New England Wind

AVANGRID RENEWABLES

Construction and Operations Plan

Lease Area OCS-A 0534

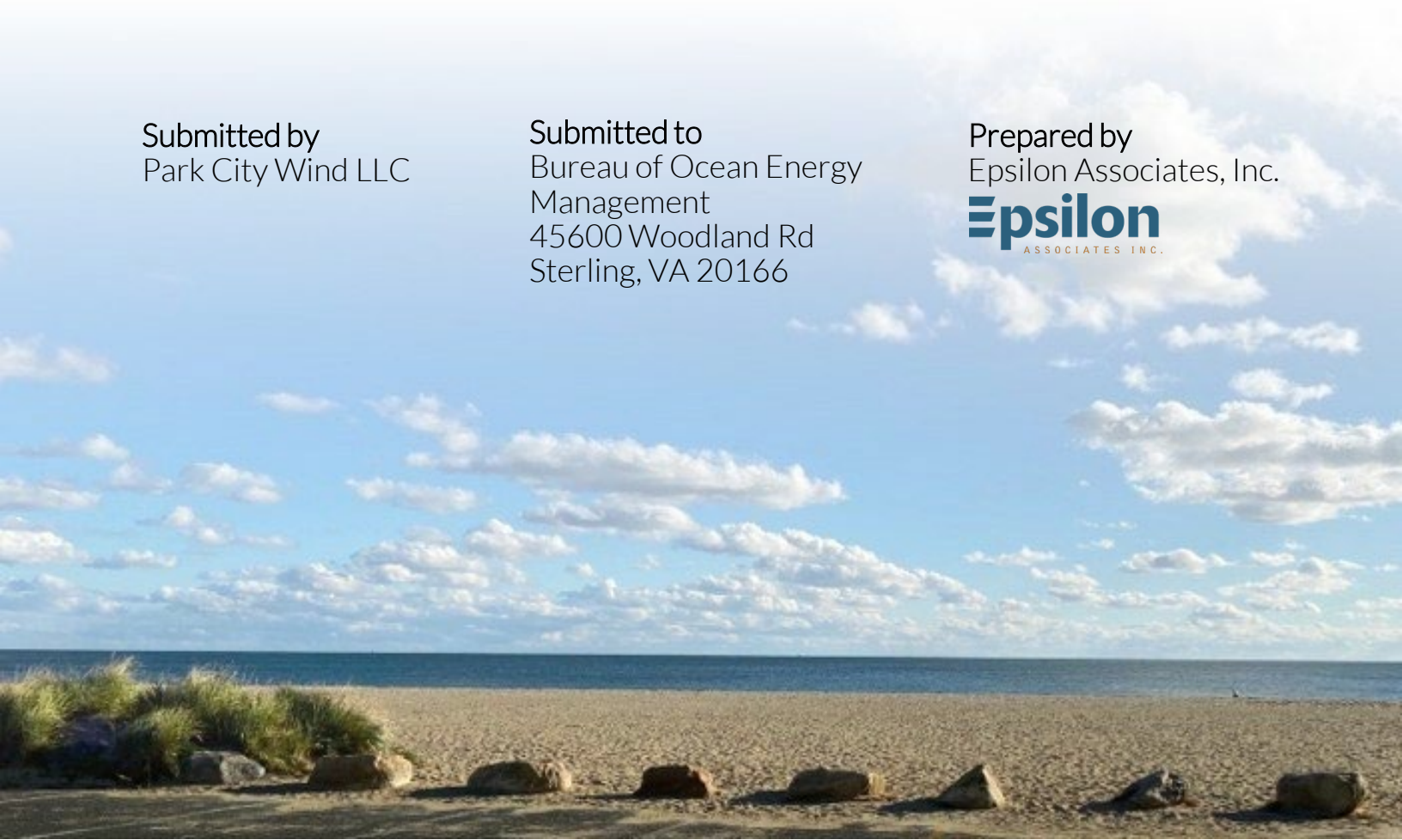
Volume III Appendices

February 2024

Submitted by
Park City Wind LLC

Submitted to
Bureau of Ocean Energy Management
45600 Woodland Rd
Sterling, VA 20166

Prepared by
Epsilon Associates, Inc.



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Submitted by:
Park City Wind LLC

Prepared by:
Epsilon ASSOCIATES INC.

In Association with:

Baird & Associates
Biodiversity Research Institute
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RPS
Saratoga Associates
SEARCH, Inc.
Wood Thilsted Partners Ltd

February 2024

Appendix III-L – Economic Analysis for New England Wind

1. Overview of New England Wind and the CCEA Economic Analysis for Phase 1 (Park City Wind)
2. Phase 1 (Park City Wind): CCEA Economic Impact Analysis - Creating A Sustainable Energy Future - Projecting the Economic Impact of Vineyard Wind's Park City Wind Project
3. Phase 2 (Commonwealth Wind): Daymark Energy Advisors – Economic Impact Analysis of Proposed Vineyard Wind Offshore Wind Energy Project

These economic analyses were prepared prior to the segregation of Lease Area OCS-A 0501 into Lease Area OCS-A 0534 and Lease Area OCS-A 0501 and the subsequent assignment of Lease Area OCS-A 0534 from Vineyard Wind LLC to Park City Wind LLC. Therefore, these reports refer to Vineyard Wind (rather than Park City Wind LLC) as the Proponent of Park City Wind and describes Park City Wind as being located within Lease Area OCS-A 0501 (rather than Lease Area OCS-A 0534).

Additionally, while the Project Design Envelope (PDE) previously included a total of four or five offshore export cables for New England Wind (two offshore export cables for Phase 1 and two or three offshore export cables for Phase 2), the Proponent has confirmed that there will be a total of five offshore export cables (two offshore export cables for Phase 1 and three offshore export cables for Phase 2).

These revisions remain within the maximum design scenario considered for this report (see Section 9.3.2.4) and the maximum potential impacts are still representative considering these modifications. Therefore, this report was not updated to reflect these minor modifications, as the findings are not affected.

New England Wind will be developed in two phases that will deliver over 2,000 MW of clean energy to New England. Prior to the submission of the COP in July 2020, New England Wind entered into a Power Purchase Agreement (PPA) with electric distribution companies in Connecticut and, following COP submission, with electric distribution companies in Massachusetts; these PPAs totaled 2,036 MW. The Proponent has agreed with the electric distribution companies in Connecticut and Massachusetts to terminate the Phase 1 and Phase 2 PPAs to enable New England Wind to participate in future offshore wind solicitations by Northeast states including, but not limited to, recent multi-state solicitations issued by Massachusetts, Rhode Island, and Connecticut in Fall 2023. These actions are necessary to address global circumstances beyond New England Wind's control that have significantly increased costs.

The Proponent remains committed to the development and permitting of both phases of New England to enable the projects to assist the federal government and the states of Connecticut, Massachusetts, and Rhode Island to meet climate and renewable energy/offshore wind goals. Massachusetts, Connecticut, and Rhode Island have all issued solicitations in Fall 2023 for additional offshore wind capacity that collectively total 6.8 GW. These three states have also signed a memorandum of understanding to allow developers to submit multi-state bids, and for the states to collaborate on their procurement decisions. The Proponent intends to submit one or more proposals for this, and if necessary, future solicitation(s). The findings of the economic analyses presented in Appendix III-L are based on the previous awards and are considered representative of potential benefits that will occur as a result of new Power Purchase Agreement(s).

Overview of Economic Analysis for New England Wind

Prepared by:

Park City Wind LLC &
Epsilon Associates, Inc.

June 2022

OVERVIEW OF ECONOMIC ANALYSIS FOR NEW ENGLAND WIND

I. Introduction

New England Wind is the proposal to develop offshore renewable wind energy facilities in Bureau of Ocean Energy Management (BOEM) Lease Area OCS-A 0534 along with associated offshore and onshore cabling, onshore substations, and onshore operations and maintenance (O&M) facilities. Park City Wind LLC, a wholly owned subsidiary of Avangrid Renewables, LLC, is the Proponent of this Construction and Operations Plan (COP) and will be responsible for the construction, operation, and decommissioning of New England Wind.

New England Wind will be developed in two Phases with a maximum of 130 wind turbine generator (WTGs) and electrical service platform (ESP) positions. New England Wind will occupy all of Lease Area OCS-A 0534 and potentially the southwest portion of Lease Area OCS-A 0501 in the event that Vineyard Wind 1 does not develop "spare" or extra positions included in Lease Area OCS-A 0501 and Vineyard Wind 1 assigns those positions to Lease Area OCS-A 0534. Phase 1 will be developed immediately southwest of Vineyard Wind 1. Phase 2 will be located southwest of Phase 1 and occupy the remainder of Lease Area OCS-A 0534. Four or five offshore export cables will transmit electricity generated by the WTGs to separate onshore transmission systems in the Town of Barnstable, Massachusetts. Each Phase of New England Wind will be developed using a Project Design Envelope that defines and brackets the characteristics of the facilities and activities for the purposes of environmental review, while maintaining a reasonable degree of flexibility with respect to the selection of key components, such as the WTGs, foundations, offshore cables, and ESPs.

Phase 1 of New England Wind includes Park City Wind, an 804 megawatt (MW) offshore wind project named after the City of Bridgeport, Connecticut. Park City Wind was developed in response to a competitive solicitation for offshore wind issued by the State of Connecticut in August 2019 pursuant to Connecticut Public Act 19-71, *An Act Concerning the Procurement of Energy Derived from Offshore Wind*. In December 2019, Park City Wind was selected as the sole winning proposal and awarded power purchase agreements (PPAs) with Connecticut's two electric distribution companies.

Phase 2 of New England Wind, also known as Commonwealth Wind, will deliver power to one or more Northeastern states and/or to other offtake users, including 1,232 MW of power to the ISO-NE electric grid to meet the Proponent's obligations under long-term contracts with Massachusetts electric distribution companies.

Economic analyses have been conducted for both Park City Wind and Commonwealth Wind.

- To determine the anticipated economic benefits of Park City Wind, the Proponent relied on a comprehensive analysis conducted by the University of Connecticut's Connecticut Center for Economic Analysis (CCEA) in October 2019. CCEA analyzed the economic impacts of two project size variations of Park City Wind (an 804 MW and a 1,200 MW

analysis) using Regional Economic Model Inc.'s (REMI) dynamic economic model of Connecticut. The resulting report, which follows this overview and is included as an attachment to Appendix III-L, describes a range of job creation and other economic impacts for both project size variations. The 804 MW analysis is representative of the benefits under the current 804 MW PPA for Park City Wind.

- To determine the anticipated economic benefits of Commonwealth Wind, the Proponent relied on a comprehensive analysis conducted by Daymark Energy Advisors (Daymark) in September 2021; this report is provided as an attachment to Appendix III-L (see the 1,232 MW analysis). Daymark analyzed the economic impacts of Phase 2 using the IMPLAN model.

The remainder of this overview focuses on Park City Wind; additional details for Commonwealth Wind are available in the Daymark report included in Appendix III-L. Utilizing the CCEA results, the Proponent has compiled a summary of the following economic benefits for Phase 1 (Park City Wind):

- jobs and expenditures during pre-construction and construction;
- jobs and economic impact during operations and maintenance; and
- projected tax revenues.

As the CCEA analysis and this overview demonstrate, New England Wind will result in significant long-term economic benefits and high-quality jobs in every phase. New England Wind will, therefore, play an important role in further establishing a thriving, utility-scale offshore wind sector in the United States (US) and realizing the tremendous potential economic benefits of this rapidly emerging industry in Connecticut, Massachusetts, and elsewhere in the Northeastern US.

II. Phase 1 (Park City Wind)

Phase 1 includes Park City Wind, an 804 MW offshore wind project designed to maximize both short-term and long-term job creation and economic development benefits for Connecticut while minimizing costs to ratepayers, potential impacts to the environment, and effects on other marine industries. As the CCEA analysis shows, Park City Wind will generate net positive impacts in Connecticut throughout the pre-construction, construction, and operations phases. These impacts include:

- Establishment of a project office in Connecticut to accommodate the Park City Wind development and management team, including consultants.

- Staging and assembly work during the construction phase that makes use of existing port facilities in Bridgeport.

- Plans to locate an O&M facility in Bridgeport for Park City Wind's operational life.

- Directly funded initiatives of up to $26.5 million (nominal) to support supply chain integration, workforce development, offshore wind-related marine and fisheries research, and local communities in Connecticut (see Appendix III-O).

Taken together, Park City Wind's direct expenditures, investments, funding commitments, and partnerships will firmly establish the offshore wind industry in Connecticut, while at the same time integrating the state's businesses and workers into skilled and well-paying jobs, redeveloping local marine infrastructure to serve the burgeoning offshore wind market, and cementing Connecticut's leadership in the nation's offshore wind future. Beyond these direct benefits, Park City Wind also offers Connecticut an opportunity to establish Greater Bridgeport as an offshore wind development, manufacturing, construction, and operations hub and realize additional job and economic benefits beyond those described herein.

A. Jobs and Expenditures During Pre-Construction and Construction

Jobs generated during the pre-construction and construction period will require workers drawn from a diverse range of occupations that represent a wide distribution of skill and educational levels, ranging from environmental scientists and engineers to iron workers, longshoremen, and machine operators. Park City Wind's construction activities will also create opportunities for maritime industries in southern New England, including but not limited to tug charters, other vessel charters, dockage, fueling, inspection/repairs, and provisioning.

Construction of Park City Wind will utilize existing port facilities. The Proponent is committed to investing in the redevelopment of port facilities to facilitate local outfitting, assembly, and load-out of Park City Wind's WTG foundation transition pieces in Bridgeport Harbor. This will bring labor-intensive construction activities and heavy steel works to Connecticut. As further discussed in COP Volume I, ports in Massachusetts, including the New Bedford Marine Commerce Terminal and harbor facilities in Fall River, may also provide construction support.

As a result of these activities, Park City Wind will support an estimated minimum of 770 direct full-time equivalent (FTE) job years[1] in Connecticut during the pre-construction and construction period. Spending associated with this period is also estimated to generate and support a significant number of additional indirect and induced jobs.[2] Specifically, direct payroll and non-payroll expenditures are expected to result in 495 indirect and induced jobs in Connecticut. Of the jobs generated by Park City Wind in Connecticut, the Proponent estimates that approximately 80% will be located in Bridgeport. Statewide, the estimated direct, indirect, and induced impacts of the project will result in Direct Labor Income of $138 million and Direct Expenditures (other than payroll) of $200 million.

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1 Direct jobs refers to FTE job-years created directly by a project or commercial enterprise.

2 Indirect jobs are those created as a result of spending on goods and services associated with a project or commercial enterprise. Induced jobs are those created by the spending of a project's or commercial enterprise's employees within a region.

These above figures are summarized in Table 1. Additional jobs and spending will occur outside of Connecticut, but these activities were beyond the scope of the CCEA analysis and are not reflected in the estimates for Park City Wind.

Table 1 Park City Wind (804 MW) Projected Jobs and Expenditures During Pre-Construction and Construction

Category		Park City Wind 804 MW
Jobs (FTE)[1]	Direct	770
	Indirect and Induced	495
	Total	1,265
Direct Labor Income	Direct	$84,302,000
	Indirect and Induced	$54,194,000
	Total	$138,496,000
Direct Expenditures other than payroll[2]	Direct	$121,919,000
	Indirect and Induced	$78,377,000
	Total	$200,296,000

Notes:

1. One FTE job is the equivalent of one person working full time for 1 year (2,080 hours). Thus, two half-time employees would equal one FTE. The estimate only includes jobs that would occur in Connecticut.
2. Amount to be spent procuring materials and services from the suppliers in Connecticut to support the development and construction of the wind facility.

B. Jobs and Economic Impact During Operations and Maintenance

As shown in Table 2, during the multi-decade O&M phase, Park City Wind will create a number of well-paying, long-term jobs and generate tens of millions of dollars per year in local economic development in Connecticut. O&M activities for Park City Wind will primarily be based out of an O&M facility in Bridgeport although the Proponent may use other ports, including Vineyard Haven on Martha's Vineyard and New Bedford Harbor, to support O&M activities. Park City Wind will also rely on local and regional purchases of goods and services throughout the O&M period.

Park City Wind is estimated to result in 70 direct FTEs annually for a total of 2,100 FTE job years in Connecticut assuming a 30-year operational life for the project. The Proponent estimates that approximately 80% of these jobs will be located in Bridgeport. Direct and indirect impacts are expected to support an additional 90 indirect and induced jobs annually (2,700 FTE job years) during operations. Statewide, the estimated direct, indirect, and induced impacts of Park City Wind will result in Annual Labor Income of $16.4 million and Annual Expenditures of $17 million during operations.

Table 2 Park City Wind (804 MW) Jobs and Economic Impact During O&M

Category		Park City Wind 804 MW
Annual Jobs (FTE)[1]	Direct	70
	Indirect and Induced	90
	Total	160
Annual Labor Income	Direct	$7,208,000
	Indirect and Induced	$9,267,000
	Total	$16,475,000
Annual Expenditures[2]	Direct	$7,459,000
	Indirect and Induced	$9,590,000
	Total	$17,049,000

Notes:

1. One FTE job is the equivalent of one person working full time for 1 year (2,080 hours). Thus, two half-time employees would equal one FTE.
2. Amount to be spent procuring materials and services from suppliers in Connecticut to support the operations and maintenance of the offshore wind facility, excluding labor costs.

