of Environmental Quality	Environmental Impact Statement	Assesses whether project addresses the environmental impacts identified in preliminary analyses.
Oregon Department of Land Conservation and Development	National Flood Insurance Program	Establishes floodplain development standards to avoid flood damage.
Municipal		
City of Coos Bay	Business License Application Building Permit Manufactured Building Placement Permit Mechanical Permit Moisture Content and Lighting Requirements	Requirement for any company making structural, plumbing, mechanical, or electrical changes to an existing or new building.
City of Coos Bay	Site Grading and Erosion Control Permit	Requirement for proposed excavation or fill activities within the city of Coos Bay.

***Table 1**: Permits required for offshore wind development*

2.3 Offshore Wind Farm Design

The proposed FOWF will utilize Vestas V236-15.0 MW turbines, modeled using the IEA 15 MW reference turbine.[96] The planned farm layout will be a grid of 22 turbines, with the lowest hub height of 140 m to mitigate instability. The offshore lease area is approximately 25.96 km^2, with the staggered grid layout depicted in Figure 5. The wind direction at this site dominates from north to south. Thus, Furow simulations set the turbines to face north at an angle of 90°. Turbines and columns are spaced six rotor diameters apart, with rows separated by 1226.30 m. Energy yield analyses from Furow estimate that a net capacity factor of 55.20% and a net annual energy production of 1,595,653,000 MWh will be achieved.

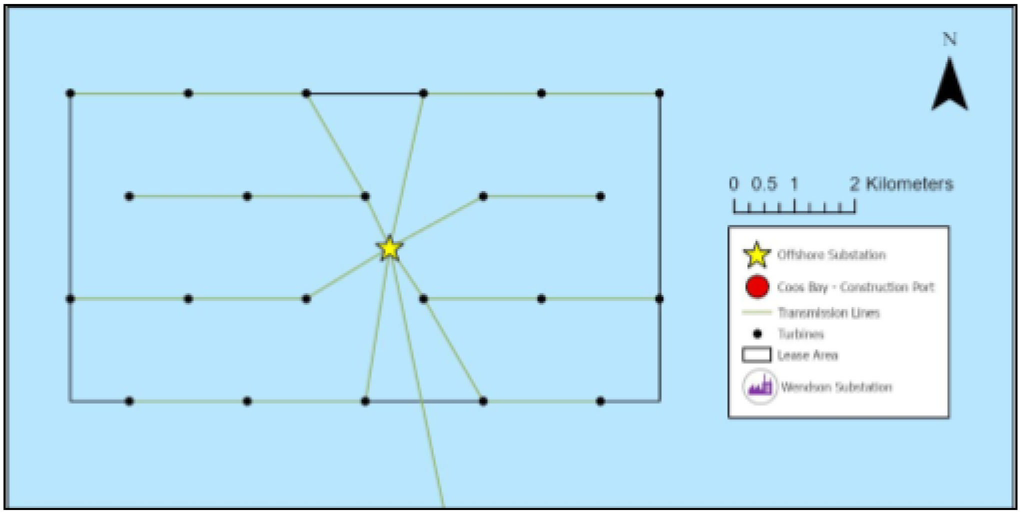


Figure 5: *Turbine layout*

2.4 Power Offtake Plan

HSWET proposes a hybrid offtake plan for the Blue Jay Wind offshore wind farm, combining a power purchase agreement with Bonneville Power Association and a virtual power purchase agreement with Amazon.

Amazon recently purchased 400 acres of land in Arlington, OR[97], intending to expand its already significant portfolio of data centers in the Pacific Northwest. Construction for these data centers is expected to begin prior to the construction of Blue Jay Wind. Once completed, the data centers will serve Amazon and AWS projects throughout the country, specifically offering low-latency connections to Amazon's corporate headquarters in Seattle and its clients located in Silicon Valley.

Amazon has stated it plans to reach net-zero carbon emissions by 2040.[98] This is reflected in their existing data center projects in Oregon. In 2024, the company purchased 200,000 MWh of clean energy from Avangrid's onshore wind farm in Gilliam County to power its data center located in Umatilla.[99] The Arlington data center project is intended to be significantly larger than that of Umatilla, meaning that Amazon will need to find a significant source of clean power to offset the data center's energy consumption. By signing a virtual power purchase agreement with HSWET, Amazon could guarantee a consistent source of clean energy to contribute to its net-zero goals while also procuring power at a non-volatile price point. In the P50 scenario of Blue Jay Wind, the farm will be generating 1,618,848 MWh of power. HSWET plans to sell 65% of this power (1,052,251 MWh annually) to Amazon with a strike price of $88.77/MWh. Should wholesale prices of energy in the Arlington area rise above this price, HSWET will compensate Amazon for the difference. Similarly, Amazon will compensate HSWET should the prices dip below.

