Searsport Offshore Wind Planning – Benefit-Cost Analysis for the Maine Port Authority PIDP 2023

A BCA provides estimates of the benefits that are expected to accrue from a project over a specific period and compares them to the anticipated costs of the project. Estimated benefits are based on the projected impacts of the project on both users and non-users of the facility, valued in monetary terms.

Based on the 2023 version of the US DOT Guidance, this analysis uses the following methodology and principles:

- Establishing existing and future conditions under "Build" and "No-Build" scenarios.
- Measuring benefits in dollar terms, whenever possible, and expressing benefits and costs in a common unit of measurement. All dollar terms are presented in 2021 prices.
- Using USDOT guidance for the valuation reductions in Co2 emissions, while relying on industry best practice for the valuation of other effects
- Discounting future benefits and costs with the real discount rates recommended by USDOT of 7 percent generally and 3 percent for benefits related to carbon dioxide emissions/
- Conducting a sensitivity analysis to assess the impacts of changes in key estimating assumptions.
- Setting appraisal period to 25 years from first year of construction

The BCA measures benefits against costs throughout a period of analysis beginning at the start of project development and including 20 - 50 years of operations.

Brief description of the project

The State of Maine is committed to the development of offshore wind (OSW) and is looking to build a port facility to support the industry. The state has completed a roadmap, and legislation is pending to confirm its commitment to commercial-scale offshore wind development. Auctions for Gulf of Maine commercial leases are anticipated to occur in Q3 2024, which means the first turbines could be installed in the Gulf of Maine at the beginning of the 2030s. The state believes it is time to pursue the development of a dedicated floating offshore wind port facility. This facility will require a site of about 100 acres and will need to be able to support commercial-scale OSW projects.

The state is taking a measured approach to offshore wind development, starting with a research test array called the Maine Research Array (MERA), which will have 12 turbines and a 144 MW capacity. MaineDOT and the Maine Port Authority are also taking steps to begin site selection and preliminary design at the Port of Searsport. The state has spent millions of dollars exploring concepts for a dedicated OSW port facility. However, this facility is highly specialized and not a traditional marine cargo terminal, and it will require a massive floating foundation to support the wind turbine generator (WTG).

The state is moving forward with designs at two sites in the Port of Searsport: Mack Point Cargo facility and the Sears Island Transportation Parcel. The state has requested funding to continue design work at both sites, begin NEPA work, and complete state and federal permitting. MaineDOT anticipates a primary site to be selected, and design completed in 2024, with permits in hand by Q1 2025.

Summary of benefits

Benefit	NPV 2021 $
Operational efficiency	$163,521,687
Carbon Reduction benefit - High	$785,908,796

Project Costs

The funding request for this project is for $10m. However, for the purpose of this Benefits-Costs Analysis, we consider the full costs of the project if it was to go ahead.

Table 1 - Project Schedule and Costs

VARIABLE	UNIT	VALUE
CONSTRUCTION START	Year	2023
CONSTRUCTION END	Year	2029
PROJECT OPENING	Year	2030
TOTAL CAPITAL COSTS	$M	$500

Project Benefits

The Searsport OSW Planning project will have many benefits in accommodating the delivery and operation of OSW projects. For this analysis, we considered two main quantified benefits:

1. **Operational efficiency (economic competitiveness)** – building the supporting infrastructure near Searsport will allow companies that develop OSW to use the facility and cut operational cost, mostly transportation and manufacturing costs. It is difficult at this stage to estimate the benefits since there are still many unknown factors such as the scope of the operation and any alternative options for OSW companies. According to a feasibility study by the State of Maine, similar projects managed to generate between $60k to $280k per acre per year in lease payments from OSW companies. Given the complexity of the proposed project we believe that it could generate lease payments which at the level of c. $280k per acre per year, applied to the estimated site size of 100 acres. We assume that lease payments represent operational efficiency since OSW would not pay it unless it resulted in efficiency of at least the same amount as of the lease.
2. **Co2 Reduction benefits** – The supporting facilities will make it easier to deliver OSW project quicker, which in turn will generate Co2 reductions benefits. It is estimated that this project will enable the delivery of 0.8 to 1.2 GW of OSW. However, this capacity is likely to build up over at least 10 years from the opening year of the project of 2030. In this analysis we assume that in 2030, c. 150MW (0.15 GW) will be enabled by the project, and this will increase by 10% to 15% each year. We assume that 100% of the generated electricity will replace natural gas generation, avoiding CO2 generation of 363g per kWh of electricity

production, in line with a recent report by DNV Engineering for Maine Governor's Energy Office.[1]

Summary of discounted costs and benefits and kWh production

	COSTS	WIND POWER PRODUCED (KWH) - LOW GROWTH	WIND POWER PRODUCED (KWH) - HIGH GROWTH	CO2 REDUCTION BENEFITS (NPV 2021 $) - LOW	CO2 REDUCTION BENEFITS (NPV 2021 $) - HIGH	OPERATIONAL EFFICIENCY (NPV 2021 $)
2023	71,428,571	0	0	0	0	0
2024	71,428,571	0	0	0	0	0
2025	71,428,571	0	0	0	0	0
2026	71,428,571	0	0	0	0	0
2027	71,428,571	0	0	0	0	0
2028	71,428,571	0	0	0	0	0
2029	71,428,571			0	0	0
2030		695	695	15,906,569	15,906,569	27,931,034
2031		765	799	17,766,414	18,573,979	27,931,034
2032		841	919	19,839,163	21,683,713	27,931,034
2033		925	1,057	22,148,796	25,308,453	27,931,034
2034		1,018	1,216	24,721,965	29,532,731	27,931,034
2035		1,119	1,398	27,588,280	34,454,853	27,931,034
2036		1,231	1,608	31,214,169	40,755,169	27,931,034
2037		1,354	1,849	34,812,469	47,519,395	27,931,034
2038		1,490	2,126	38,818,287	55,395,898	27,931,034
2039		1,639	2,445	43,277,144	64,566,165	27,931,034
2040		1,803	2,812	48,239,590	75,241,104	27,931,034
2041		1,983	3,233	54,459,958	88,804,303	27,931,034
2042		2,181	3,718	60,673,979	103,434,243	27,931,034
2043		2,399	4,276	67,586,204	120,455,068	27,931,034
2044		2,639	4,918	75,274,135	140,254,869	27,931,034
2045		2,903	5,655	83,823,790	163,284,372	27,931,034
2046		3,194	6,504	94,455,100	192,356,956	27,931,034
2047		3,513	7,479	103,900,610	221,210,499	27,931,034
TOTAL				864,506,624	1,458,738,340	502,758,621

[1] See: Socioeconomic Analysis of Offshore Wind in the Gulf of Maine (2022).

Sensitivity Analysis

In the central scenario for this analysis, we assumed a growth rate of 15% from 2030, in line with the current ambition of the state of Maine. However, to further ensure the robustness of the analysis we also estimated the Co2 reduction benefits using a 12.5% and 10% growth rates.

Table 2 - sensitivity analysis

	HIGH GROWTH (15%)	MEDIUM GROWTH (12.5%)	LOW GROWTH (10%)
BENEFITS PV (2021 $)	949,430,483	775,454,603	642,727,260
COSTS PV (2021 $)	359,765,648	359,765,648	359,765,648
BCR	2.64	2.16	1.79
NPV (2021 $)	589,664,836	415,688,956	282,961,613