C. Tax Revenues During Pre-Construction, Construction, and First Year Operations and Maintenance

The new economic activity generated by Park City Wind will have a substantial positive impact on state and local tax receipts in Connecticut. Impacts include increased personal income tax, payroll tax, sales tax, property tax, corporate tax, and other fee and tax revenues. The CCEA analysis estimates that state and local tax payments for Park City Wind can be expected to reach $238 million in Connecticut during the operations phase. As noted by CCEA, Park City Wind's overall tax impacts would "strengthen Connecticut's fiscal capacity, and total fiscal benefits increase with the size of the [p]roject."

CCEA's tax revenue impact estimate for Park City Wind is highly conservative as it does not include positive tax revenue impacts that would be realized in Connecticut during the pre-construction and construction period. The estimate also does not fully account for potential tax revenue impacts at the federal level or in other states as this was beyond the scope of the analysis. This is relevant for Park City Wind since the project's onshore facilities will be constructed and maintained in Massachusetts. As with Connecticut, tax revenue generated by Park City Wind in Massachusetts would include those paid by the Proponent, its employees, and contractors (i.e. direct impacts) and taxes generated by the economic activities created in other areas of the economy through indirect and induced impacts. Furthermore, contractors engaged by the Proponent will utilize local companies for portions of Park City Wind's offshore and onshore work and make lease or other payments to local landowners to support onshore construction on Cape Cod.

The CCEA analysis also does not account for the fee and host community payments that Park City Wind will generate at the state and local level in Massachusetts, including the following:

1. **Chapter 91 License Fee:** The Proponent will pay a Tidelands Occupation Fee to Massachusetts based on the area of seafloor occupied by Park City Wind in state waters. It is anticipated that the precise amount of the fee will be determined at the completion of construction based on actual permanent occupation of Commonwealth tidelands, and that the fee will be substantial. For reference, the fee that was assessed in connection with the Vineyard Wind 1 project was $1,978,980, subject to adjustment based on final as-built impact calculations.

2. **Ocean Development Mitigation Fee:** This fee is intended to compensate Massachusetts for unavoidable impacts on public interests and rights in the Ocean Management Planning Area and to support planning, management, restoration, or enhancement of marine resources and uses. The Proponent has proposed a minimum fee of $287,500 for Park City Wind, subject to adjustment based on final as-built impact calculations. This fee will be finalized during Massachusetts Environmental Policy Act review at the state level.

3. **Host Community Payment:** The Proponent expects to execute a Host Community Agreement (HCA) with the Town of Barnstable, which would provide funding to the Town to offset potential impacts associated with hosting the onshore facilities for Park City Wind. The Proponent expects that the HCA for Park City Wind will contain very similar terms as those in the 2018 HCA for Vineyard Wind 1.

4. **Nantucket Offshore Wind Community Fund:** The Proponent's Good Neighbor Agreement with the Town and County of Nantucket, the Maria Mitchell Association, and the Nantucket Preservation Trust (collectively the "Nantucket Parties") establishes a long-term relationship with the Nantucket Parties and more generally, the Nantucket community, to support and promote the parties' mutual interests in renewable energy development, combating the effects of global climate change, enhancing coastal resiliency, and protecting, restoring, and preserving cultural and historic resources. In accordance with the agreement, the Nantucket Parties will establish the Nantucket Offshore Wind Community Fund, which will support projects and initiatives related to protecting, restoring, and preserving cultural and historic resources, coastal resiliency, climate adaptation, and renewable energy. Phase 1 and Phase 2 of New England Wind will each contribute $3 million to the Nantucket Offshore Wind Community Fund at financial close.

III. Phase 2 (Commonwealth Wind)

The potential benefits of Phase 2 of New England Wind, also known as Commonwealth Wind, are provided separately in the Daymark Economic Analysis included as an attachment to Appendix III-L.

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IV. Conclusion

Offshore wind energy generation development has significant job creation and economic development potential. The conservatively estimated anticipated minimum level of economic benefits for New England Wind demonstrate the potential for millions in new state and local tax revenues along with thousands of direct, indirect, and induced FTE jobs years.

Phase 1 (Park City Wind) will deliver a significant boost to the Connecticut economy and create well over 1,000 direct, indirect, and induced FTE job years in that state. Of the jobs generated by Park City Wind in Connecticut, the Proponent estimates that approximately 80% will be located in Bridgeport. Outside of Connecticut, jobs and economic benefits will accrue to Massachusetts through construction of Park City Wind's onshore facilities in the Town of Barnstable. Further benefits would be realized in the event that port facilities in Massachusetts, and elsewhere, are used to support construction and operation activities for Phase 1.

Likewise, Phase 2 (Commonwealth Wind) will result in another set of positive economic impacts in the Northeastern US, as further described in the Daymark study included in Appendix III-L.

Given the scale and scope of projected economic impacts, New England Wind will play an important role in further establishing a thriving, utility-scale offshore wind sector in the US and realizing the tremendous potential economic benefits of this rapidly emerging industry in Connecticut, Massachusetts, and elsewhere in the Northeastern US.

University of Connecticut

Creating A Sustainable Energy Future

Projecting the Economic Impact of Vineyard Wind's

Park City Wind Project

Prepared by:

Peter Gunther, Senior Research Fellow, CCEA
Fred Carstensen, Director, CCEA

October 29, 2019

Table of Contents

Executive Summary

Vineyard Wind's Park City Wind offshore wind project (hereafter the "Project"), as the UConn's Connecticut Center for Economic Analysis (CCEA) study presented here demonstrates, will deliver significant net enhancements to employment, household incomes, state Gross Domestic Product (GDP), fiscal health, and environmental goals and commitments. Relying on Regional Economic Model Inc.'s (REMI) dynamic economic model of Connecticut, CCEA analyzed two Project variants—1,200 megawatts (MW) and 804 MW—with Connecticut-based activities concentrated in Bridgeport. The resulting analysis clearly shows Project benefits.

In all phases—development, construction, and operations—the Project generates significant net benefits to Connecticut and, in particular, to Bridgeport. According to the analysis, total Connecticut job-years increase by at least 7,773 with the 1,200 MW variant and at least 6,087 with the 804 MW variant. Of these, at least 5,000 job-years will be in distressed Connecticut communities for the 1,200 MW variant and almost 4,000 for the 804 MW variant. Outside of Connecticut, the rest of the United States (U.S.) benefits from an additional 2,903 (1,200 MW) and 1,355 (804 MW) direct full-time equivalent (FTE) job-years and, using only Connecticut-based multipliers, between 900 to 1,742 indirect FTE job-years.

Connecticut GDP rises by a minimum of $4,300 million for the 1,200 MW variant and $1,633 million for the 804 MW variant while upwards of $481 million (1,200 MW) and $287 million (804 MW) in new personal income tax revenue is generated for the state. The Project also strengthens Connecticut's fiscal capacity by $356 million (1,200 MW) and $104 million (804 MW) through direct, indirect, and induced activities in the economy. Meanwhile, the rest of the U.S. benefits from $368 million and $219 million in federal personal income taxes paid throughout the lifespan of the Project, for the 1,200 MW and 804 MW variants, respectively, as well as additional shipments to Connecticut of $1,583 million (1,200 MW variant) and $645 million (804 MW variant), mostly during operations, to meet all increased demands.

Concentrated in Bridgeport, Connecticut residents benefit from increased personal incomes, in current dollars, of at least $3,995 million for the 1,200 MW variant and $1,471 million for the 804 MW variant. For the increased personal income, Fairfield residents minimally retain $2,752 million (1,200 MW) and $1,184 million (804 MW) over the Project's lifespan after paying federal and state personal income taxes. During development, average wages and salaries are 5-6% higher than Connecticut averages and during operations 27-29% higher. Incremental workers in the construction phase, when job terms tend to be short, benefit from wages and salaries that are annually 98% of Connecticut averages per job for both the 804 MW and 1,200 MW variants. Overall, incremental wages and salaries are 25% higher than current market averages.

The Project is estimated to achieve greenhouse gas (GHG) emission savings worth at least $22 million initially rising to at least $37 million by 2055 for the 804 MW variant, with benefits that are 50% higher for the 1,200 MW variant.

The next section provides a brief discussion of the context for this proposal, the history and experience of CCEA, and the reason CCEA relies on the REMI model to development dynamic economic impact analyses. The Overview section summarizes the results of the study, which follows as the report.

The Context and About CCEA

Vineyard Wind LLC (Vineyard Wind) asked CCEA to undertake this dynamic study of two variants of Park City Wind, an offshore wind project that will be installed on the Outer Continental Shelf in federally designated Lease Area OCS-A 0501. The Project will generate offshore wind electricity that will be delivered to the New England Power Pool (NEPOOL) through an interconnection point located on Cape Cod in Massachusetts.

In proposing to this Project, Vineyard Wind is extending its commitment to responsible offshore wind development, including respect for Connecticut's commitment to protect marine habitats and mammals by minimizing impacts on the environment. Vineyard Wind's previous commitments include an historic agreement to protect the North Atlantic Right Whale through enhanced avoidance, monitoring, and mitigation measures during construction through a partnership with the Conservation Law Foundation, the Natural Resources Defense Council, and the National Wildlife Federation.

Vineyard Wind has also contributed significantly to the new offshore energy industry's momentum in the U.S., which has the potential to create thousands of new, well-paying jobs. Vineyard Wind has also made clear its commitment to continue to work with other domestic offshore wind developers to help confront the challenges facing this rapidly emerging industry and urge adoption of a reasonable, productive regulatory approach that integrates analyses for individual projects in a deliberate and coherent fashion.

About CCEA

Established 27 years ago at the behest of then Governor Lowell Weicker and Joe McGee, Commissioner of the Connecticut Department of Economic Development, CCEA, with its annually updated Connecticut REMI models, has undertaken more than two hundred studies of the Connecticut economy. CCEA is thus deeply experienced in applying REMI's dynamic modelling capacity to complex investments and their operations. Many of these studies have led to significant undertakings, including, but not limited to, Governor Malloy's $850 million Bioscience Connecticut's initiative at the University of Connecticut School of Medicine and the $400 million UTC commitment, which underwrote the rebuilding of the UTC world research facilities in East Hartford. REMI has been the standard in Connecticut for such dynamic analyses since 1992.

About REMI

First developed by the late Professor George Treyz of the University of Massachusetts in the 1980s as a dynamic equilibrium model, REMI has morphed to take a larger array of economic drivers into account and to project a broader range of impacts. One such innovation delivers metrics on the shipments into Connecticut from the rest of the U.S. stimulated by the Project's

Connecticut expenditures, thus capturing national impacts. Other U.S. impacts result from direct expenditures elsewhere in the U.S. during construction and the delivery of about 50% of the power generated beyond Connecticut.

Overview

This report presents an analysis of the economic impacts of the Park City Wind offshore wind project, for which Vineyard Wind proposes to concentrate Connecticut-based activities in Bridgeport, Connecticut. The report projects dynamic economic impacts for two Project variants—1,200 MW and 804 MW. Geographies of interest include Bridgeport and surrounds, other distressed communities in Connecticut, the State of Connecticut, and the rest of the U.S.

Park City Wind Economic Impacts

Capitalization of total Project expenditures in Connecticut varies with generation capacity. The 1,200 MW variant involves capital expenditures of approximately $1,201 million in Connecticut and $282 million elsewhere in the U.S. The 804 MW variant has approximately $887 million in total capital expenditures in Connecticut and another $188 million elsewhere in the U.S. For both Project variants, the study assumes the Project's development phase began in January 2019 and spans approximately 13 quarters. The development phase is followed by a construction phase of approximately nine quarters and an operations phase that extends over 30 years.

Among other things, Park City Wind will support Connecticut's goal of procuring cost-effective large-scale renewable energy generation, including 40% Class I renewable energy and 2,000 MW of offshore wind by 2030. This approach is integral to Connecticut's Global Warming Solutions Act, which targets reductions in state-wide GHG emissions by providing safe, renewable electricity. Connecticut's target of curbing GHG emissions 80% by 2050 relative to 2001 levels requires actions both in-state and accessing other states' markets.

However, Park City Wind does much more than facilitate achievement of the state's renewable energy and GHG targets. As this report details, the Park City Wind variants are estimated to generate:

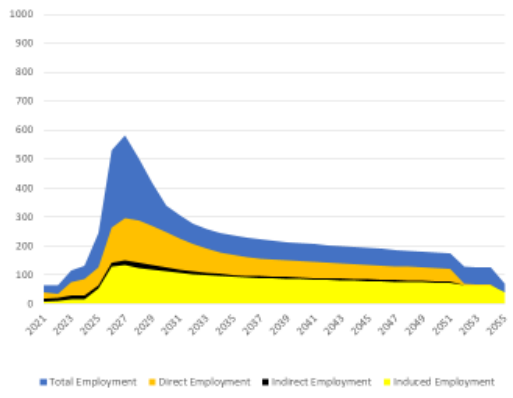
- At least 7,773 (1,200 MW) and 6,087 (804 MW) direct, indirect, and induced jobs in Connecticut over the life of the Project. For the rest of the U.S., the Project will generate an additional 2,904 (1,200 MW) and 1,355 (804 MW) direct FTE job years overall and, using only Connecticut-based multipliers, between 1,742 (1,200 MW) and 900 (804 MW) indirect FTE job years during development and construction.
- Average wages and salaries that are 5-6% higher than overall averages in Connecticut during development and 27-29% higher during operations. Incremental workers in the construction phase benefit from annual wages and salaries that are 98% of Connecticut averages. Across all years, incremental wages and salaries are 25% above current market averages among all employees.
- Rising incomes, as documented in the report, exemplified by Connecticut disposable incomes rising by $3,214 million for the 1,200 MW variant and $1,185 million for the 804 MW variant in current dollars over the Project's lifespan.

- Government revenues that exceed incremental costs for state and local governments in every year and are sufficient to accumulate a surplus of $356 million for the 1,200 MW variant and $104 million for the 804 MW variant by 2055.
- Assessed at rates per ton of CO_2-eq, environmental amenities worth $22 million at start-up, rising to $37 million (current) annually for the 804 MW variant, with benefits about 50% higher for the 1,200 MW option. This estimate excludes any GHG savings resulting from accelerated adoption of green clean electricity energy to fuel power electric vehicles (EVs) facilitated by the Project.

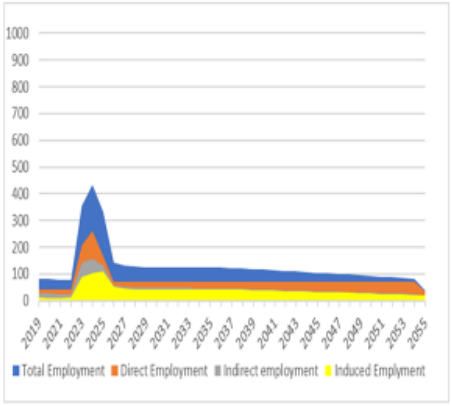
Chart O-1 illustrates the dynamic incremental employment impacts from the Project. Job creation peaks during construction and continues throughout the operations phase, predominantly in Greater Bridgeport. A comparison of the two graphs below indicates differences between the two Project variants. The larger option, shown to the left, also generates more sustained growth in which induced employment exceeds that of both Park City Wind's direct and indirect employment. Given the challenges Connecticut has faced in quality job growth since 2008, this anticipated outcome for both employment and earlier documented average wages and salaries ought to be of special interest.

Chart O-1: Total Employment Impacts: Connecticut and 2018-2055 (Jobs)

1200 MW Base Case



840 MW BASE Case



Expanded employment and higher incomes both contribute directly and indirectly to improving the Connecticut's fiscal position, as summarized in **Table O-1**.

Of the personal income taxes collected in Connecticut, 23.5% accrue to the state, which explains why all state and local incremental revenues are less than the personal income taxes paid by residents. Aggregates of state expenditures rise because expenditures pertaining to the larger population are more than offset by shrinking welfare payments attributable to fuller employment. The bottom line is that under both variants, Park City Wind generates additional net revenues for Connecticut, including $356 million (1,200 MW variant) and $104 million (804

MW variant) over and above increased state and local government additional expenditures over the Project's lifespan, with positive impacts realized throughout development and construction. The federal government benefits from an increase in personal income taxes of $368 million and $219 million in the 1,200 MW and 804 MW variants, respectively, as well as increases in corporate income taxes and reductions in unemployment insurance. **Table O-1** contains totals for each Project variant.

Table O-1: Total Income and Revenue Impacts (Millions Current $)

	Total Tax Impacts
1,200 MW	
Connecticut PI in Current Dollars	3,995
Fairfield County PI in Current Dollars	3,422
Connecticut DPI in Current Dollars	3,214
Fairfield County DPI in Current Dollars	2,752
Personal Income Taxes Collected in CT	481
Federal Personal Income Taxes	368
Personal Income Taxes Paid in Fairfield	442
State & local Government Expenditures	83
All Incremental State & Local Revenues	439
Surplus	356
804 MW	
Connecticut PI in Current Dollars	1,471
Fairfield County PI in Current Dollars	1,408
Connecticut DPI in Current Dollars	1,185
Fairfield County DPI in Current Dollars	1,133
Personal Income Taxes Collected in CT	287
Federal Personal Income Taxes	219.1
Personal Income Taxes Paid in Fairfield	275
State & local Government Expenditures	40.3
All Incremental State & Local Revenues	144.0
Surplus	103.7

Note: "PI" is Personal Income and "DPI" is Disposable Personal Income.