On top of this, HSWET plans on selling electricity directly into the wholesale grid, specifically through the Bonneville Power Administration (BPA)- a federal agency that markets hydroelectric and renewable power throughout the Pacific Northwest. BPA manages an extensive transmission network and sells electricity to regional utilities, cooperatives, and public agencies, making it a highly bankable offtake partner.[100]

In 2023, the Pacific Northwest recorded the highest U.S. wholesale electricity prices, averaging $82/MWh, primarily due to elevated natural gas costs. Although prices are forecast to moderate to around $67/MWh in 2024, the region remains favorable for wholesale renewable power due to rising demand, aging grid infrastructure, and corporate sustainability targets.[101]

Selling to BPA ensures access to a large, creditworthy buyer while simplifying interconnection and reducing counterparty risk. Although wholesale pricing can be more volatile than fixed power purchase agreements, this route provides immediate market access and positions our project to participate in long-term BPA procurement programs or open solicitations as they arise.

HSWET plans on selling 35% of Blue Jay Wind's generated power (566,596 MWh annually) through BPA's network. Assuming an average price of $67/MWh and in conjunction with the virtual power purchase agreement signed with Amazon, this would allow us to hit our blended PPA price of $81.15/MWh.

3.1 Capital Expenditures

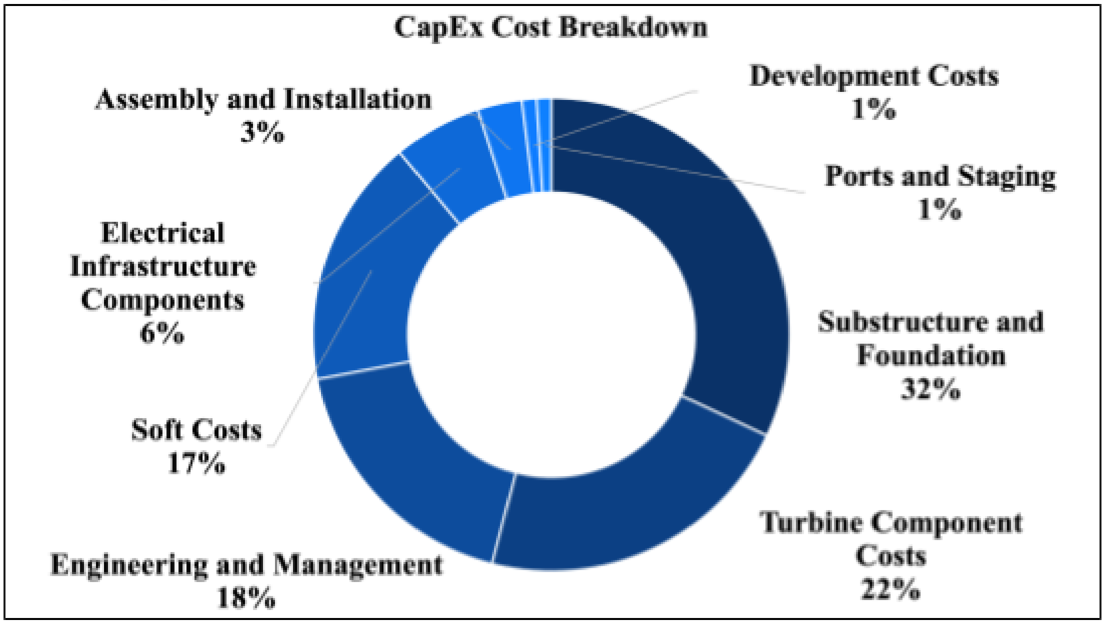
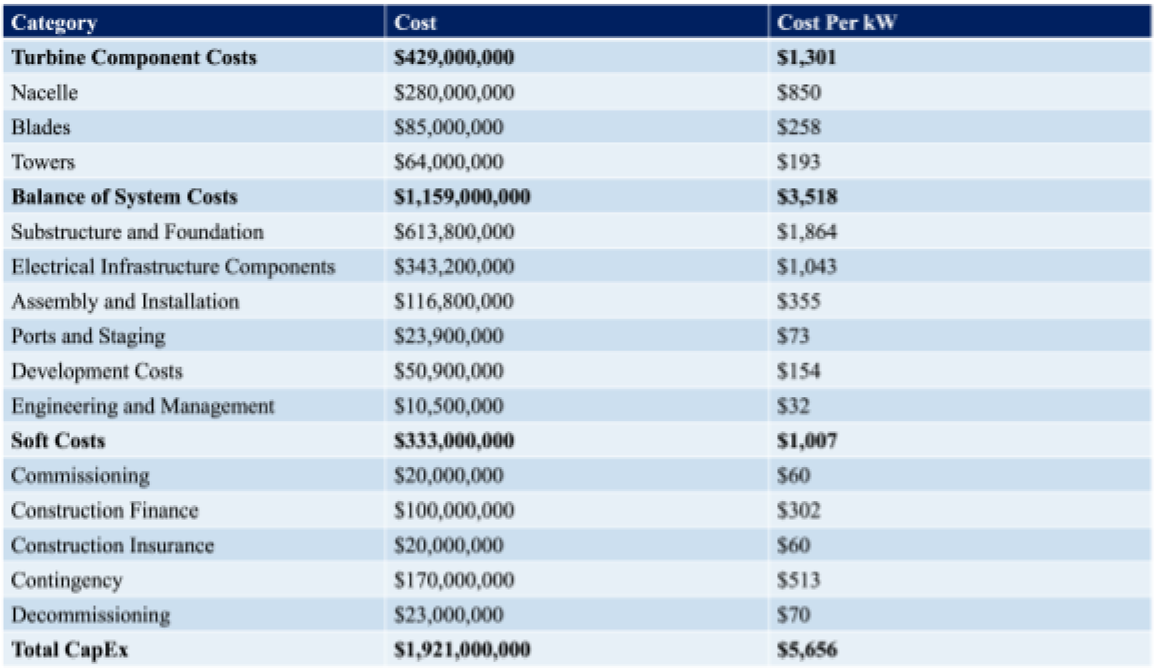


***Figure 6**: CapEx Breakdown by Percentage of Total Cost*

HSWET uses both the JEDI and ORBIT models to estimate the capital expenditures (CapEx) for the Blue Jay Wind (BJW) offshore wind farm based on project-specific inputs for a 330 MW floating development. Based on NREL's ORBIT yield assumptions and detailed system design inputs, the resulting CapEx is approximately $5,656/kW, or $1,921,000,000 for the full buildout. This figure is broadly consistent with projections from NREL's ORCA model, which estimates 2032 CapEx for Oregon's Site 4 near Coos Bay at around $2,924/kW in 2018 dollars.[102] When adjusted for inflation and project scale, BJW's modeled CapEx falls within the expected range for a high-capacity floating offshore project operating in deep waters. Slight discrepancies may reflect ORBIT's inclusion of fully itemized soft costs, conservative component pricing, and a smaller system size relative to the 600 MW ORCA reference case.[103] Overall, the BJW estimate aligns with the capital cost trajectory outlined in NREL's Annual Technology Baseline and regional studies, reinforcing the credibility of its financial assumptions.[104]



Category	Cost	Cost Per kW
Turbine Component Costs	**$429,000,000**	**$1,301**
Nacelle	$280,000,000	$850
Blades	$85,000,000	$258
Towers	$64,000,000	$193
Balance of System Costs	**$1,159,000,000**	**$3,518**
Substructure and Foundation	$613,800,000	$1,864
Electrical Infrastructure Components	$343,200,000	$1,043
Assembly and Installation	$116,800,000	$355
Ports and Staging	$23,900,000	$73
Development Costs	$50,900,000	$154
Engineering and Management	$10,500,000	$32
Soft Costs	**$333,000,000**	**$1,007**
Commissioning	$20,000,000	$60
Construction Finance	$100,000,000	$302
Construction Insurance	$20,000,000	$60
Contingency	$170,000,000	$513
Decommissioning	$23,000,000	$70
Total CapEx	**$1,921,000,000**	**$5,656**