Government surpluses vary among options depending on the mix of industries involved. State and local revenues documented in **Table O-1** are those generated within the REMI model and by direct payments made during development, construction, and operations. During operations, the data include government revenues generated within the REMI model with the direct payments after deductions from the Project assumed to be subsumed within the model estimates. With 50% of sales in Connecticut, direct Connecticut sales income payments from the Project to state and local governments beginning after 2035 are expected to accumulate to $118 to $185 million by 2055, depending on the size of the Project and write-off availabilities. The

relative magnitudes between the penultimate line of the last table and direct sales taxes expected to be paid by the Project suggest that modelled estimates of both revenues and surplus are conservative in the 804 MW case.

In addition to substantial direct Project expenditures, Vineyard Wind is committing tens of millions of dollars to fund direct investments, including upgrades to port infrastructure in Bridgeport. While these direct investments are included in the economic impacts described and analyzed herein, both possible public and/or private matching funds are unknown as are future uses of the improved harbor facilities and/or manufacturing facilities; these may be quite significant, but are excluded from this analysis, contributing to its conservative approach.

Park City Wind represents an immediate opportunity to directly share the benefits of U.S. offshore wind development with Connecticut ratepayers and blue-collar workers, while building the foundation for a new industry right here in Connecticut. Vineyard Wind continues to engage with all relevant stakeholders, including its contractors, regulators, policy makers, local residents, and fishermen, and many other supporters to evaluate options for delivering Park City Wind and other proposed projects. Beyond the economic benefits the Project will deliver to Connecticut, Park City Wind will also significantly reduce carbon emissions.

Market Benefits

Park City Wind will generate revenues not only for itself but also for on-shore electricity distributors. Due to the more favorable and reliable consistency of offshore winds, wind generation at sea enjoys higher capacity factors relative to land-based wind farms. As a result, the Project is conservatively expected to deliver electricity at 50% of labelled nameplate capacity, which is well above the production levels of well-operating onshore generators susceptible to more variable winds. These assessments remain conservative as they are based on half the generation being delivered to Connecticut and nearly half of that (49%) of that going to Fairfield County; distribution among Connecticut counties is based on county shares of Connecticut consumption of all goods and services. The remaining half of the generation is assumed to be delivered into nearby U.S. destinations for final consumption. The analysis herein, however, covers only impacts to the sales into NEPOOL. Omitted are all forward linkages such as the availability of additional electricity to accelerate adoption of Electric Vehicle (EVs) and other major uses of electricity.

Environmental Amenities

Park City Wind's generation is modelled as an alternative source to meet demands for electricity from fossil fuels. For example, Connecticut's adoption of EVs nearly doubled in 2018 and increased an additional 26% in 2019.[1] Because wind generation also avoids GHG emissions that fossil fuel power stations would otherwise emit, CCEA has assessed these amenity values in-line with recommended guidelines issued by the U.S. Interagency Working Group. These rates per ton of CO_2-equivalent grow at constant amounts of just under a dollar per year due to the increasing fragility of environmental sinks.

[1] EV Club of Connecticut based on Connecticut DMV data. *EV Club: CT electric vehicle registrations increased 26% in 2019* **Hartford Business Journal**, Jan 30, 2020.

Job Creation Benefits

Table O-2 summarizes Project employment findings for Connecticut, covering totals during development, construction, and operations, including indirect and induced multipliers. The text clearly articulates CCEA's methodology in reaching those estimates and delineates a few sensitivities. Employment impacts are supplemented by average compensation per job for all additional employees, including those working in service industries where remuneration is generally lower than for those directly involved. Project phases delineate the following timeframes:

- **Development:** Approximately 13 quarters,
- **Construction:** Approximately nine quarters, and
- **Operations:** 25-30 years from commissioning.

Table O-2 provides the employment impacts for the two Park City Wind variants in three lines each. The first of three lines is total employment by phase and for all phases. The total multipliers apply to the direct, indirect, and induced impacts based on data provided by Vineyard Wind of direct employment for each Project variant.

Table O-2: Summary of Connecticut Employment Impacts

		Development Private Sector	Construction Private Sector	Operations Total	Connecticut Jobs Total*	Distressed Communities Jobs
1,200 MW						
Job-Years		519	1,076	6,894	7,773	5,000
Multipliers	Total	1.8	1.5	2.28	2.14	
	Direct & Indirect	1.5	1.4	1.6	1.6	
804 MW						
Job-Years		371	894	4,822	6,087	3,985
Multipliers	Total	2.06	1.51	2.28	2.11	
	Direct & Indirect	1.7	1.4	1.7	1.6	

*In the 1,200 MW variant, due to the improved economy, there is a slight drop in government activities, so the total is less than the sum of the columns.

The table illustrates that:

- The Project will generate in excess of 7,773 (1,200 MW) and 6,087 (804 MW) total job-years in Connecticut with the greatest number occurring during the 30-year operations phase; albeit the largest annual boost to employment will occur during construction.
- Multipliers are a succinct way of indicating spinoffs and induced demand impacts during each phase of the Project's expected lifespan. Due to relatively high wages and salaries during development and operations, these impacts are stronger in those phases than during construction where jobs are relatively short duration on average compared to employment in alternative sectors.

- Largely because average wages and salaries during planning are above Connecticut averages, and due to strong linkages among development personnel, the development phase employment multiplier shows that total employment more than doubles direct employment. During construction, incremental workers benefit from wages and salaries that are annually 10 to 18% above Connecticut averages, again lending demand strength to the multiplier. During development, average wages and salaries are 99% higher than Connecticut averages while during operations, they are 34% higher.
- The Project will revitalize Bridgeport's harbor as a center for Connecticut to actively participate in building Park City Wind and future offshore wind projects.
- Estimated U.S. employment impacts outside of Connecticut, as estimated by the CCEA, include:

    1. Impacts on the four western counties of Western Massachusetts contained in CCEA's model;
    2. REMI also measures purchasing leakages within supply chains to both the Project and suppliers meeting Connecticut induced demands into the rest of the U.S.; and,
    3. Direct purchases by Vineyard Wind for the Project and an approximation of the U.S. supply chain meeting those demands.

Park City Wind contributes to economic growth in Connecticut through higher employment in good quality jobs where average remuneration in all but the construction phases is above state and regional averages. A low benchmark for remuneration is average wages and salaries for Connecticut and the four western counties of Massachusetts per job of $48,000 in 2018 and a higher criterion for average compensation per job in Fairfield County of $62,000. That lofty compensation does not rule out communities in Fairfield County, such as Bridgeport and parts of New Haven in close proximity to Yale University, being distressed communities. Because the Project is committed to locating in and assisting distressed communities, CCEA has approximated employment in distressed communities by the sum of the additional employment in Fairfield, New London, and Hartford counties. There are, of course, other communities that will benefit, so that estimate is meant as an approximation. This Project drives development not only through direct, indirect, and induced employment opportunities but also through growth in average wages and salaries, and thus in aggregate demand.

GDP Impacts

GDP impacts over the lifespan of the Project illustrate that with the population shift to secure well-paid jobs, Bridgeport and Fairfield marginally outperform the state in the 804 MW variant but not in the 1,200 MW variant. For both variants, the GDP impacts, in real 2019 dollars, are larger during extended years of operations with GDP. For the 804 MW variant, GDP increases during development by $26 million, construction by $125 million, and operations by $4,377 million. Discounted at 7%, the NPV amounts to $1.4 billion in 2019. Because operations are concentrated in Bridgeport, Fairfield County, GDP impacts are concentrated there. Before discounting, for the 1,200 MW variant, total GDP impacts cumulating to $4,300 million occur in

Bridgeport/Fairfield and $4,527 million in Connecticut. For the 804 MW variant, total GDP impacts in Bridgeport/Fairfield cumulate to $2,572 million ahead of statewide results at $2,424 million and are similarly distributed over the phases.

Conclusions

The list below highlights the minimum additional income and GDP benefits projected for Connecticut and its communities over the duration of the Project:

- Total increases in real Connecticut GDP (2019 $) of at least $4,527 million (1,200 MW) and $2,572 million (804 MW). Of this, $151 million (1,200 MW) and $113 million (804 MW) occur within a year of the end of construction, where real GDP is the standard measure of economic growth prior to depreciation;
- A population shift during operations from the rest of Connecticut into Bridgeport, which explains why GDP impacts are higher in Fairfield County than in Connecticut for the 80w MA variant;
- Increases in Connecticut personal income, which measures pre-income-tax benefits accruing to people in as spent dollars rises, of $3,995 million (1,200 MW) and $1,471 million (804 MW);
- Increases in disposable personal income, left from personal income after personal income taxes, of at least $3,214 million (1,200 MW) and $1,184 million (804 MW);
- Increases in personal income tax revenues of $481 million (1,200 MW) and $287 million (804 MW); and
- Deducting expected increases in state and local government expenditures of $83 million (1,200 MW) and $40 million (804 MW) to meet Project needs of the larger economy over the Project's lifespan, increases in in-state and local government revenues sufficient to build state and local government surpluses by $356 million and $104 million in current dollars for the 1,200 MW and 804 MW variants, respectively.

The Project also achieves GHG savings worth at least $22 million initially rising to at least $37 million by 2055 for the 804 MW variant. Those expected savings rise in proportion to increased generating capacity, with the 1,200 MW variant resulting in benefits that are about 50% higher. Total benefits could also rise by achieving higher capacity ratios.

Report

Introduction

Vineyard Wind asked CCEA to assess supply chain impacts and indirect economic benefits for 1,200 MW and 804 MW variants of the Park City Wind offshore wind project. The two Project variants call forth different investment and production profiles for direct investments and expenditures in Connecticut and elsewhere in the U.S. throughout the expected lifetime of the Project's three phases: development, construction, and operations.

Created at the request of Governor Lowell Weicker and Joe McGee, the Commissioner of the Department of Economic Development, in 1992, CCEA has over its 27-year history completed more than 200 dynamic economic studies. Over this period, the REMI model (described below) has become the de facto standard for such studies in Connecticut. Several CCEA studies have been of particular significance because of the policies or initiatives that flowed from them. For example, CCEA evaluated the environmental and economic benefits of biodiesel. This resulted in a change in the state classification of biodiesel that led, in turn, to construction of the first biodiesel refinery in Connecticut. It also resulted in a team of five faculty from three colleges, together with CCEA, securing a $1.5 million U.S. Department of Energy research grant to develop an integrated analysis of the potential of biofuels.

Two other CCEA studies are worthy of special note as they resulted in major state initiatives. First, CCEA developed the study on which Governor Malloy based his $850 million BioScience initiative and expansion of University of Connecticut's (UConn) School of Medicine, which then laid the basis for attracting matching investment by Jackson Laboratories to the Schools complex in Farmington. Second, a CCEA analysis of the use of stranded tax credits to fund major capital projects was the basis for the 2014 $400 million agreement with UTC and its commitment to remain in Connecticut for at least 15 years. CCEA has also completed multiple studies to assess whether investment funds have generated the employment and fiscal impacts from their investments to warrant receipt of tax credits.

As noted, CCEA relies on the REMI model for its dynamic economic impact studies. REMI is the product of Regional Economic Models, Inc. of Amherst, Massachusetts. The late Professor George Treyz of the University of Massachusetts developed the REMI framework and founded the company in 1980. To maintain the highest possible accuracy, the company updates (recalibrates) the model annually based on changes in the national input/output table that the U.S. Department of Commerce maintains; the input/output table provides detailed data on all input (labor and material) linkages between every county in the country. REMI is unique among economic models because it alone uses a general equilibrium framework (that is, it looks at the entire array of interactions in the economy over time, capturing the various feedbacks that emerge as industries or sectors grow or shrink). This approach is particularly useful when looking at long-term impacts as it projects how the economy broadly changes, including migratory adjustments, fiscal rebalancing, and interstate trade. Because of this comprehensive structure, REMI alone is also able to project a rich array of dynamic impacts, whether on tax revenues, job creation, demographic changes, household income, etc. For this reason, when Governor Weicker and Commissioner McGee asked UConn to create a center to provide sophisticated dynamic

economic analysis of proposed state policies or investments, they also specifically asked that the then new center, CCEA, license the REMI model. And, as noted, REMI has been the de facto choice for all dynamic economic impact studies in Connecticut since 1992.

Methodology and Scenarios

The two Park City Wind variants analyzed have nameplate capacities of 1,200 MW and 804 MW. Both variants utilize three phases—development, construction, and operations over 30 years; expenditure data have been supplemented for anticipated employment during these three phases. Park City Wind is expected to either substitute for or feed additional demands for electricity that would otherwise have been met by fossil fuel power stations in New England. For specified scenarios, based on the U.S. Interagency Working Group's estimates of current and future costs of GHGs, CCEA has monetized avoidance of deleterious health risks from fossil fuel generation as environmental amenity benefits integral to its assessment.

At its heart, economic development enhances choice by expanding incomes and generating well-paid employment opportunities, especially for those in distressed communities. For that reason, CCEA's report documents both expanding employment and levels of average wages and salaries of all those employed – direct, indirect, and induced. The Project's approach is designed to favor stimulating distressed Connecticut coastal areas with investments targeted in them. While the Project can determine its direct investment, supply chain participants and employees are free to exercise locational choices.

The charts and tables that follow summarize the direct, indirect, and induced benefits from the Project across phases to Fairfield County, Connecticut, and, partially, elsewhere in the U.S. In REMI's dynamic approach, phases are not entirely independent of each other. Once each phase is complete, the economy adjusts back to normality during subsequent years so economic drag is exerted at the beginning of each subsequent phase. In addition, migration and the shift of actual capital to optimum levels adjust slowly.

The outputs of the economic model include estimates of direct employment, indirect employment, and induced employment. The model estimates employment attributable to the Project and its immediate suppliers (Direct) and their suppliers ad infinitum back through all supply chains (Indirect or intermediate demand). Those additional earnings by all the direct and indirect employees and entrepreneurs are saved, spent, or taxed away. They also attract workers either to remain in Connecticut or to immigrate to it. The resulting additional spending of their earnings generates induced or consumer-based employment as does even further spending by the initial round of induced expenditures, resulting in further induced employment and interstate trade. The three sets of employees – Direct, Indirect, and Induced – may reside in Fairfield County, Connecticut, or elsewhere in close proximity so the impacts are geographically spread out as noted in the results.

The analysis measures income through several metrics. GDP measures the increased output or value added in the economy before depreciation. Unlike the sum of the value shipped because GDP includes only value added, it avoids double counting that is contained in the sum of value shipped, an inferior alternative metric. Differences with REMI's base case measure the additional value generated by the Project to each geography's REMI output, usually excluding inflation that

is in constant 2009 dollars, or, alternatively, inclusive of inflation as noted. Because readers viscerally comprehend the value of today's dollars, CCEA has converted all real dollar values to 2019 dollars. To the extent that the Project contributes to inflation, growth measured in current dollars will exceed growth in real or constant dollars.

More germane metrics from individual residents' vantage point are Personal Income (PI) and Disposable Personal Income (DPI). Differences in PI in each of the development cases, with REMI's base case measured in current dollars, show that the Project will improve incomes. By subtracting personal income taxes from PI, CCEA estimates DPI, which measures the increased personal purchasing power generated by the Project. DPI is the measure of economic growth that captures the enhanced freedom to purchase goods and services accruing to individuals.

CCEA allocates increased federal and state personal income taxes between jurisdictions and provides the bases for deriving higher sales taxes and corporate income taxes that contribute to fiscal improvements in each of those jurisdictions. REMI also estimates increased state and local expenditures so that improvements in fiscal health constitute the penultimate section of each chapter followed by the chapter's conclusions.

Because Park City Wind's generation will be delivered into the NEPOOL, environmental amenity impacts from avoided fossil fuel usage will be spread throughout the region. When included, environmental amenities generate incentives to move to jurisdictions where the amenities are being realized but, in this instance, such benefits are spread across New England. As a result, the CCEA has included environmental amenities, with 50% of them being realized in Connecticut, concentrated in and around Bridgeport.

Although not fully covered, CCEA's modelling process identifies three impacts on the rest of the U.S. CCEA's version of REMI includes Connecticut's eight counties and four counties in Western Massachusetts. As part of its output, REMI also identifies all imports into Connecticut required to meet demands generated by the Project from the rest of the U.S. Further, Vineyard Wind has indicated its intention to make purchases elsewhere in the U.S. Applying current Connecticut ratios of employment relative to value shipped and similar employment multipliers, CCEA has estimated U.S. employment impacts.

The next section gives a brief background on the Project and its impacts and benefits before considering amenities. Park City Wind features considerable research into wind and distribution technologies. As with any good research, these activities inevitably raise questions demanding further exploration that will extend analysis beyond that covered by investment in included research and development (R&D). Those impacts are, however, separable and will be considered as they are defined over time.

Park City Wind Inputs

The study analyzes the economic benefits of Vineyard Wind's development, construction, and operation of a 1,200 MW and 804 MW offshore wind project, including accounting for environmental amenity benefits. The analysis is based on Project-related expenditures primarily in Bridgeport, Connecticut. Other Connecticut direct impacts spread into New Haven, Hartford, New London, Tolland, and coastal Middlesex Counties during construction.

All inputs are treated as being procured from their respective industries with the exception of 48 direct employees working on operations akin to utility employees. They are treated as new employees starting in 2025 but declining at 2.5% annually thereafter in keeping with REMI's assumptions of annual improvement in labor productivity. That employment is used conservatively because of Vineyard Wind's estimated employment is in FTEs whereas REMI operates in jobs, albeit the vast majority of utility industry jobs are full-time.

The analysis starts in the development phase, moves to construction, and then into a 30-year operations phase.

Development Phase

Because offshore wind is not yet defined as its own industry, CCEA developed bridging matrixes to span the gap between the engineering description and the REMI classifications for each phase of the Project. Table 1 classifies and quantifies direct inputs into the Project during the development phase. This phase also covers the planning and documentation.

Table 1: Procurement of Development Inputs

Item	REMI Industry Classification
Internal resource and associated costs under development	Management of companies and enterprise
Local permitting fees and surveys in development	Local government revenues
Federal permitting	Federal government revenues
State permitting	State government revenues
Project management costs during development	Management of companies and enterprises
Surveys in development period supplied by local suppliers	Scientific, technical, and professional services

Construction

The Project's construction phase covers a period of approximately nine quarters; Table 2 summarizes expected procurements in Connecticut during this phase of the Project. Expenditures are split evenly between among quarters over the construction period. Because construction activities are focused on wharf facilities, it is a bit of an anomaly within the construction industry so that inputs are less than ideal but the best option available. Construction is concentrated in Bridgeport and surrounding areas with minor amounts spread into New Haven, Hartford, Tolland, and New London.

Table 2 translates Vineyard Wind's project descriptors into NAICS classifications deployed in REMI. Although the fits are not as ideal as one might wish, the basic underlying approach is to find fits that most closely approximate the Project's reality. For most line items, costs estimates were provided by Vineyard Wind based on their latest information from various stages of negotiations with potential suppliers for the Project.

Table 2: Planned Procurements During Construction

Item	REMI Industry Classification
Cost of local fabrication of components, assembly and final coating of jacket structure at site	Construction of other non-residential structures
Cost of facility lease and local equipment	Real Estate
Investment in site facilities to accommodate assembly, load-out	Construction of other non-residential structures
Cost of logistics in relations to installation of electrical service platform jacket structure from facility	Scientific, technical, and professional services
State supplier for pre-lay grapnel run, post lay survey, guard vessel, crew transfer vessels, etc. for export cable	Water transportation
All services for the construction management sourced locally	Scientific, technical, and professional services
Internal resource and associated costs under construction	Scientific, technical, and professional services
Local permits and surveys in construction phase	Local government revenues
State permitting	State government revenues
Federal permitting	Federal government revenues
Project office in state during construction	Real estate and Machinery & Equipment Rentals
Staging and assembly harbor for wind turbines, including lease costs and logistics	Scientific, technical, and professional services
Lease cost at Bridgeport	
Investment in additional port facilities to accommodate blade storage during construction, associated upgrades, and logistics at site	
Workforce development grants, including training facilities and scholarships	Educational services: Private
Supply chain development	Machinery and Equipment
R&D funds	Scientific, technical, and professional services

Operations

Given that construction costs are spread over nine quarters and operational costs over 30 years, annual outlays peak during construction. Operations have been incorporated into the model in terms of jobs in each year across the 30 years of operations at 2019 productivity levels. Spreading them across the years takes REMI's assumption of 2.5% productivity gains into consideration. Not monetized among the operating costs are 2,114 person years of professional personnel, including divers and offshore wind specialty trades. Based on an initial full year of operations, requiring a 30th of these personnel, and accepting the ongoing labor productivity gains, CCEA has modelled additional personnel conservatively at 1,410. Table 3 illustrates the NAIC codes utilized by CCEA.

Table 3: Planned Procurements During Operations

Item	REMI Industry Classification
Operations and Maintenance (O&M) Base Operations	Administration and support services
Contracted services and supplies from local suppliers, including spare components and port services	Administration and support services
O&M logistics, including service operations vessel service, crew and fuel, fuel and port calls, crew, spare parts, and technicians under Service Maintenance Agreement	Water transportation
Onshore O&M to be performed by a local supplier	Management of companies and enterprises
Environmental mitigation (fisheries)	Scientific, technical, and professional services
Taxes and fees – Modeled	
Array and export cable surveys	Scientific, technical, and professional services
Cable storage	Warehousing and storage
Local community program	Windfall facilitating household tax avoidance shifting funds to spending

Park City Wind Impacts

CCEA ran the REMI model from 2019 in order to capture the impacts from the current year through all Project phases. The modelling picks up not only positive impacts as expenditures peak during construction but also the downward adjustment pressures on the economy immediately post-construction, which may be partially or wholly offset by Project start-up. The following sections cover impacts on employment, income, and state and local government by jurisdiction.

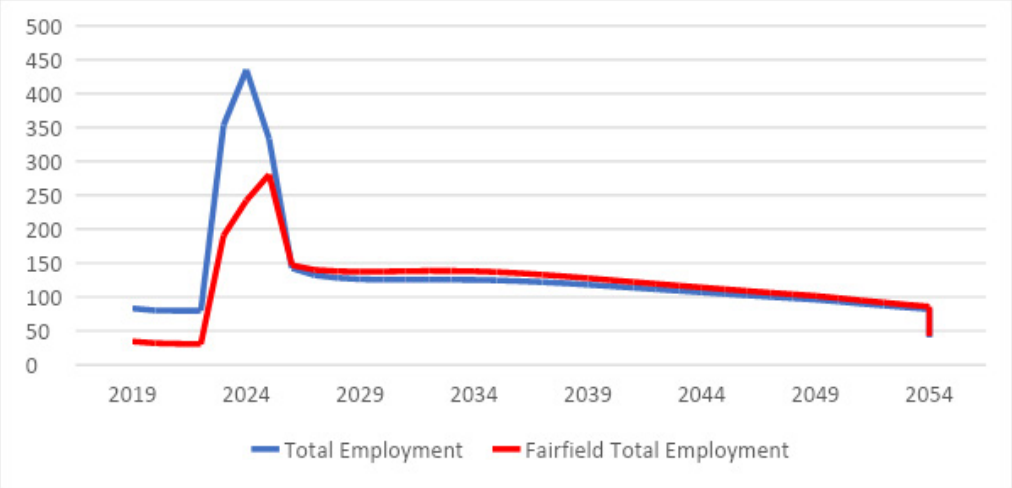
Employment: Connecticut by County

In the analysis, CCEA used sales/cost data during development and construction to attain differences in key economic indicators with those in REMI's base model. Yet, because incremental costs, especially for new employees, were well below the full costs of their industries of specialization, the model generated inadequate direct employment figures. The REMI model did, however, yield reasonable employment multipliers, which CCEA then applied to the direct employment data provided by Vineyard Wind to attain total employment impacts.

Total employment impacts relative to REMI's benchmark case—the 804 MW variant—in Connecticut and Bridgeport (approximated by Fairfield County) typify the magnitude of impacts as demonstrated in Chart 1. Throughout development, Bridgeport is a key source of employees. Yet during construction, a considerable share of the employees come from elsewhere in Connecticut. Shares from outside Bridgeport ebb as employees and their families

adjust to steady operating employment in Bridgeport with increasing shares of incremental employees taking up residency. Because the employment impacts are largely located in Bridgeport, its operations employment impacts exceed those in Connecticut as workers migrate to the area attracted by the higher incomes. Through time, the employment impacts decline amidst steady output and rising labor productivity. The dip in 2055 is a statistical artifact based on half a year of operations.

Chart 1: Total Employment Impacts: Connecticut and Fairfield County—804 MW



CCEA has summarized job impacts by phase in Table 4. Annually during construction, state residents annually will include up to 1,076 (1,200 MW) and 894 (804 MW) private sector job-years.

Table 4: Incremental Job Impacts by Phase Jobs: Connecticut and Fairfield County

	Development Private Sector	Construction Private Sector	Operations All Employment	Total Employment*
1,200 MW				
Connecticut	519	1,076	6,894	7,773
Fairfield County	159	687	6,572	7,572
804 MW				
Connecticut	371	894	4,822	6,087
Fairfield County	142	389	4,994	5,525

* In the 1,200 MW variant, there is a slight decline in government employees to 2024 so the total is less than the sum of the columns.

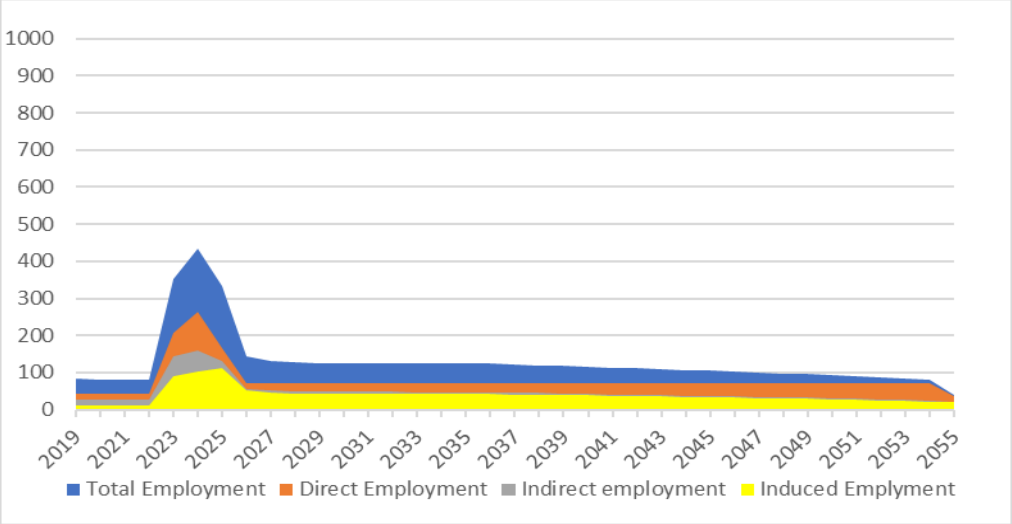
Due to ongoing steady employment generated by the Project during operations, Bridgeport's share of employment grows. This outcome implies that Bridgeport (Fairfield County) will gain slightly relative to the rest of the state during operations. The intra-country movements and the paucity of employment impacts in neighboring states from procurement in Connecticut suggest

that Connecticut trades personnel are highly mobile within the state. The dip at the end of the impacts is attributable to only part of 2055 being included in lifecycle of the Project.

An alternative approach to employment is to designate it as direct, indirect, and induced as noted in the introduction. One way to condense those results over time is to deploy multipliers. They are annual multiples to attain either Direct plus Indirect employment (alias supply chain employment) or total employment.

REMI facilitates estimating employment multipliers in a slightly different way than happens within static models. Because input data are entered by sales rather than employment in the development and construction phases, the model estimates total employment, intermediate employment (Indirect), and employment derived from incremental consumption as "Induced" employment. Chart 2 shows the resulting dynamic multipliers for Connecticut. They capture the post-construction adjustment dip and gradual but higher rates of increase from then to the 2030s onward. The widening of the gap between the two multipliers also suggests that induced impacts grow in importance over time which is consistent with increased residency by employees and their families in Bridgeport and Fairfield County.

Chart 2: Connecticut Employment Multipliers—804 MW



Employment impacts grow with Park City Wind's procurement in Connecticut and with the scope of the Project. Table 5 summarizes employment impacts for both Project variants in three lines each. The total multipliers apply to the direct, indirect, and induced impacts based on Vineyard Wind's data of direct employment for both Project variants.

Table 5: Summary of Connecticut Employment Impacts

		Development Private Sector	Construction Private Sector	Operations Total	Connecticut Jobs Total*	Distressed Communities Jobs
1,200 MW						
Job-Years		519	1,076	6,894	7,773	5,000
Multipliers	Total	1.8	1.5	2.28	2.14	
	Direct & Indirect	1.5	1.4	1.6	1.6	
804 MW						
Job-Years		371	894	4,822	6,087	3,985
Multipliers	Total	2.06	1.51	2.28	2.11	
	Direct & Indirect	1.7	1.4	1.7	1.6	

*In the 1,200 MW variant, there is a slight decline in government employees to 2024 so the total is less than the sum of the columns.

The table illustrates that:

- The Project will generate in excess of 7,773 (1,200 MW) and 6,087 (804 MW) total job-years in Connecticut overall with the greatest number occurring during the 30-year operating phase albeit, the largest annual boost to employment will occur during construction.
- Multipliers are a succinct way of indicating spinoffs and induced demand impacts during each phase of the Project's expected lifespan. Due to relatively high wages and salaries during development and operations, these impacts are stronger in those phases than during construction where jobs are of relatively short duration on average compared to employment in alternative sectors.
- Largely because average wages and salaries during development are above Connecticut averages, and due to strong linkages among development personnel, the development phase employment multiplier shows that total employment more than doubles direct employment. During construction, incremental workers benefit from annual wages and salaries that are 10 to 18% above Connecticut averages, again lending demand strength to the multiplier. During development, average wages and salaries are 99% higher than Connecticut averages, and during operations they are 34% higher.
- Compared to other phases, multipliers are relatively weak during construction because construction-workers are specialized and highly mobile so that spending from these earnings is by where workers live. This is a conservative assumption that likely understates impacts but is consistent with established methodology.
- The Project will revitalize Bridgeport's harbor as a center for Connecticut to participate actively in building offshore wind generation.

Both Project variants contribute to economic growth in Connecticut through higher employment in good quality jobs with above average remuneration in all but the construction phase. A low benchmark for remuneration is the average wages and salaries or Connecticut and the four Western counties of Massachusetts per job of $48,000 in 2018 and a higher criterion for average compensation per job in Fairfield County of $62,000. That lofty compensation does not rule out communities in Fairfield County, such as Bridgeport and parts of New Haven in close proximity to Yale University, being distressed communities. Because the Project is committed to locating in and assisting distressed communities, CCEA has approximated employment in distressed communities by the sum of the additional employment in Fairfield, New London, and Hartford counties. There are, of course, other communities that will benefit so that estimate is meant as an approximation. The Project drives development not only through direct, indirect, and induced employment opportunities but also through growth in average wages and salaries, and thus in aggregate demand.

Employment Beyond Connecticut

Employment impacts elsewhere in the country are measured by three determinants:

1. CCEA's REMI model contains impacts on the four western counties of Western Massachusetts;
2. REMI also measures purchasing leakages within supply chains to both the Project and suppliers meeting Connecticut direct, indirect, and induced demands into the rest of the U.S.; and
3. Direct purchases by the Project and an approximation of the U.S. supply chain meeting those demands.

The rest of the U.S. benefits from an additional 2,904 (1,200 MW) and 1,355 (804 MW) direct full-time equivalent (FTE) job years and, using only Connecticut-based multipliers, between 900 to 1,742 indirect FTE job years. The country also benefits from $597 million and $219 million, for the 1,200 MW and 804 MW variants, respectively, in federal personal income taxes paid throughout the lifespan of the Project as well as additional shipments to Connecticut of $1,643 million (1,200 MW variant) and $645 million (804 MW variant), mostly during operations, to meet increased demands, including those from additional Connecticut consumption

Incomes: Connecticut by County

As noted in the introduction, various income metrics measure alternative aspects of income impacts. Germane here are increases in:

1. GDP—Measures gross income improvements, prior to depreciation, in each jurisdiction covered in the analysis, which are denominated in both real and current dollar.
2. Output—Includes double counting of supplies albeit it is a measure of total value shipped by all industries and governments. It is differentiated from GDP, which is the sum of incremental value added by the private and public sectors and excludes double counting.

3. PI—Measures the extent to which persons are better-off inclusive of the personal income taxes paid to federal and state governments in the sense that the ability pay those taxes reduces debt for which citizens are ultimately responsible and/or increases the ability of governments to spend on behalf of their citizenry.
4. DPI—Measures income left in the hands of households to enjoy freely and is PI net of personal income taxes. For individuals, DPI extends their freedom of choice, the essence of economic growth aside from increased government services over which there may be some debate about individual preferences.
5. Amenities—Non-pecuniary benefits, such as cleaner air, which, because they are not generally traded, need to be monetized before being included in the analysis.

Within the REMI model, improved amenities attract net migration into a jurisdiction. In this case, because the Project delivers clean electricity into NEPOOL, which includes Connecticut, amenities are realized throughout New England rather than just in Connecticut. For comparative purposes, CCEA includes the last of these metrics. Yet, because REMI's Connecticut model assumes that amenities are not being delivered to neighboring jurisdictions, their inclusion will exaggerate the migratory impacts in Connecticut because longer migratory distances can be expected to dampen migratory impacts. Additionally, GHG impacts are not fully modelled where green electricity availability plays a role in accelerating Connecticut residents' adoption of EVs. None of the amenities arising from adoptions of EVs have been taken into account. Thus, included amenities may be a small subset of those actually achieved.

This section first observes Connecticut and Fairfield County for the 804 MW variant before contrasting Real GDP, output, and PI/DPI impacts with the 1,200 MW variant.

GDP

Chart 3 contains Connecticut and Fairfield County GDP impacts in millions of real 2019 dollars and current dollars; Connecticut is represented with a solid line and Fairfield County delineated with perforated lines, with the differences between the two metrics being inflation. For both metrics, Fairfield County receives a majority of the impacts, albeit a smaller share during construction where the mobility of construction trade workers results in impacts being more broadly distributed. During operations, Bridgeport and surrounds slightly outpace Connecticut as labor migrations shift population to that area. By the end of the modelled timeframe, underlying inflation approximately doubles the measurement of GDP. The word "underlying" here is important. Given the inflationary index of 210.687 in 2049, relative to the base year of 2009, only 0.002 is added to the index by the Project such that the Project's inflationary impacts are close to nil. The remaining bulk of the inflation stems from underlying inflation within REMI over time.