***Table 2**: CapEx Summary by Total Cost and Unit Cost ($/kW)*

3.2 Operating Expenditures

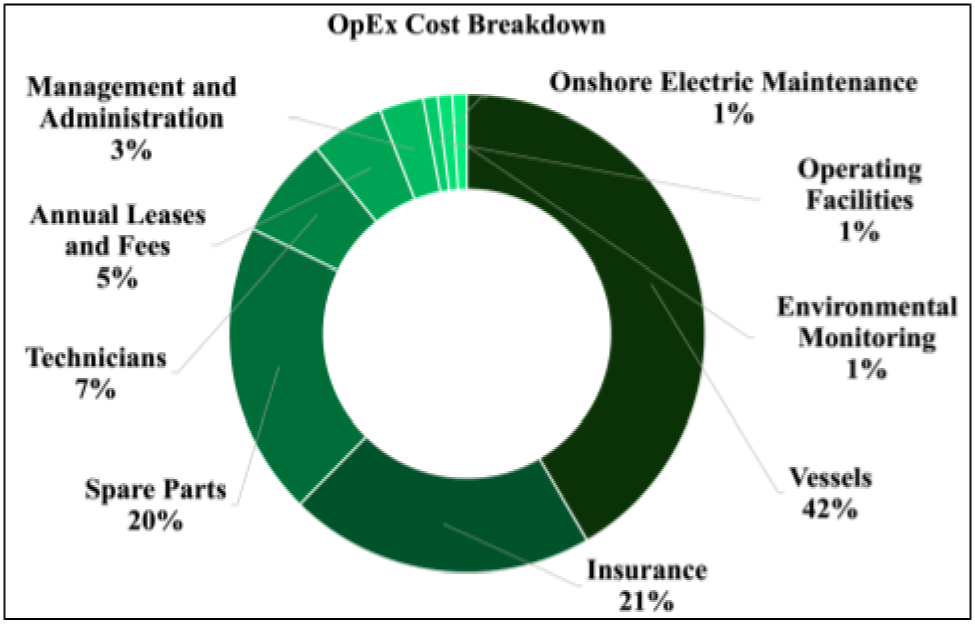


***Figure 7**: OpEx Breakdown by Percentage of Total Cost*

In addition to capital expenditures, HSWET initially used the JEDI model to estimate operational expenditures (OpEx) for the Blue Jay Wind (BJW) project. However, to align more closely with industry expectations and strengthen project bankability, HSWET adopted OpEx figures from the 2024 Guide to Floating Offshore Wind report.[105] Based on this reference, BJW's annual OpEx is projected at approximately $89.50/kW, totaling $29,541,000 per year for the 330 MW floating offshore wind farm.

Maintenance accounts for 69% of total OpEx, primarily driven by vessel costs, spare parts, and labor, while the remaining 31% covers insurance, lease fees, and administrative operations. A detailed breakdown is provided in the accompanying table and chart. To increase the bankability of the project, as suggested by S&P Global, HSWET plans to negotiate a full-service O&M contract with Vestas with a guaranteed uptime of 95%.

While the adopted OpEx remains higher than NREL's 2024 Annual Technology Baseline benchmarks for floating offshore wind—$61.58/kW (advanced case), $67.53/kW (moderate), and $75.59/kW (conservative)—the estimate reflects near-term logistical constraints, elevated offshore vessel costs, and early-stage operational risk factors not fully captured in long-term projections.[104] BJW's OpEx thus provides a realistic and bankable basis for early-phase financial planning in the emerging floating offshore wind sector.

Category	Cost	Cost Per kW
Maintenance	**$20,361,000**	**$61.76**
Technicians	$1,990,000	$6.04
Spare Parts	$5,910,000	$17.90
Vessels	$12,310,000	$37.30
Onshore Electric Maintenance	$151,000	$0.46
Operations	**$9,180,000**	**$27.74**
Management and Administration	$844,000	$2.56
Operating Facilities	$392,000	$1.19
Environmental Monitoring	$151,000	$0.46
Insurance	$6,345,000	$19.26
Annual Leases and Fees	$1,448,000	$4.40
Total OpEx	**$29,541,000**	**$89.50**