Table 6 divides GDP impacts among the three phases. Output growth generates similar patterns to the above except that futuristic impacts are more impacted by inflation than near-term ones, whereas Chart 3 illustrates that annual impacts occur during construction; the most important phase is the more prolonged operating one.

Chart 3: Annual GDP Impacts—804 MW (Millions $)

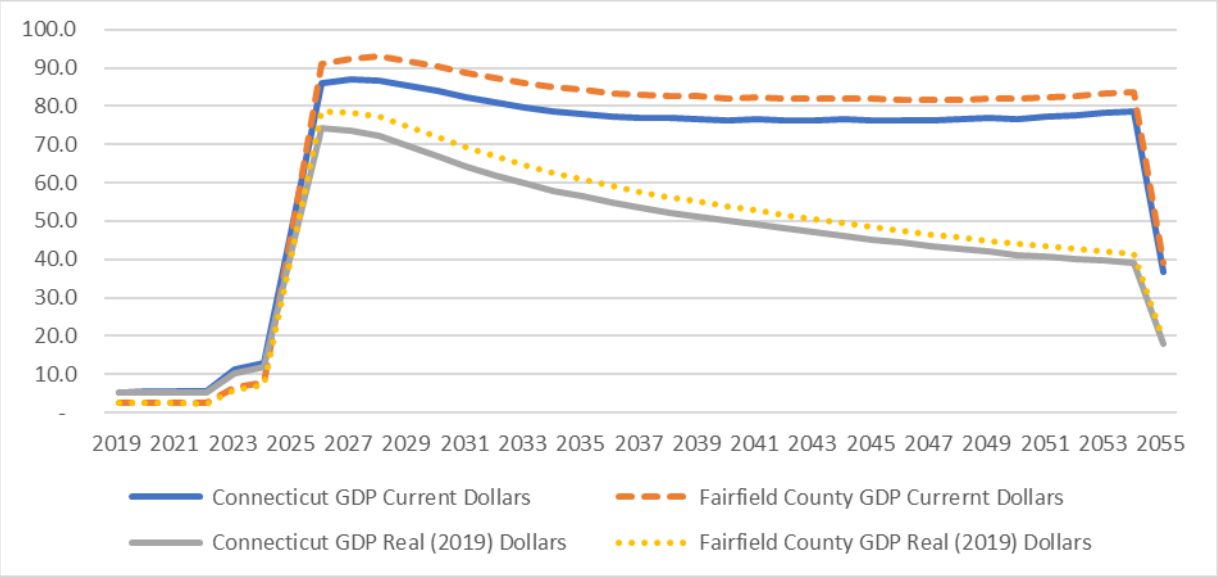


Table 6: Connecticut GDP Impacts by Phase (Millions 2019$)

Phase	Development	Construction	Operations	Total
1,200 MW (Real GDP)				
Connecticut	26	125	4,377	4,527
Fairfield County	12	106	4,182	4,300
804 MW (Current $)				
Connecticut	14	30	2,380	2,424
Fairfield County	8	19	2,545	2,572
804 MW (Real GDP)				
Connecticut	14	27	1,592	1,633
Fairfield County	7	17	1,702	1,726

Because the REMI model follows established purchasing patterns based on extant business, it is not fully capturing the Project's establishment of personnel new to Bridgeport. Establishing staff there and paying them will create added value beyond the GDP measured by the model. Given expected remuneration of $40.5 million during development and another $200 million during construction for the 804 MW variant, for example, the model is definitely underestimating GDP increments in both jurisdictions.

Output

Output is the sum of all industry outputs inclusive of each industry's inputs. It is the measure of all economic activity in the case of manufacturing measured at the factory gate. Chart 4 is patterned very similarly to Chart 3 although the vertical axis is larger due to multiple counting within the supply chain. While this metric is used often to hype impacts, it tends to exaggerate them. By the year 2049, the model estimates that annual Connecticut impacts will be about $16 million higher than those of GDP, a measure of the domestic supply chain contributions as indirect inputs.

Chart 4: Output Impacts—804 MW (Millions $)

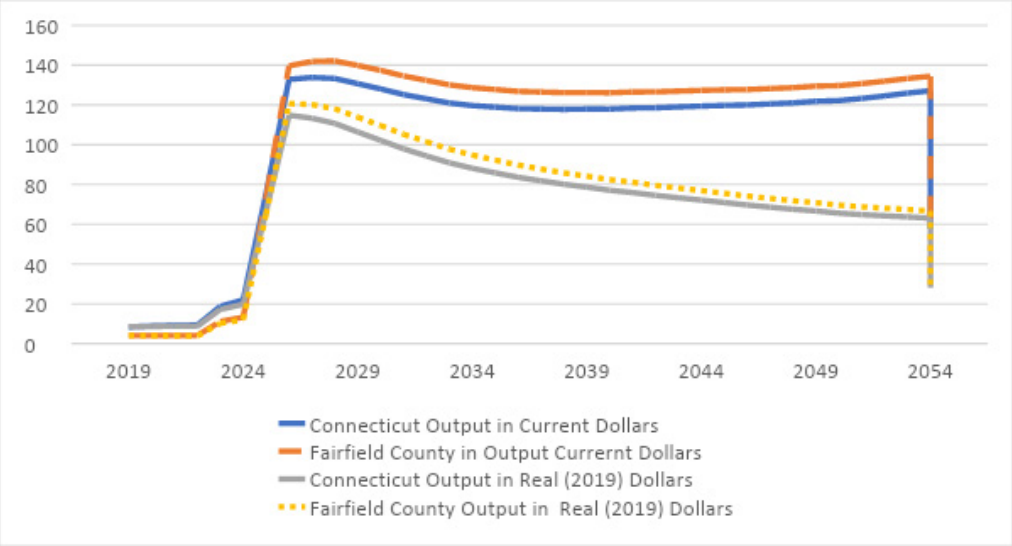


Table 7 illustrates the Project's output for the 804 MW variant and reinforces the importance of each phase for Fairfield County and Connecticut. As above, these estimates will rise as the Project becomes more established in Bridgeport and adds to its industrial capacity.

Table 7: Connecticut Output Impacts by Phase—804 MW (Millions $)

Phase	Development	Construction	Operations	Total
Current $				
Connecticut	25	52	3,699	3,776
Fairfield County	14	33	3,936	3,983
Real (2019 $)				
Connecticut	21	41	2,140	2,203
Fairfield County	12	26	2,277	2,315

Personal Income, Disposable Personal Income, and Personal Income Taxes

Charts 5a and 5b illustrate the impacts of PI, DPI, and personal income taxes collected in Fairfield County and Connecticut throughout the modelled period. The upper bound in both charts is annual PI and the upper bound of gray represents the level of DPI. The difference between the two, colored in yellow or blue, represents state personal income taxes. The charts show that more economic activity is impacted at the county level than the state. Yet the differences between personal income taxes paid from the two jurisdictions closes over time as greater shares of employees migrate into Bridgeport, redressing issues of that stressed community. That same phenomenon also explains the differences in incomes between the two jurisdictions, which also closes during operations.

Chart 5a: Fairfield County PI, DPI, and Personal Income Taxes—804 MW (Millions Current $)

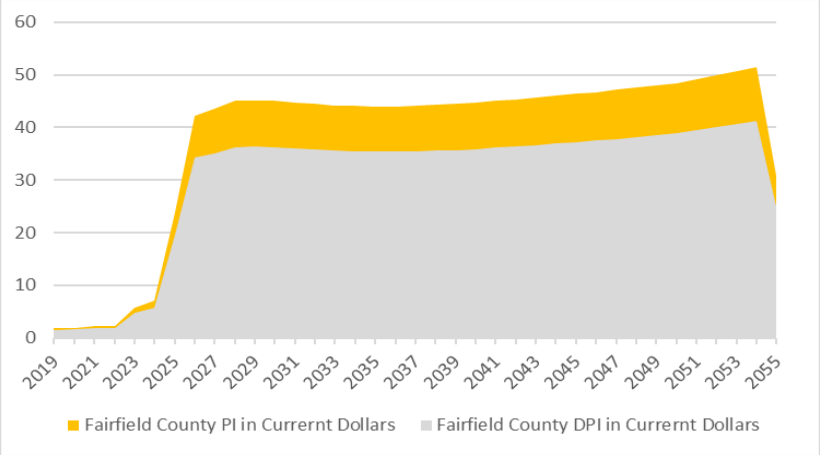


Chart 5b: Connecticut PI, DPI, and Personal Income Taxes—804 MW (Millions Current $)

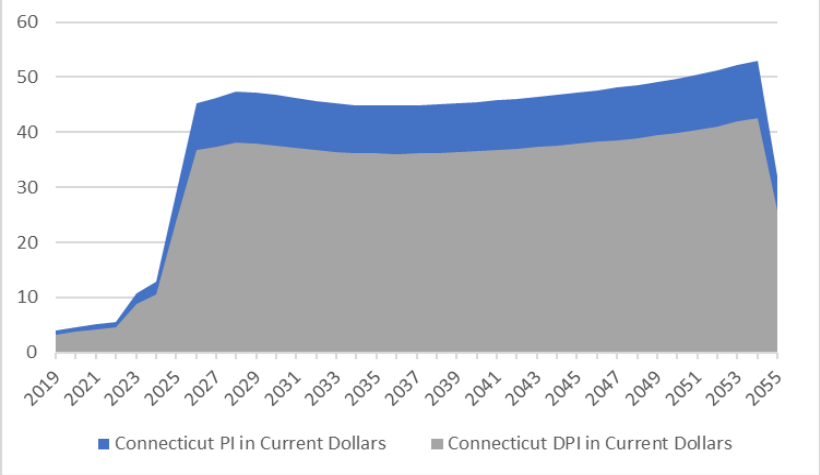


Table 8 presents totals for each phase for PI, DPI, and Personal Income Taxes sourced in each jurisdiction for both Project variants. For the 804 MW variant, total personal income taxes collected in Connecticut rise by $606 million over the duration of the Project from development through the first 25 years of operations. Connecticut's resulting share of personal income taxes is 23.5% or $67 million in current dollars. During operations, the majority of these are collected in Fairfield County.

Table 8: PI, DPI, and Personal Income Tax Impacts (Millions Current $)

	Development	Construction	Operations	Total
1,200 MW				
Connecticut PI in Current Dollars	20	65	3,909	3,995
Fairfield County PI in Current Dollars	8	44	3,370	3,422
Connecticut DPI in Current Dollars	17	54	3,144	3,214
Fairfield County DPI in Current Dollars	7	36	2,709	2,752
Personal Income Taxes Collected in CT	3	9	469	481
Federal Personal Income Taxes	3	7	358	368
Personal Income Taxes Paid in Fairfield	1	6	435	442
804 MW				
Connecticut PI in Current Dollars	19.2	23.6	1,428	1,471
Fairfield County PI in Current Dollars	8.3	12.8	1,387	1,408
Connecticut DPI in Current Dollars	15.8	19.4	1,149	1,185
Fairfield County DPI in Current Dollars	6.9	10.7	1,115	1,133
Personal Income Taxes Collected in CT	3.4	4.1	279	287
Federal Personal Income Taxes	2.6	3.1	213.4	219.1
Personal Income Taxes Paid in Fairfield	1.4	2.2	272	275

Other Fiscal Considerations

Beyond personal income taxes, CCEA has established state impacts on sales taxes and other revenues sources as well as increased state and local expenditures associated directly and indirectly with the Project. Such expenditures can arise from costs to ensure that Project components are esthetically acceptable, meet codes, and that public infrastructure needs are met. More subtly, public expenditures are needed to meet the demands of the larger retained and migrant populations for household public services, hookups, roads, and schooling demands. It is important that the Project generates sufficient increased government revenues to meet expanded demands for services. These demands accelerate during the construction period and carry into operations.

Personal income tax and sales tax accounted for 82% of state revenues in 2018 with Corporations and Business Taxes accounting for an additional 5%. Assuming that increases in Corporations Business Taxes and other revenues keep pace with personal income tax and sales taxes, CCEA has estimated total increases in state revenues noted in Chart 6. Additional tax revenues are

derived within the REMI model encompassing major sources of increased government revenues. The difference between the two lines is the net annual surpluses. The fiscal performance is annually positive.

Chart 6 consolidates incremental state revenues and expenditures with the differences, illustrated by the gap between the two lines, over time being annual surpluses. Because incremental state and local government revenues remain below a million dollars annually, most of the state tax revenues accrue to the general fund as net surpluses from the Project. These are assumed to be saved rather then spent by the state. Any expenditure of these funds could reduce the surplus or build other capacity for growth, again separable decisions by governments. While these future revenues may not result in surpluses, they do provide the means for governments to attain the surpluses or, like individuals, fund further choices.

Chart 6: Connecticut State Fiscal Surpluses—804 MW (Millions Current $)

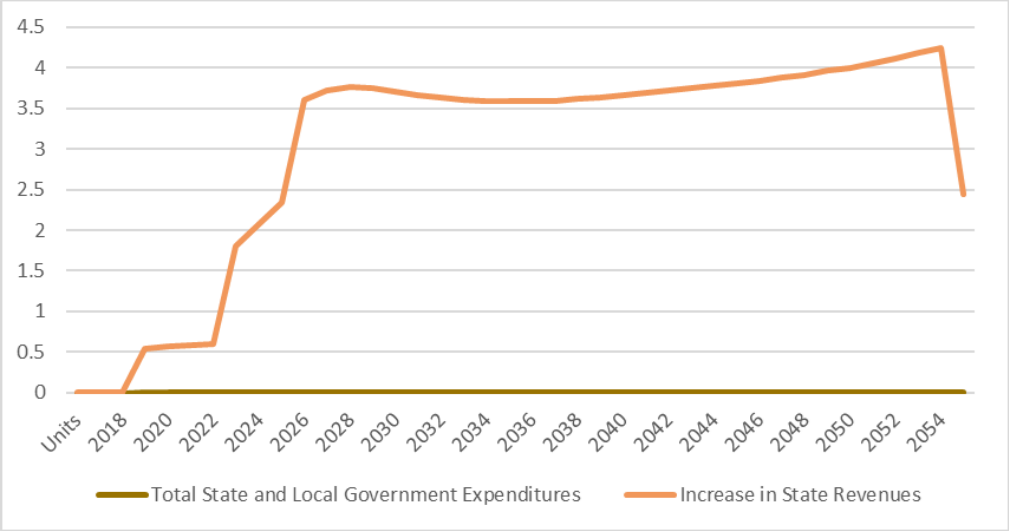


Table 9 shows increased Connecticut expenditures, revenues, and net surpluses by Project phase. While each phase produces a net surplus, the majority of surpluses occur during operations, albeit annual averages are higher during construction. To avoid double counting, the taxes which the Project expects to pay to state and local governments have not been included in the above. Yet for the 804 MW variant, for example, these payments are expected to reach $238 million from 2025 to 2055 and rise as high as $370 million for the 1,200 MW variant. These payments strengthen Connecticut's fiscal capacity, and total fiscal benefits increase with the size of the Project.

Table 9: Impact on Incremental Connecticut State Revenues, Expenditures, and Net Surpluses by Phase (Millions of Current $)

	Development	Construction	Operations	Total
1,200 MW				
State and local government revenues	1	2	80	83
State and local government expenditures	2	7	430	439
Net surplus	1	5	349	356
804 MW				
State and local government revenues	2.9	3.5	137.7	144.0
State and local government expenditures	1.6	1.7	37.0	40.3
Net surplus	1.2	1.8	100.7	103.7

Table 10 indicates total income impacts for both Project variants. At a quick glance, the results for the 1,200 MW option appears low so CCEA reserves the right to amend them. Nevertheless, both Project variants point to creating a sustainable future on a significant scale with beneficial impacts increasing with the size of the Project. Table 10 also shows that the Project strengthens Connecticut's fiscal capacity.

Table 10: Total Income Impacts

	GDP (2019 $)	Output (2019 $)	PI (Current $)	DPI (Current $)
1,200 MW				
Connecticut	4,527	5,707	3,995	3,214
Fairfield	4,300	5,394	3,422	2,752
804 MW				
Connecticut	1,631	2,533	1,471	1,185
Fairfield	1,726	2,658	1,408	1,133

As with employment, the scale of operations and the construction pace can both impact income. Typical of such differences, increases in real GDP elsewhere in the U.S. in real 2019 dollars. The negatives during construction for the 1,200 MW version suggests that it will draw construction workers not only from other counties into Connecticut so that GDP is generated in Connecticut as opposed to outside the state. For the 804 MW variant, the REMI model is identifying links to Western Massachusetts during operations. Table 11 provides U.S. GDP impacts for both Project variants.

Table 11: Phased Other U.S. GDP Impacts by Project Size (Millions of Real 2019 $)

	Development	Construction	Operations	Total
1,200 MW	247	197	1,299	1,742
804 MW	106	83	1,129	1,318

Impacts on Distressed Communities

This Project contributes to both enhanced employment and higher incomes in distressed communities by generating relatively high paying jobs in those communities. As the direct purchaser of services, the Project has the capacity to ensure that the majority of the direct jobs in Bridgeport are filled by residents whenever they qualify or can, within reasonable costs, be trained by the Project. Further, much of the R&D and supply chain integration activities will be carried out in distressed communities, including New Haven and Hartford.

For these reasons, Project expenditures are tailored to occur in distressed areas. Based on the Project's direct, indirect, and induced impacts over its lifespan, total economic benefits to distressed Connecticut communities will increase by $1.4 to $2.7 billion depending on the Project variant and the distribution of Project components. Comparing remuneration per job in those communities with dollars earned directly, indirectly, and induced employment from the Project shows that Park City Wind will contribute to real growth in these communities.