Table 3: *OpEx Summary by Total Cost and Unit Cost ($/kW)*

3.3 Incentives

As a qualified clean energy property under IRC Sections 45 and 48, Blue Jay Wind will be eligible, as of January 1, 2025, for either of the Inflation Reduction Act's clean energy incentives: the Clean Electricity Production Credit (PTC) or the Clean Electricity Investment Credit (ITC). HSWET has chosen to move forward with claiming the investment tax credits, the industry preferred credit for supporting offshore wind projects, given the inherently high upfront costs of wind projects and the associated higher value of ITC versus PTCs.[106] HSWET will benefit from ITC's one-time payment, which offers a more predictable incentive than the annually calculated PTC and avoids exposure to the possible regulatory step down of PTC, which could begin as soon as 2031. Under the ITC, Blue Jay Wind will automatically qualify for a 6% base credit of the installed equipment cost in the year it is put into service. However, this base credit will increase to 30% provided that HSWET meets the prevailing wage and apprenticeship requirements throughout the project's construction and operation. On top of this 30% credit, HSWET qualifies for an additional 10% credit due to the project's location in a qualified energy community. The onshore staging site for the project resides in Census Tract 8 in Coos County, which is eligible for the 48C tax credit. When receiving the ITC, HSWET will not be eligible for the recently added elective pay structure and instead plans to partner with a tax equity investor who will help monetize the tax credit as well as project depreciation.

3.4 Financing Plan

HSWET utilized the Pivotal180 Tax Equity Model to size debt, tax equity, and sponsor equity, structuring the capital stack with tax equity first and debt guaranteed by the Export and Investment Fund of Denmark (EIFO). Unlike traditional offshore wind projects that often rely on construction loans followed by refinancing into long-term debt, Blue Jay Wind will maintain Citi as its sole senior lender through both construction and operational phases, eliminating the need for refinancing. HSWET sizes debt using debt sculpting with a P50 target Debt Service Coverage Ratio (DSCR) of 1.60x.

Tax equity financing is sized first to achieve a target yield of 13%. Under the partnership structure, pre-flip (Years 1–6), the tax equity investor receives 20% of cash distributions and 99% of taxable income, losses, and tax credits until the 13% yield is achieved. Post-flip (Year 7 onward), the allocation shifts to 5% of cash distributions and 5% of taxable income, losses, and credits. HSWET chose JP Morgan as our tax equity sponsor given its large tax base, strong financial health and longevity, and its $1 trillion commitment to green finance by 2030.[107] HSWET chose Citi as our loan creditor given their history of investing in green energy projects and their $500 billion commitment to environmental finance by 2030.[108]

The project will also be highly bankable because its debt will be guaranteed by the EIFO. The EIFO is a Danish government-owned entity established to promote Danish exports, including Vestas turbines and floating foundations.[109] Because Denmark is a large exporter of wind power equipment, the EIFO has a long track record of financing offshore wind development. It usually supports developers by offering loan guarantees to project developers, meaning that Denmark will repay the loan if projects default.[110] With this guarantee, our debt's risk is as minimal as Denmark's. Blue Jay Wind's interest rate will still be higher than Denmark's because of an OECD arrangement preventing unfair subsidies. This arrangement requires a minimum interest rate of 5.28%.[111] Local cost coverage is capped at 45% of total costs, and the maximum tenor is 22 years.[112] Blue Jay Wind's use of Vestas turbines and other Danish-manufactured components satisfies these requirements, allowing full loan eligibility. With a sovereign guaranteeing our debt, HSWET anticipates that lenders will agree to provide a loan at the minimum interest rate.

Recognizing that early-stage financing for offshore wind projects remains among the most challenging to secure due to permitting, construction, and technology risks, HSWET prioritized securing a power purchase agreement (PPA) early in development. The PPA provides revenue certainty, enhancing project bankability and enabling HSWET to attract both tax equity and sovereign-backed debt. Per industry standard, a 2.39% annual escalation will be built into the PPA pricing structure. The PPA will also include a clause allowing an amendment in the PPA price such that if tariffs and/or a regulatory change to tax credits cause more than a 5% decline in HSWET's developer margin, HSWET will be able to increase the PPA rate to achieve the same margin less 5% projected at that execution of the PPA. This is a strategy being employed today by leading renewables developers such as AES, Brookfield, and NextEra to manage tariff and regulatory changes.

The PPA price is solved based on a target sponsor equity Internal Rate of Return (IRR). Based on benchmarks from RWE's Capital Markets Day 2023 presentation, the typical unlevered post-tax IRR for offshore projects ranges from 7–11%.[113] Given the additional risks associated with floating offshore wind technology, HSWET conservatively adopted the upper end of this range (11%) and applied a 1% premium for leverage, targeting a final levered post-tax IRR of 12%.