Conclusions

The results of the modelling justify proceeding with the Project. CCEA's estimates are modest because:

1. Project variants do not include wind turbine procurement in Connecticut;
2. Direct employment inputs have not been adjusted from FTEs to part-time employment deployed in REMI;
3. The model does not account for documented future spinoffs resulting from improving the productivity of suppliers' labor forces; and
4. Fiscal surpluses are all assumed to be used to pay-off Connecticut's debt rather than fund new state initiatives.

Highlights for Connecticut from Park City Wind include:

- The generation of at least 7,773 (1,200 MW) and 6,087 (804 MW) direct, indirect, and induced jobs in Connecticut over the life of the Project.
- Income gains in Connecticut add up to Connecticut disposable incomes rising by $3,214 million for the 1,200 MW variant and $1,184 million for the 804 MW variant in current dollars over the Project's lifespan.
- Estimated net accumulated surpluses accruing to Connecticut amount to $356 million and $104 million in current dollars for the 1,200 MW and 804 MW variants, respectively.
- Approximately 5,000 job-years will be located in distressed Connecticut communities for the 1,200 MW variant and almost 4,000 for the 804 MW variant.

CONFIDENTIAL

ECONOMIC IMPACT ANALYSIS OF PROPOSED VINEYARD WIND OFFSHORE WIND ENERGY PROJECT

SEPTEMBER 16, 2021

PREPARED FOR

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TABLE OF CONTENTS

APPENDICES

TABLE OF FIGURES

TABLE OF TABLES

LIST OF ACRONYMS

CapEx	capital expenditures
CIP	Copenhagen Infrastructure Partners
COD	commercial operation date
CTV	crew transfer vessels
FTE	full-time equivalent
MA DOER	Massachusetts Department of Energy Resources
MRIO	Multi-Regional Input-Output
NAICS	North American Industry Classification System
OpEx	operating and maintenance expenses
POI	point of interconnection
PV	present value
RFP	request for proposals
SOV	service operation vehicle
VW	Vineyard Wind

DISCLAIMER

The analyses supporting the results presented here involve the use of assumptions and projections with respect to conditions that may exist or events that may occur in the future. Although Daymark Energy Advisors has applied assumptions and projections that are believed to be reasonable, they are subjective and may differ from those that might be used by other economic or industry experts to perform similar analysis. In addition, actual future outcomes are dependent upon future events that are outside Daymark Energy Advisors' control. Daymark Energy Advisors cannot, and does not, accept liability under any theory for losses suffered, whether direct or consequential, arising from any reliance on this presentation, and cannot be held responsible if any conclusions drawn from this presentation should prove to be inaccurate.

I. EXECUTIVE SUMMARY

Commonwealth Wind is an offshore wind project (Project) that Vineyard Wind (VW) is proposing to build in federally designated Lease Area OCS-A 0534, which is located approximately 22 miles south of Martha's Vineyard. The Project consists of either an 825 MW or a 1,232 MW offshore wind energy generation facility that will deliver power to Massachusetts via high voltage alternating current subsea cables that make landfall in the Town of Barnstable, Massachusetts. Both project configurations will deliver significant economic benefits to Massachusetts and the broader northeast region.

Daymark was retained by Vineyard Wind to quantify the range of economic benefits of the Project. Daymark modeled these benefits using the IMPLAN model, described in detail Section IV below. This report summarizes the results of our analysis of the economic benefits of both the 825 MW and the 1,232 MW configurations. This report quantifies the Project benefits during the development, construction, and operations phases. The operations phase is assumed to be the 20-year contract term through 2046. However, we also present operations benefits for the longer, 30-year expected life span.

A. Project Expenditures

Below is a breakdown of the total expenditures VW is planning to make on the projects, as well as the total estimated expenditures in Massachusetts and the New England region. For the 825 MW project, VW is estimating that about 61% of all development costs will be spent in Massachusetts, and 20% of construction costs and 40% of operations costs will be spent in Massachusetts. The proportion of Massachusetts expenditures is very similar for the 1,232 project, as noted in Table 1 below. When presenting results, we refer to development and construction costs as capital costs, or CapEx and ongoing Operations costs as OpEx.

Table 1. Total CapEx and OpEx of Commonwealth Wind (millions of $, nominal)

Phase	Project Size (MW)	Total Expenditure	MA Expenditure	Additional Regional Expenditure	% spend in MA
Development	825	$86.9	$53.1	$13.4	61%
	1,232	$89.4	$55.2	$13.4	62%
Construction	825	$2,986.6	$592.3	$25.3	20%
	1,232	$4,202.7	$762.0	$25.3	18%
Operations	825	$1,873.5	$756.2	$0.0	40%
	1,232	$2,489.6	$909.3	$0.0	37%
Total	825	$4,947.0	$1,401.6	$38.7	28%
	1,232	$6,781.7	$1,726.5	$38.7	25%

Table 2. Breakdown of Spending Modeled (millions of $, nominal)

Phase	Project Size (MW)	Total Expenditure, MA + Regional	Spending Modeled in IMPLAN	Other Spending Discussed Qualitatively
Development	825	$66.5	$60.7	$5.8
	1,232	$68.5	$62.7	$5.8
Construction	825	$617.6	$584.4	$33.2
	1,232	$787.4	$774.1	$13.2
Operations	825	$756.2	$712.6	$43.5
	1,232	$909.3	$854.4	$54.9
Total	825	$1,440.3	$1,357.7	$82.6
	1,232	$1,765.2	$1,691.3	$73.9

For the 825MW project option, Daymark included $1,358 million of a total $1,440 million of northeast-based spending in its economic benefits model. For the 1,232MW project option, Daymark included $1,691 million of a total $1,765 million of northeast-based spending in its economic benefits model. The remaining spending happens in categories such as direct payments, leases, and taxes. Since it is uncertain how these funds will be spent once they are disbursed, we cannot calculate their economic benefit. Additionally, direct payments (such as real estate purchases), do not add value to the economy because there are no products created or services provided. Other spending

discussed qualitatively in Table 2 above corresponds to the values that were not modeled or included in the reported benefits.

B. Economic benefits

The economic benefits estimated in this report are gross benefits, not net benefits. The results show total benefits in terms of economic output and employment resulting from the proposed investments. The majority of the estimated gross benefits and employment numbers are most properly interpreted as "*supported*" impacts rather than "*created*," as detailed further in Section IV, Part A.

The proposed 825 MW Commonwealth Wind Project is expected to generate approximately $1,232 million in direct benefits, approximately $447 million in indirect benefits, and $533 million in induced benefits in the New England region. The economic impact is expressed in 2021$ present value (PV). The Project is estimated to support approximately 3,253 job-years of direct employment, approximately 2,717 job-years of indirect employment, and approximately 3,832 job-years of induced employment.

The alternatively proposed 1,232 MW Commonwealth Wind Project is expected to generate approximately $1,521 million in direct benefits, approximately $540 million in indirect benefits, and $640 million in induced benefits. The economic impact is expressed in 2021$ PV. The Project is estimated to support approximately 4,021 job-years of direct employment, approximately 3,260 job-years of indirect employment, and approximately 4,622 job-years of induced employment. These totals in these figures assume a 20-year operation period.

Table 3. Total Northeast Economic Benefits of 825 MW Project ($2021 NPV)

	CapEx + OpEx (20 Years)	Capital Expenditure (2022 - 2027)	OSW - Operational Expenses (COD to Year 20)	OSW - Operational Expenses (COD to Year 30)
Description	**Total**	**OSW Construction**	**OSW - O&M**	**OSW - O&M**
Direct Impact				
Employment (Job Years)	3,253	2,009	1,244	1,612
Labor Income, PV $ Millions	$590.9	$351.4	$239.6	$293.4
Output, PV $ Millions	$1,232.2	$777.5	$454.7	$551.0
Indirect Impact				
Employment (Job Years)	2,717	1,571	1,146	1,506
Labor Income, PV $ Millions	$173.0	$109.6	$63.5	$79.0
Output, PV $ Millions	$446.9	$276.0	$170.9	$211.7
Induced Impact				
Employment (Job Years)	3,832	2,097	1,735	2,241
Labor Income, PV $ Millions	$188.2	$113.6	$74.6	$91.5
Output, PV $ Millions	$533.0	$319.5	$213.5	$261.9
Total Impacts				
Job Years	9,803	5,677	4,126	5,358
Labor Income, PV $ Millions	$952.1	$574.5	$377.6	$463.9
Output, PV $ Millions	$2,212.1	$1,373.0	$839.1	$1,024.6

Table 4. Total Northeast Economic Benefits of 1,232 MW Project ($2021 NPV)

	CapEx + OpEx (20 Years)	Capital Expenditure (2022 - 2027)	OSW - Operational Expenses (COD to Year 20)	OSW - Operational Expenses (COD to Year 30)
Description	**Total**	**OSW Construction**	**OSW - O&M**	**OSW - O&M**
Direct Impact				
Employment (Job Years)	4,021	2,596	1,425	1,815
Labor Income, PV $ Millions	$711.3	$421.0	$290.3	$354.2
Output, PV $ Millions	$1,520.6	$959.4	$561.3	$675.4
Indirect Impact				
Employment (Job Years)	3,260	1,899	1,360	1,770
Labor Income, PV $ Millions	$206.9	$131.4	$75.5	$93.1
Output, PV $ Millions	$539.6	$335.3	$204.4	$251.2
Induced Impact				
Employment (Job Years)	4,622	2,526	2,096	2,691
Labor Income, PV $ Millions	$225.7	$135.6	$90.1	$110.1
Output, PV $ Millions	$640.3	$382.2	$258.1	$315.1
Total Impacts				
Job Years	11,902	7,022	4,881	6,276
Labor Income, PV $ Millions	$1,143.9	$688.0	$455.9	$557.4
Output, PV $ Millions	$2,700.5	$1,676.8	$1,023.7	$1,241.7

Daymark separately estimated the potential state, county, and municipal tax benefits of the Project's construction versus operation and maintenance phases. The tax results are inclusive of the following types of taxes: sales, property, excise, personal income,

corporate profits and other special taxes[1]. Tax impacts are presented below in Table 5 and Table 6. Taxes are included in the overall economic benefit output calculations.

Table 5. Massachusetts Tax Benefits of 825 MW Project ($2021 NPV)

	CapEx + OpEx (20 Years)	Capital Expenditure (2021 - 2027)	OSW - Operational expenses (COD to Year 20)	OSW - Operational expenses (COD to Year 30)
Description	**Total**	**OSW Construction**	**OSW - O&M**	**OSW - O&M**
Direct Impact				
State Tax	$25.6	$14.6	$11.0	$13.6
County Tax	$0.1	$0.1	$0.1	$0.1
Municipal Tax	$9.1	$5.3	$3.9	$5.1
Sub-Total	$34.9	*$19.9*	*$14.9*	*$18.7*
Indirect Impact	$0.0			
State Tax	$11.8	$6.7	$5.1	$6.2
County Tax	$0.1	$0.1	$0.1	$0.1
Municipal Tax	$9.4	$4.8	$4.5	$5.4
Sub-Total	$21.3	*$11.6*	*$9.8*	*$11.7*
Induced Impact	$0.0			
State Tax	$15.6	$8.2	$7.4	$9.1
County Tax	$0.2	$0.1	$0.1	$0.1
Municipal Tax	$14.5	$7.4	$7.1	$8.5
Sub-Total	$30.3	*$15.7*	*$14.6*	*$17.7*
Total, PV $ Millions	$86.4	**$47.2**	**$39.3**	**$48.2**

Table 6. Massachusetts Tax Benefits of 1,232 MW Project ($2021 NPV)

	CapEx + OpEx (20 Years)	Capital Expenditure (2021 - 2027)	OSW - Operational expenses (COD to Year 20)	OSW - Operational expenses (COD to Year 30)
Description	**Total**	**OSW Construction**	**OSW - O&M**	**OSW - O&M**
Direct Impact				
State Tax	$25.6	$14.6	$11.0	$13.6
County Tax	$0.1	$0.1	$0.1	$0.1
Municipal Tax	$9.1	$5.3	$3.9	$5.1
Sub-Total	$34.9	*$19.9*	*$14.9*	*$18.7*
Indirect Impact	$0.0			
State Tax	$11.8	$6.7	$5.1	$6.2
County Tax	$0.1	$0.1	$0.1	$0.1
Municipal Tax	$9.4	$4.8	$4.5	$5.4
Sub-Total	$21.3	*$11.6*	*$9.8*	*$11.7*
Induced Impact	$0.0			
State Tax	$17.4	$10.0	$7.4	$9.1
County Tax	$0.2	$0.1	$0.1	$0.1
Municipal Tax	$16.1	$9.1	$7.1	$8.5
Sub-Total	$33.7	*$19.1*	*$14.6*	*$17.7*
Total, PV $ Millions	$89.9	**$50.6**	**$39.3**	**$48.2**

[1] The tax portion of the IMPLAN output is discussed here in more detail: https://support.implan.com/hc/en-us/articles/360041584233-Taxes-Where-s-the-Tax-

Vineyard Wind is also planning on partnering with a third-party to establish a cable manufacturing facility in New Bedford. This facility would provide Vineyard Wind with cables for their project, as well as be able to supply other offshore wind ventures with cables. Below in Table 7 are estimated impacts of this manufacturing facility. Investment values are in $2021 NPV and in millions.

Table 7. Cable Manufacturing Partner Benefits (2022-2057)

Cable Manufacturing Estimates	FTE Job Years	Investment
Development	104	$14
Construction	493	$199
O&M (30 years)	5,255	$649

II. INTRODUCTION

Daymark was retained by Vineyard Wind, LLC (VW), a joint venture between Avangrid and Copenhagen Infrastructure Partners (CIP), to provide an economic impact analysis of Commonwealth Wind The Project proposed by Vineyard Wind is in response to a request for proposals (RFP) issued by the Massachusetts Department of Energy Resources (MA DOER), in coordination with the Fitchburg Gas & Electric Light Company d/b/a Unitil (Unitil), Massachusetts Electric Company and Nantucket Electric Company d/b/a National Grid (National Grid), and NSTAR Electric Company d/b/a Eversource Energy (Eversource), as investor-owned electric distribution companies to procure long term contracts for offshore wind energy resources. The RFP is also known as the 83C III solicitation. The analysis in this report focuses on estimating the economic benefits associated with direct investments made in the Commonwealth of Massachusetts during development, construction, and operational phases of the Project. This report also discusses additional benefits that would accrue to the New England region, specifically in Connecticut. The analysis is designed to support the estimation of credible economic benefits consistent with the requirements stated in the 83C III RFP. This report is based on near-final data provided to Daymark by Vineyard Wind, and there may be minor variations between our assumptions and the final proposal.

III. THE PROPOSED PROJECT

Commonwealth Wind is an offshore wind project that Vineyard Wind is proposing to build in federally designated Lease Area OCS-A 0534, which is located approximately 22 miles south of Martha's Vineyard. The Project consists of either an 825 MW or a 1,232 MW offshore wind energy generation facility that will deliver power to Massachusetts via high voltage alternating current subsea cables that make landfall in the Town of Barnstable, Massachusetts. This report evaluates the economic benefits of both the 825 MW and the 1,232 MW configurations. This report discusses project benefits during the development, construction, and operations phases. The operations phase is assumed to be a 20-year contract term through 2046. However, we also present operations benefits for a longer, 30-year expected life span.

The Project will progress through three phases. Phase 1, the development phase (2022–2027), includes activities such as outreach, planning, and permitting. Concurrently, Phase 2 or the construction period (also 2022–2027), involves the construction and installation of various structures such as wind turbines and foundations, transmission cables, onshore and offshore substation facilities, and port upgrades. Phase 3, the operation and maintenance period (2028–2057), involves routine monitoring and repair of the structures built during the construction period. Figure 1 shows the timeline of the proposed Project.

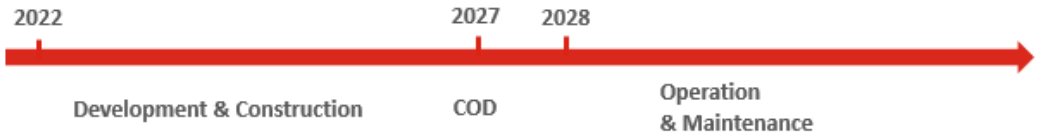

Figure 1. Project Timeline

The total capital expenditures (CapEx) and operating expenditures (OpEx) for the projects are approximately $4,947 million and $6,782 million for the 825 and 1,232 MW project configurations, respectively. Massachusetts-specific expenditures are estimated at $1,402 and $1,727 million. The CapEx and OpEx expenditures are summarized in Table 8, below. All dollar values in the table are expressed as the sum of nominal dollars, in accordance with the bid requirements defined in the RFP. The Massachusetts state-specific spending for the development phase is about 61% of total spend. The

Massachusetts state-specific spending for the construction phase is about 20% and state-specific OpEx spending is expected to be about 40% (see Table 8).

Table 8. CapEx and OpEx of Commonwealth Wind (millions of $, nominal)

Phase	Project Size (MW)	Total Expenditure	MA Expenditure	Additional Regional Expenditure	% spend in MA
Development	825	$86.9	$53.1	$13.4	61%
	1,232	$89.4	$55.2	$13.4	62%
Construction	825	$2,986.6	$592.3	$25.3	20%
	1,232	$4,202.7	$762.0	$25.3	18%
Operations	825	$1,873.5	$756.2	$0.0	40%
	1,232	$2,489.6	$909.3	$0.0	37%
Total	825	$4,947.0	$1,401.6	$38.7	28%
	1,232	$6,781.7	$1,726.5	$38.7	25%

IV. ANALYSIS METHOD

A. IMPLAN

Daymark used the IMPLAN model,[2] an input/output model developed by the IMPLAN Group to estimate the direct and indirect economic impacts to Massachusetts and Connecticut resulting from the development, construction, and operation of the two Vineyard Wind offshore wind project sizes as well as the proposed partner projects.

Impacts from the analysis are broken into three categories: (1) direct benefits, (2) indirect benefits, and (3) induced benefits. Direct benefits are realized directly from investment in Massachusetts-based businesses. Indirect benefits arise from the business-to-business transactions that are inherent within an industry's supply chain (for example, should a developer hire a contractor, and the contractor in turn leases a crane that lease would be considered an indirect benefit). IMPLAN also reports induced benefits, which are household spends resulting from the direct investment. While induced benefits are included in this report, they are harder to track, measure, and verify, and they should therefore be viewed as less precise estimates than direct or indirect benefits.

All benefit types from IMPLAN are further broken down by category as shown in Figure 2. Intermediate Inputs are defined by IMPLAN as "purchases of non-durable goods and services such as energy, materials, and purchased services that are used for the production of other goods and services, rather than for final consumption"[3]. Daymark has primarily reported Output and Labor Income in this report, as well as the job-years associated with the Project.

[2] IMPLAN, "*What is IMPLAN?,*" August 13, 2018, accessed September 18, 2020, available at: https://blog.implan.com/what-is-implan#:~:text=IMPLAN%20is%20a%20platform%20that,system%20that%20is%20fully%20customizable.

[3] https://support.implan.com/hc/en-us/articles/360044176233-Understanding-Intermediate-Inputs-II-

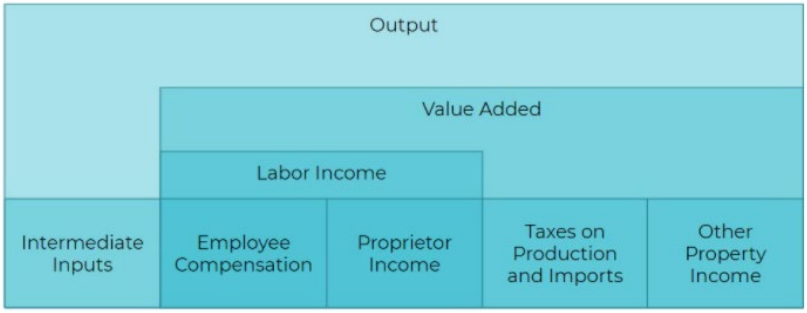

Figure 2. Components of output for a given industry[4]

The IMPLAN model reports employment output in two ways: "job years" and "employment compensation." If a worker is employed by a company in one position for 12 months, that is considered one job-year. If the same employee holds the same position for 24 months, that is considered two job-years. Additionally, if one employee holds two positions for the same 12 months, that is considered two job-years. IMPLAN provides ratios to determine full-time equivalents (FTEs) based on these job-years. The use of FTEs makes understanding employment figures easier – a person working one year for 35 hours a week, or more, is considered one FTE, while a second individual working part-time for the same year would be considered 0.5 FTEs, depending on exact hours worked.

VW provided Daymark with FTE job year estimates. We used these as inputs to the IMPLAN modeling for the majority of the spend categories based on our determination noted above that VW's estimates were more representative. Employment compensation is simpler to understand, as it is the dollar value of the labor supported by the investment in a project.

IMPLAN, like any input/output model, considers gross benefits only, not net benefits. This complicates interpretation of results. It is difficult to determine exactly how much of the gross results are "new" jobs for example, and how much the Project can be supported by any existing margins or "slack" in the industry. This holds truer for indirect and induced benefits and employment, where the jobs and industries impacted are best described as "supported" rather than "created."[5]

[4] IMPLAN, "*Understanding Output*," accessed September 17, 2020, available at: https://implanhelp.zendesk.com/hc/en-us/articles/360035998833-Understanding-Output.

[5] IMPLAN, "*Employment Data Details*," available at: https://implanhelp.zendesk.com/hc/en-us/articles/115009510967-Employment-Data-Details.

For this analysis, results generated by IMPLAN are reported in 2021 dollars. In order to estimate present value, Daymark discounted future years at a real discount rate of 1.55%, which is the interest rate of a 15-year, investment-class Massachusetts municipal bond.[6]

B. Multi-Regional Input Output (MRIO)

Using IMPLAN, Daymark performed a Multi-Regional Input-Output (MRIO)[7] analysis to estimate economic impact at the county-level and to capture any incremental economic activities occurring within Massachusetts. Due to regional business-to-business trade and worker commuting, the significant investment considered by the Project will impact not only the county where the activities occur, but also the neighboring counties in Massachusetts. Neighboring states, including Connecticut and the broader New England region, will also see economic benefits from the Project due to the geographic proximity and ongoing activities there. We discuss Connecticut and regional benefits separately.

When assigning costs to specific regions for the MRIO analysis, Daymark was specific where possible, to allocate investments to the counties with confirmed spending; these counties include Suffolk, Bristol, Essex, and Barnstable. The economic analysis considered all capital and operational expenses in these four counties. In addition, in order to track all relevant supply chain impacts and minimize leakage[8] (via indirect benefits), Daymark grouped the remaining Massachusetts counties into a study sub-region. To represent the regional benefits associated with the Project, Daymark also included Connecticut in its model to ensure most leakages were captured; the majority of spending in the northeast region not occurring in Massachusetts occurs in Connecticut. While other states will likely receive some spill-over benefits, they are small.

The resulting six regions (the four specific counties and the two multi-county regions) balance precision and accuracy in the MRIO analysis without overwhelming the model by inputting each county individually.

[6] https://emma.msrb.org/IssueView/Details/P1410828.

[7] IMPLAN, "*MRIO: Introduction to Multi-Regional Input-Output Analysis*," accessed September 18, 2020, available at: https://implanhelp.zendesk.com/hc/en-us/articles/115009713448-Introduction-to-MRIO.

[8] A leakage is indirect or induced economic activity that occurs outside of the study region. For example, if an employee living in Massachusetts earns income via the Project, but their closest grocery store is in Rhode Island, their grocery spending is an induced benefits leakage that will not be captured in the current model due to the omission of Rhode Island.

C. Mapping to industry categories

Vineyard Wind provided Daymark with expected Massachusetts- and Connecticut-specific spending by year, by location, and by category. The analysis requires defining how payments would be made, to whom they would go, and a breakdown of services, labor, and materials. Certain categories of spending such as direct reimbursement payments or real estate costs are not included in the analysis because they provide no economic benefit, despite providing a financial benefit.[9]

After receiving a detailed understanding of planned direct investment in Massachusetts, Daymark mapped each investment to a North American Industry Classification System (NAICS) code. NAICS codes are detailed industry standard categories commonly understood across the fields of public policy and economics.

Daymark used the IMPLAN model for the analysis. IMPLAN has its own industry categorization system. IMPLAN produces a "bridge" document that links NAICS industries directly to the appropriate IMPLAN category, as determined by IMPLAN's in-house economists.

[9] Direct payments are transfers of funds from one entity to another that add no value to the economy as a whole because no products are created and no services are provided.

V. STATE-SPECIFIC COST MODEL INPUTS

Daymark conducted its analysis of the Project using the IMPLAN input/output model (see Section IV above). The key inputs in the model are the state-specific Project expenditures for each phase. This section describes the various types of Project costs during each phase.

A. Capital investment period

Vineyard Wind (VW) is investing between $87 and $89 million in development of the Project, with between $53 and $55 million worth of spending in Massachusetts, depending on project size. The slight difference in spending is due to a higher permitting cost for the larger project size. These development costs are for engineering and planning, permitting, environmental monitoring, administration, and bid development. During construction, VW is planning to invest $592 million in the 825 MW size Project and $762 million in the 1,232 MW size Project. These costs are for engineering and development, port upgrades, interconnection and substation upgrades, and transportation and installation of equipment. Equipment and other costs that are not being sourced specifically in MA, such as the wind turbines, are not included in our inputs. Input categories are discussed in more detail below.

Point of Interconnection upgrades

In ISO New England, new wholesale power generators are required to pay for any transmission system upgrades necessary to reliably connect a project to the grid. This cost category includes substation equipment such as transformers, breakers, relays, and grounding, and any additional materials required. The proposed Point of Interconnection is in Barnstable County.

Transportation and installation

A variety of ships, barges, and ferries will be needed to transport both people and materials throughout the project timeline. Project costs include expenses associated with rendering services related to crew transfer vessels (CTV), service operation vehicle (SOV), and guard vessels. Additionally, specialized vessels will be required to conduct civil works such as dredging and surveying at both the port facilities and the Project site.

Design and engineering support

Engineering and other technical services make up a significant portion of Massachusetts investment for the proposed Project across the three phases (development,

construction, and operation). In the development phase, engineering/technical services include permitting, environmental monitoring, and geotech activities. In the construction phase, engineering/technical services activities are associated with installation and construction of the array cable package, export cable, electrical service platform, foundations, wind turbine generators, certification and verification, electrical design, EPC project management and geotech. In the operations phase, engineering services include environmental surveying and technical maintenance activities.

Port upgrades

The construction phase involves $19.3 million of Massachusetts direct spend associated with port development activities, as well as $56 million of spend from a VW partner in port redevelopment. This port will be located in Salem, MA, in Essex County.

Direct initiatives

VW's proposal includes spending programs to help train, educate, and invest in the future of offshore wind and to further stakeholder engagement and environmental justice. These direct initiatives include supporting such things as environmental research, higher education organizations, energy efficiency funds, diversity, equity, and inclusion and workforce development, community outreach, and technology innovation. Although these funds are expected to have economic impacts, they are not modeled or included in the total economic benefits of the proposed Project presented in this report. This is due to uncertainty surrounding how these funds will be spent once they are disbursed. The estimated impact of these activities is reported separately.

Offshore wind support facilities

Vineyard Wind has established a relationship with a corporation that would agree to build a cable manufacturing facility in Somerset if Vineyard Wind's project is chosen. This manufacturing facility would supply Vineyard Wind and other future offshore wind projects with materials. For use in our modeling, this third-party has provided job and investment estimates for both the development and construction of the Project as well as ongoing operations.

Table 9. Cable Manufacturing Benefits (nominal $)

Cable Manufacturing Estimates	FTE Job Years	Investment
Development	104	$14
Construction	493	$199
O&M (30 years)	5,255	$649

Vineyard Wind, with the help of another third-party, would also assist in establishing New Bedford as a hub for maintenance of offshore balance of plant. This third-party provided a job estimate of 750 job-years over a 30-year time period for servicing all the turbines in the area (including other offshore projects besides Vineyard Wind). It is important to note that these benefits were calculated separately and are not included in summary tables of project benefits in this report.

B. Project related operational expenditures

Operational phase expenses for operation and maintenance are primarily composed of salaries to facility operators. Other costs included in this category are spare parts, electricity consumption, and various other maintenance items. Vineyard Wind provided Daymark with Massachusetts-specific operation and maintenance (O&M) related budgets for two O&M period durations: a 20-year period and a 30-year period. The economic impact analysis only considers O&M expenses related to offshore wind facility operation and does not include any O&M related to the proposed cable manufacturing facility, which is reported in its own section.

Jobs that would be necessary to operate the offshore wind facility include plant operators, electrical and mechanical engineers, wind turbine technicians, as well as ship's captains, engineers, and deckhands. Many of these jobs have high earning potential due to necessary education, technical training, or certification processes.

C. Direct FTE-year estimates

Vineyard Wind provided Daymark with full-time equivalent job year (FTE-year) estimates for each budgeted line-item. An initial run of the IMPLAN model was performed using only investment dollars, omitting the VW-supplied FTE-year estimates to help affirm the selection of IMPLAN industry codes. The final IMPLAN modeling was done by manually substituting in VW-supplied FTE-year estimates for some spending categories. Many of the IMPLAN industry categories approximate for the exact type of work indicated and VW's budgeting therefore gives the best indication of the direct job loading.

VI. ECONOMIC IMPACT

Daymark considered direct, indirect, and induced benefits estimated via IMPLAN in this economic impact analysis. Daymark presents economic impacts, both output and employment benefits, at the overall investment levels.

As discussed earlier in this report, the economic benefits estimated in this analysis are gross impacts. The results show overall benefits – both in terms of output and employment – to the economy as a result of the proposed investments. For example, the job numbers estimated in this analysis are labor necessary to complete various activities planned in each investment category. The analysis does not tell us about any net gain in economic impacts, rather, these estimates should be interpreted as supported impacts and not necessarily created impacts.

A. 83C Project overall benefits

The proposed 825 MW Commonwealth Wind Project is expected to generate approximately $717.7 million in direct benefits, approximately $222.8 million in indirect benefits, and $288.8 million in induced benefits in Massachusetts during its construction and operational phases. The economic impact is expressed in 2021$ PV. The Project is estimated to support approximately 1,847 job-years of direct employment, approximately 1,560 job-years of indirect employment, and approximately 1,917 job-years of induced employment. These figures assume a 20-year operation period; we also analyzed a 30-year operation period.

The alternatively proposed 1,232 MW Commonwealth Wind Project is expected to generate approximately $899.3 million in direct benefits, approximately $311.9 million in indirect benefits, and $351.4 million in induced benefits in Massachusetts during its construction and operational phases. The economic impact is expressed in 2021$ PV. The Project is estimated to support approximately 2,425 job-years of direct employment, approximately 1,766 job-years of indirect employment, and approximately 2,346 job-years of induced employment. These figures assume a 20-year operation period; we also analyzed a 30-year operation period.

Table 10 and Table 11 break down the economic impacts by the key investment phases, including development, construction, and O&M.

Table 10. Massachusetts Economic Benefits of 825 MW Project ($2021 NPV)

Description	Total	Development	Construction	OpEx 20 years
Direct Impact				
Employment (Job Years)	1,847	187	1,659	1,244
Labor Income, PV $ Millions	$319.1	$34.9	$284.2	$239.6
Output, PV $ Millions	$717.7	$44.5	$673.1	$454.7
Indirect Impact				
Employment (Job Years)	1,560	54	1,506	1,146
Labor Income, PV $ Millions	$83.9	$5.0	$79.0	$63.5
Output, PV $ Millions	$222.8	$11.1	$211.7	$170.9
Induced Impacts				
Employment (Job Years)	1,917	163	1,755	1,735
Labor Income, PV $ Millions	$102.6	$10.3	$92.3	$74.6
Output, PV $ Millions	$288.8	$27.9	$260.9	$213.5
Total Impacts				
Employment (Job Years)	5,323	404	4,920	4,126
Labor Income, PV $ Millions	$505.6	$50.2	$455.5	$377.6
Output, PV $ Millions	$1,229.2	$83.5	$1,145.7	$839.1

Table 11. Massachusetts Economic Benefits of 1,232 MW Project ($2021 NPV)

Description	Total	Development	Construction	OpEx 20 years
Direct Impact				
Employment (Job Years)	2,425	185	2,239	1,425
Labor Income, PV $ Millions	$388.7	$36.4	$352.3	$290.3
Output, PV $ Millions	$899.3	$46.4	$852.9	$561.3
Indirect Impact				
Employment (Job Years)	1,766	56	1,711	1,360
Labor Income, PV $ Millions	$121.5	$5.1	$116.3	$75.5
Output, PV $ Millions	$311.9	$11.4	$300.5	$204.4
Induced Impacts				
Employment (Job Years)	2,346	169	2,177	2,096
Labor Income, PV $ Millions	$124.6	$10.7	$113.9	$90.1
Output, PV $ Millions	$351.4	$29.0	$322.4	$258.1
Total Impacts				
Employment (Job Years)	6,537	410	6,127	4,881
Labor Income, PV $ Millions	$634.8	$52.2	$582.5	$455.9
Output, PV $ Millions	$1,562.6	$86.9	$1,475.7	$1,023.7

During the construction phase, offshore wind-related construction activities for the 825 MW Project are expected to support approximately $673.1 million in direct benefits, $211.7 million in indirect benefits, and $260.9 million in induced benefits. Offshore wind-related construction is expected to support approximately 1,659 job-years of direct employment, 1,506 job-years of indirect employment, and 1,755 job-years of induced employment.

During the construction phase, offshore wind-related construction activities for the 1,232 MW Project are expected to support approximately $852.9 million in direct benefits, $300.5 million in indirect benefits, and $322.4 million in induced benefits. Offshore wind-related construction is expected to support approximately 2,239 job-years of direct employment, 1,711 job-years of indirect employment, and 2,177 job-years of induced employment.

Daymark estimated state, county, and municipal taxes during the Project's construction phase and during its operating and maintenance phase. The proposed Project is expected to generate $86.4 million in tax benefits to governments within Massachusetts over the capital expenditure and 20-year operation period for the 825 MW Project size. This includes approximately $34.9 million in direct tax benefits, $21.3 million in indirect tax benefits, and $30.3 million in induced tax benefits. Table 12 presents the tax benefits associated with the 825 MW Project; Table 13 presents the tax benefits associated with the 1,232 MW Project.