In addition to external financing, HSWET will leverage favorable federal tax incentives under the Inflation Reduction Act (IRA). Wind turbine components and energy storage qualify for 5-year Modified Accelerated Cost Recovery System (MACRS) depreciation, while water transportation equipment is eligible for 10-year MACRS, and electric transmission infrastructure for 15-year MACRS.[114] Wind turbine components and energy storage are eligible for 5-year MACRS, water transportation equipment for 10-year MACRS, electric transmission infrastructure (>69kV lines and land improvements) for 15-year MACRS, and land improvements for transmission/distribution for 20-year MACRS.[115] Pursuant to IRC Section 50(c), equipment qualifying for the 30% Investment Tax Credit (ITC) must reduce its depreciable basis accordingly, meaning turbines will be depreciated on 70% of their original basis. HSWET assumes a blended marginal corporate tax rate of 27.0%, reflecting the federal corporate income tax rate of 21.00% and Oregon's 7.60% state income tax on taxable income exceeding $1 million.[116]

Using NREL's System Advisor Model (SAM), HSWET estimates a real levelized cost of energy (LCOE) of 6.48¢/kWh for the Blue Jay Wind project.[117] Based on a total net capital cost of $1,313,144,704, HSWET projects an investor Net Present Value (NPV) of $64,177,976 and a developer NPV of $189,496,272.

3.5 Energy Market Condition

Blue Jay Wind will operate within the Western Electricity Coordinating Council (WECC) market, with the nearest trading hub being the Intercontinental Exchange's (ICE) Mid-Columbia Exchange (Mid-C). As of 2023, 38% of Oregon's electricity generation came from natural gas, while 62% came from renewables.[118] Although the region's renewable capacity has historically been dominated by hydroelectric power, 69% of Oregon's current renewable generation now comes from other sources.[119] With the rapid growth of non-hydro renewables, understanding how shifts in the generation mix will affect electricity prices is critical.

To estimate future electricity prices in Oregon, HSWET used ICE Mid-C Around the Clock energy futures, which extend through 2035. These futures reflect market expectations for energy price trends and serve as a key indicator for forecasting. Current trading suggests an average energy price of $59.69/MWh between March 2025 and March 2035—well below the $80.45/MWh price required for Blue Jay Wind to meet its IRR (Figure 8).

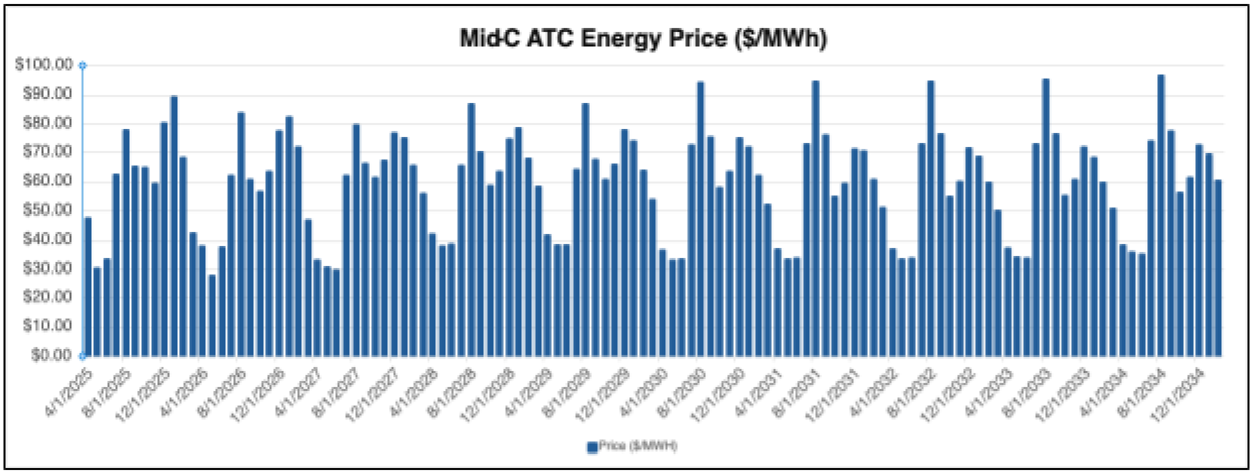


***Figure 8**: Forecasted Mid-C ATC Energy Price ($/MWh) from 2025 to 2034*

HSWET anticipated that Blue Jay Wind could secure an above-market PPA price from the Bonneville Power Administration (BPA), supported by new Oregon legislation promoting green energy. Oregon mandates that electricity providers deliver 100% clean energy by 2040, enabling renewable projects to command premium prices. A similar trend is seen in New York, where a "zero-emission grid by 2040" requirement helped drive the New York Offshore Wind Round 2 auction to $114.25/MWh, despite traders forecasting an average wholesale price of $57.61/MWh through 2035.[120] This outcome demonstrates that PPA prices for offshore wind can significantly exceed expected wholesale rates.

Blue Jay Wind's target PPA price is also competitive relative to other offshore wind projects. Industry analysis, including Lazard's LCOE v16.0 report, estimated offshore wind levelized costs between $72/MWh and $140/MWh, depending on site conditions, technology maturity, and financing structures.[121] Early-stage floating projects along the Pacific Coast are expected to fall toward the higher end of this range due to increased infrastructure and deployment costs. In this context, Blue Jay Wind's targeted $81.15/MWh PPA positions it at the lower end of the expected cost range for offshore wind development.

3.6 Auction Bid

HSWET built a Random Forest model to predict winning bids using data from the BOEM Lease Numbers OCS-P 0561 through OCS-P 0565. These leases were assessed due to being in the Pacific Northwest, with physical characteristics similar to Oregon. Four components were assessed to build the ensemble learning regression model: (1) average wind speed at 140 m, (2) proximity to port, (3) bathymetry, and (4) acreage. The average wind speed was measured at each lease area's centroid point from 2003 to 2022. According to the model, BJW's wind speed of 9.31 m/s, 70.11 km distance from the Port of Coos Bay, an average depth of 122.40 m, and an acreage of 6414.04 results in a winning bid requiring \$2,011.52/acre (Figure 9). This prediction is supported by the averaged cost per acre from all five California leases, which has a value of \$2061.41/acre. Accounting for a 7.5% inflation increase since 2022 to 2026 brings the cost to \$2162.38/acre, HSWET proposes a maximum bid of \$12,901,969.74 for 6414.04 acres.

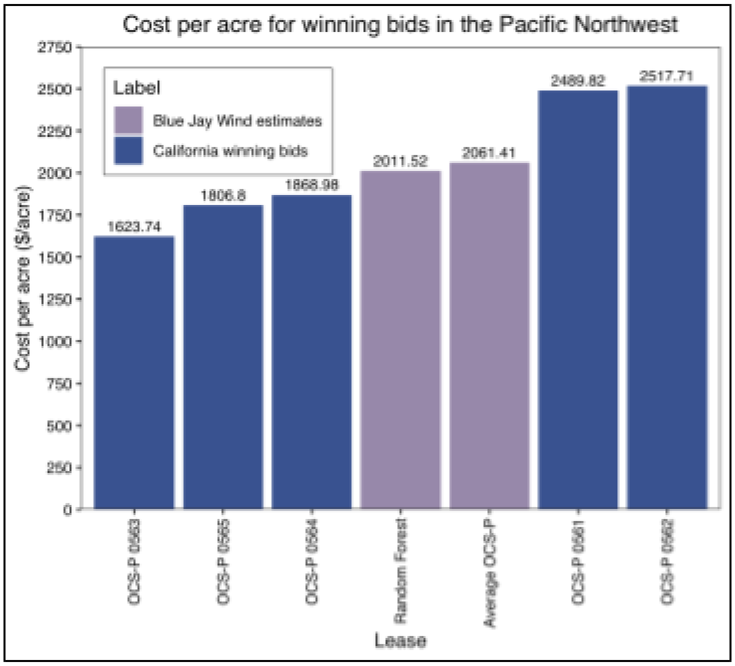


***Figure 9**: Winning Bid Cost per Acre: California Leases vs. Blue Jay Estimates*

3.7 Optimization

HSWET determined a nameplate capacity of 330 MW as the most optimal quantity from NREL's CREST and JEDI models.[122-123] First, HSWET estimated capital and operating expenditures using the JEDI model. These values were then used to arrive at our total nameplate capacity through CREST. HSWET adjusted the farm's nameplate capacity and debt/equity structures on both models within industry standards and offtake capacity in Oregon until the 1.6x debt service coverage ratio was achieved. HSWET incorporated the generation of investment tax credits into our calculations and plans on transferring them to a tax equity sponsor through a partnership flip structure.

HSWET's initial intuition with choosing a turbine model was to follow macro trends in offshore wind development, which are heading toward larger turbine rated capacities. In the end, the Vestas V236-15.0 MW model was chosen after considering SG14-222 DD and Haliade-X 14.7 MW. HSWET researched the robustness and commercial readiness of both the V236 and the General Electric Haliade X, but ultimately decided on Vestas' platform due to its reliability and Vestas' vast industry experience. Moreover, other U.S. developers are launching or plan to launch projects utilizing the V236-15.0 MW model.[124-125]

Different farm layouts were also analyzed before settling on a gridded layout. A perimeter farm layout was tested, but required more space while outputting a similar performance to the gridded layout. An oval shape of 3x8x8x3 resulted in a worse performance than the aforementioned layouts from the outermost turbines entering lower wind resource zones, which generally decrease as position approaches land. Thus, HSWET only looked to optimize the gridded layout. This optimization aimed to minimize the lease area while maintaining a performance similar to a turbine spacing of eight rotor diameters. The total lease area was compressed from 76.23 km^2 to 25.96 km^2, thereby saving HSWET an upfront cost of \$27,830,442.83 due to a smaller bid proposal. This consequently decreases the net energy yield by 22,216.20 MWh, which would correspond to an annual loss of \$1,439,609.76. The 76.23 km^2 lease area would profit over the current lease area after 19 years of operation. However, HSWET would rather save this upfront cause to handle unforeseen circumstances.

When initially predicting a winning auction bid, HSWET first built a linear regression machine learning model. Manual analysis of the above parameters showed that cost per acre correlated: (1) positively with wind speed, (2) negatively with port proximity, (3) negatively with bathymetry, and (4) negatively with acreage. However, the linear regression model estimated that the BJW parameters required a winning bid cost per acre more than 10 orders of magnitude greater than what is observed in the California leases. This prompted HSWET to use the Random Forest model instead.

4.1 Risks

The Blue Jay Wind project faces financial risks from regulatory and logistical challenges. The Jones Act restricts offshore turbine installation to U.S.-built and operated vessels, and with only one compliant vessel available, developers must resort to costly alternatives that increase capital expenditures.[126] Insurance premiums for renewable energy projects have also risen, narrowing available coverage and raising operating costs. For BJW, these conditions demonstrate the importance of efficient design and scale to manage costs and attract financing.

Construction risks remain a significant challenge for large-scale energy projects. Recent developments across the LNG, wind, and solar sectors highlight a growing trend of delays tied to contractor bankruptcies, supply chain disruptions, and permitting bottlenecks and reversals. For example, the Golden Pass LNG terminal, a major natural gas export project in Texas, experienced mechanical completion delays into 2025 following the bankruptcy of its lead contractor.[127] While BJW is an offshore wind development, similar risks associated with supply chain volatility and contractor performance remain critical considerations. Offshore and onshore wind projects are forecasted to encounter one-to-three-year delays, largely driven by turbine shortages and regulatory hurdles. Rising capital expenditures further compound these challenges, with inflation, grid interconnection upgrades, and permitting complexities contributing to broader cost escalation across new energy infrastructure. To mitigate construction-phase risks, HSWET plans to incorporate performance guarantees, contingency allowances, and liquidated damages clauses into project contracts to limit exposure to cost overruns and schedule slippage. HSWET will also plan to pursue a safe harboring strategy under which HSWET would spend 5% of the project cost 4 years before the projected commercial operation date to lock in the then-relevant tax credit regime and insulate the project from some policy risk.

Another key risk is the uncertainty surrounding future wind energy policy and intensifying geopolitical competition. On January 20, 2025, the Trump administration announced a temporary moratorium on offshore wind leasing across the outer continental shelf[128] followed by an April 16, 2025 order to halt construction on the Empire Wind project.[129] Such policy reversals reduce investor confidence and jeopardize efforts to drive down wind energy costs.[130] This undermines the economic principles of "learning by doing" and economies of scale, where increased production leads to greater efficiency. As of mid-2022, China leads globally with 25 GW of operational offshore wind capacity. To maintain competitiveness in this sector, continued support from the U.S. executive branch is essential.[131] Furthermore, since Vestas, our wind farm supplier, continues to source critical components from China, the company must address geopolitical uncertainty by reinforcing supply chain resilience and preparing for potential cost increases or regulatory disruptions.[132]

In parallel, the electricity grid remains a prime target for cyberattacks by U.S. adversaries.[133] To secure both offshore and onshore substations, robust cybersecurity measures must be implemented. Vestas has already drawn attention from cybercriminals and geopolitical actors.[134]

In the event of a sudden environmental catastrophe affecting wind farms, it is essential to have an immediate environmental assessment unit on standby. Currently, the Oregon Department of Environmental Quality operates an emergency response program for oil spills.[135] We propose partnering with this department to develop a specialized response unit and reporting system tailored for offshore wind-related incidents.

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