Table 12. Massachusetts Tax Benefits of 825 MW Project ($2021 NPV)

	CapEx + OpEx (20 Years)	Capital Expenditure (2021 - 2027)	OSW - Operational expenses (COD to Year 20)	OSW - Operational expenses (COD to Year 30)
Description	**Total**	**OSW Construction**	**OSW - O&M**	**OSW - O&M**
Direct Impact				
State Tax	$25.6	$14.6	$11.0	$13.6
County Tax	$0.1	$0.1	$0.1	$0.1
Municipal Tax	$9.1	$5.3	$3.9	$5.1
Sub-Total	$34.9	*$19.9*	*$14.9*	*$18.7*
Indirect Impact	$0.0			
State Tax	$11.8	$6.7	$5.1	$6.2
County Tax	$0.1	$0.1	$0.1	$0.1
Municipal Tax	$9.4	$4.8	$4.5	$5.4
Sub-Total	$21.3	*$11.6*	*$9.8*	*$11.7*
Induced Impact	$0.0			
State Tax	$15.6	$8.2	$7.4	$9.1
County Tax	$0.2	$0.1	$0.1	$0.1
Municipal Tax	$14.5	$7.4	$7.1	$8.5
Sub-Total	$30.3	*$15.7*	*$14.6*	*$17.7*
Total, PV $ Millions	$86.4	**$47.2**	**$39.3**	**$48.2**

Table 13. Massachusetts Tax Benefits of 1,232 MW Project ($2021 NPV)

	CapEx + OpEx (20 Years)	Capital Expenditure (2021 - 2027)	OSW - Operational expenses (COD to Year 20)	OSW - Operational expenses (COD to Year 30)
Description	**Total**	**OSW Construction**	**OSW - O&M**	**OSW - O&M**
Direct Impact				
State Tax	$25.6	$14.6	$11.0	$13.6
County Tax	$0.1	$0.1	$0.1	$0.1
Municipal Tax	$9.1	$5.3	$3.9	$5.1
Sub-Total	$34.9	*$19.9*	*$14.9*	*$18.7*
Indirect Impact	$0.0			
State Tax	$11.8	$6.7	$5.1	$6.2
County Tax	$0.1	$0.1	$0.1	$0.1
Municipal Tax	$9.4	$4.8	$4.5	$5.4
Sub-Total	$21.3	*$11.6*	*$9.8*	*$11.7*
Induced Impact	$0.0			
State Tax	$17.4	$10.0	$7.4	$9.1
County Tax	$0.2	$0.1	$0.1	$0.1
Municipal Tax	$16.1	$9.1	$7.1	$8.5
Sub-Total	$33.7	*$19.1*	*$14.6*	*$17.7*
Total, PV $ Millions	$89.9	**$50.6**	**$39.3**	**$48.2**

B. Capital investment period

Project related CapEx benefits

Offshore wind construction primarily includes activities such as interconnection-related upgrades, wind turbine foundation and cable related works, and vessels related work. Table 14 and Table 15 present the economic benefits of offshore wind-related construction activities.

Investment in offshore wind-related construction and development activities at the 825 MW size is expected to support $717.7 million in direct benefits, $252.8 million in indirect benefits, and $288.8 million in induced benefits. These benefits support 1,847 job-years of direct employment, 1,438 job-years of indirect employment, and 1,917 job-years of induced employment. At the 1,232 MW size, there is expected to be $899.3 million in direct benefits, $311.9 million in indirect benefits, and $351.4 million in induced benefits. This Project size is expected to support 2,434 job-years of direct employment, 1,766 job years of indirect employment, and 2,346 job-years of induced employment.

Table 14. CapEx Benefits by Year 825 MW Project ($2021 NPV)

		Development and Construction					
Description	**Total**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Direct Impact							
Employment (Job Years)	1,847	179	103	261	479	622	202
Labor Income, PV $ Millions	$319.1	$36.9	$23.7	$55.5	$76.8	$84.1	$42.1
Output, PV $ Millions	$717.7	$56.9	$42.5	$111.1	$179.3	$241.3	$86.6
Indirect Impact							
Employment (Job Years)	1,438	86	75	192	350	541	195
Labor Income, PV $ Millions	$99.6	$7.2	$5.8	$13.8	$23.9	$35.9	$13.0
Output, PV $ Millions	$252.8	$16.9	$14.3	$35.4	$61.7	$92.2	$32.4
Induced Impacts							
Employment (Job Years)	1,917	181	127	319	470	560	261
Labor Income, PV $ Millions	$102.6	$11.2	$7.4	$17.2	$24.6	$28.9	$13.4
Output, PV $ Millions	$288.8	$30.7	$20.5	$48.6	$69.7	$81.7	$37.6
Total Impacts							
Employment (Job Years)	5,202	447	305	771	1,299	1,723	658
Labor Income, PV $ Millions	$521.3	$55.3	$37.0	$86.5	$125.2	$148.8	$68.4
Output, PV $ Millions	$1,259.2	$104.5	$77.3	$195.1	$310.7	$415.1	$156.6

Table 15. CapEx Benefits by Year 1,232 MW Project ($2021 NPV)

		Development and Construction					
Description	**Total**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
Direct Impact							
Employment (Job Years)	2,434	194	114	382	613	876	256
Labor Income, PV $ Millions	$388.7	$38.5	$25.1	$66.9	$96.9	$109.4	$51.8
Output, PV $ Millions	$899.3	$60.1	$45.3	$135.9	$230.3	$321.0	$106.7
Indirect Impact							
Employment (Job Years)	1,766	90	79	233	436	689	240
Labor Income, PV $ Millions	$121.5	$7.5	$6.2	$16.6	$29.6	$45.6	$15.9
Output, PV $ Millions	$311.9	$17.7	$15.1	$43.0	$77.6	$118.8	$39.9
Induced Impacts							
Employment (Job Years)	2,346	189	135	386	592	724	321
Labor Income, PV $ Millions	$124.6	$11.7	$7.8	$20.7	$30.8	$37.2	$16.4
Output, PV $ Millions	$351.4	$32.0	$21.7	$58.6	$87.5	$105.3	$46.2
Total Impacts							
Employment (Job Years)	6,546	473	327	1,000	1,641	2,288	817
Labor Income, PV $ Millions	$634.8	$57.7	$39.1	$104.3	$157.4	$192.2	$84.1
Output, PV $ Millions	$1,562.6	$109.8	$82.1	$237.5	$395.4	$545.1	$192.8

C. Operations and maintenance period

Daymark estimated the economic impacts associated with the operations and maintenance phase of the Project. Over the course of its 30 years of operation at the 825 MW size, the Project produces $551 million in direct benefits, $211.7 million in indirect benefits, and $261.9 million in induced benefits. During the same operation period, the Project is estimated to support 1,612 job-years of direct employment, 1,506 job-years of indirect employment, and 2,241 job-years of induced employment. For the 1,232 MW Project, a 30-year O&M period produces $675 million in direct benefits, $251 million in indirect benefits, and $315 million in induced benefits. This

project size supports 1,815 job-years of direct employment, 1,770 job-years of indirect employment, and 2,691 job-years of induced employment. See Table 16 and Table 17.

Table 16. OpEx Benefits 825 MW Project ($2021 NPV)

Description	COD + 20 years	COD + 30 years
Direct Impact		
Employment (Job Years)	1,244	1,612
Labor Income, PV $ Millions	$239.6	$293.4
Output, PV $ Millions	$454.7	$551.0
Indirect Impact		
Employment (Job Years)	1,146	1,506
Labor Income, PV $ Millions	$63.5	$79.0
Output, PV $ Millions	$170.9	$211.7
Induced Impacts		
Employment (Job Years)	1,735	2,241
Labor Income, PV $ Millions	$74.6	$91.5
Output, PV $ Millions	$213.5	$261.9
Total Impacts		
Employment (Job Years)	4,126	5,358
Labor Income, PV $ Millions	$377.6	$463.9
Output, PV $ Millions	$839.1	$1,024.6

Table 17. OpEx Benefits 1,232 MW Project ($2021 NPV)

Description	COD + 20 years	COD + 30 years
Direct Impact		
Employment (Job Years)	1,425	1,815
Labor Income, PV $ Millions	$290.3	$354.2
Output, PV $ Millions	$561.3	$675.4
Indirect Impact		
Employment (Job Years)	1,360	1,770
Labor Income, PV $ Millions	$75.5	$93.1
Output, PV $ Millions	$204.4	$251.2
Induced Impacts		
Employment (Job Years)	2,096	2,691
Labor Income, PV $ Millions	$90.1	$110.1
Output, PV $ Millions	$258.1	$315.1
Total Impacts		
Employment (Job Years)	4,881	6,276
Labor Income, PV $ Millions	$455.9	$557.4
Output, PV $ Millions	$1,023.7	$1,241.7

D. Benefits in economically distressed areas and EJ communities

Massachusetts defines an Environmental Justice community as including one of the following criteria[10]:

- the annual median household income is not more than 65 per cent of the statewide annual median household income;
- minorities comprise 40 per cent or more of the population;
- 25 per cent or more of households lack English language proficiency; or
- minorities comprise 25 per cent or more of the population and the annual median household income of the municipality in which the neighborhood is located does not exceed 150 per cent of the statewide annual median household income.

According to the interactive map on the state website, all counties where VW is proposing work (Barnstable, Bristol, Suffolk and Essex) contain Environmental Justice populations. Specifically, they all contain populations that meet the annual median household income criteria[11]. Table 18 and Table 19 break down the economic impact of the projects by county, based on the inputs from VW. These tables should be interpreted as an upper bound of estimated impacts. If some labor is sourced from other counties in Massachusetts, which is likely, the benefits and job years presented below for each county will be lower.

[10] https://www.mass.gov/info-details/environmental-justice-populations-in-massachusetts

[11] https://www.mass.gov/info-details/massgis-data-2020-us-census-environmental-justice-populations%E2%80%9D

Table 18. Economic Impact by County 825 MW Project ($2021 NPV)

	Suffolk	Bristol	Barnstable	Essex
Direct Impact				
Employment (Job Years)	298	1,261	261	27
Labor Income, PV $ Millions	$72.7	$191.6	$48.4	$6.5
Output, PV $ Millions	$106.1	$504.3	$93.4	$13.8
Indirect Impact				
Employment (Job Years)	122	1,159	133	24
Labor Income, PV $ Millions	$12.6	$76.1	$9.2	$1.7
Output, PV $ Millions	$28.3	$194.6	$25.3	$4.6
Induced Impacts				
Employment (Job Years)	349	1,253	280	36
Labor Income, PV $ Millions	$22.2	$64.1	$14.3	$1.9
Output, PV $ Millions	$59.9	$182.2	$41.3	$5.3
Total Impacts				
Employment (Job Years)	768	3,673	673	87
Labor Income, PV $ Millions	$107.5	$331.7	$71.9	$10.2
Output, PV $ Millions	$194.4	$881.1	$160.0	$23.7

Table 19. Economic Impact by County 1,232 MW Project ($2021 NPV)

	Suffolk	Bristol	Barnstable	Essex
Direct Impact				
Employment (Job Years)	306	1,619	264	36
Labor Income, PV $ Millions	$74.6	$244.4	$61.0	$8.7
Output, PV $ Millions	$108.8	$654.2	$117.8	$18.4
Indirect Impact				
Employment (Job Years)	124	1,442	168	32
Labor Income, PV $ Millions	$12.8	$94.7	$11.6	$2.3
Output, PV $ Millions	$28.9	$245.0	$31.9	$6.2
Induced Impacts				
Employment (Job Years)	357	1,587	353	49
Labor Income, PV $ Millions	$22.8	$81.1	$18.1	$2.6
Output, PV $ Millions	$61.5	$230.7	$52.1	$7.2
Total Impacts				
Employment (Job Years)	787	4,648	784	117
Labor Income, PV $ Millions	$110.3	$420.2	$90.7	$13.7
Output, PV $ Millions	$199.1	$1,129.9	$201.8	$31.8

E. Regional benefits

The proposed 825 MW-sized Commonwealth Wind Project is expected to generate approximately $59.8 million in direct benefits, approximately $23.2 million in indirect benefits, and $30.7 million in induced benefits in Connecticut during its development and construction phases. The economic impact is expressed in 2021$ PV. The Project is

estimated to support approximately 162 job-years of direct employment, approximately 133 job-years of indirect employment, and approximately 180 job-years of induced employment. See Table 20. Table 21 discusses the benefits associated with the larger project size.

Table 20. Connecticut Benefits of 825 MW Project ($2021 NPV)

Description		Total	Development	Construction
Direct Impact				
	Employment (Job Years)	162	71	92
	Labor Income, PV $ Millions	$32.2	$6.9	$25.3
	Output, PV $ Millions	$59.8	$12.6	$47.3
Indirect Impact				
	Employment (Job Years)	133	28	105
	Labor Income, PV $ Millions	$9.9	$2.1	$7.9
	Output, PV $ Millions	$23.2	$4.8	$18.4
Induced Impact				
	Employment (Job Years)	180	37	142
	Labor Income, PV $ Millions	$11.0	$2.4	$8.7
	Output, PV $ Millions	$30.7	$6.6	$24.2
Total Impacts				
	Employment (Job Years)	475	135	340
	Labor Income, PV $ Millions	$53.2	$11.4	$41.8
	Output, PV $ Millions	$113.8	$23.9	$89.9

Table 21. Connecticut Benefits of 1,232 MW Project ($2021 NPV)

Description	Total	Development	Construction
Direct Impact			
Employment (Job Years)	162	71	92
Labor Income, PV $ Millions	$32.3	$6.9	$25.3
Output, PV $ Millions	$60.1	$12.6	$47.5
Indirect Impact			
Employment (Job Years)	133	28	106
Labor Income, PV $ Millions	$10.0	$2.1	$7.9
Output, PV $ Millions	$23.3	$4.8	$18.6
Induced Impact			
Employment (Job Years)	180	37	142
Labor Income, PV $ Millions	$11.0	$2.4	$8.7
Output, PV $ Millions	$30.8	$6.6	$24.2
Total Impacts			
Employment (Job Years)	475	135	340
Labor Income, PV $ Millions	$53.3	$11.4	$41.9
Output, PV $ Millions	$114.2	$23.9	$90.3

Table 22 and Table 23 represent the combined economic impact of the Commonwealth Wind Project throughout the northeast. As mentioned previously in this report, while no direct spending is assumed to occur in states other than Massachusetts or Connecticut (and therefore no direct benefits), we nonetheless expect some additional leakages to occur in states such as Rhode Island or New Hampshire in terms of indirect or induced benefits. These benefits have not been modeled and are not expected to be of the same magnitude as those in Massachusetts or Connecticut.

Table 22. Regional Benefits of 825 MW Project ($2021 NPV)

	CapEx + OpEx (20 Years)	Capital Expenditure (2022 - 2027)	OSW - Operational Expenses (COD to Year 20)	OSW - Operational Expenses (COD to Year 30)
Description	**Total**	**OSW Construction**	**OSW - O&M**	**OSW - O&M**
Direct Impact				
Employment (Job Years)	3,253	2,009	1,244	1,612
Labor Income, PV $ Millions	$590.9	$351.4	$239.6	$293.4
Output, PV $ Millions	$1,232.2	$777.5	$454.7	$551.0
Indirect Impact				
Employment (Job Years)	2,717	1,571	1,146	1,506
Labor Income, PV $ Millions	$173.0	$109.6	$63.5	$79.0
Output, PV $ Millions	$446.9	$276.0	$170.9	$211.7
Induced Impact				
Employment (Job Years)	3,832	2,097	1,735	2,241
Labor Income, PV $ Millions	$188.2	$113.6	$74.6	$91.5
Output, PV $ Millions	$533.0	$319.5	$213.5	$261.9
Total Impacts				
Job Years	9,803	5,677	4,126	5,358
Labor Income, PV $ Millions	$952.1	$574.5	$377.6	$463.9
Output, PV $ Millions	$2,212.1	$1,373.0	$839.1	$1,024.6

Table 23. Regional Benefits of 1,232 MW Project ($2021 NPV)

	CapEx + OpEx (20 Years)	Capital Expenditure (2022 - 2027)	OSW - Operational Expenses (COD to Year 20)	OSW - Operational Expenses (COD to Year 30)
Description	**Total**	**OSW Construction**	**OSW - O&M**	**OSW - O&M**
Direct Impact				
Employment (Job Years)	4,021	2,596	1,425	1,815
Labor Income, PV $ Millions	$711.3	$421.0	$290.3	$354.2
Output, PV $ Millions	$1,520.6	$959.4	$561.3	$675.4
Indirect Impact				
Employment (Job Years)	3,260	1,899	1,360	1,770
Labor Income, PV $ Millions	$206.9	$131.4	$75.5	$93.1
Output, PV $ Millions	$539.6	$335.3	$204.4	$251.2
Induced Impact				
Employment (Job Years)	4,622	2,526	2,096	2,691
Labor Income, PV $ Millions	$225.7	$135.6	$90.1	$110.1
Output, PV $ Millions	$640.3	$382.2	$258.1	$315.1
Total Impacts				
Job Years	11,902	7,022	4,881	6,276
Labor Income, PV $ Millions	$1,143.9	$688.0	$455.9	$557.4
Output, PV $ Millions	$2,700.5	$1,676.8	$1,023.7	$1,241.7

F. Cable manufacturing

Vineyard Wind is partnering with a third-party to plan, construct, and operate a cable manufacturing facility in Somerset MA, as part of their bid. As this facility does not get built without the Vineyard Wind project, it is important to include these benefits in this report. Because the operational output will be used throughout the region and to

support multiple projects, benefits of the cable manufacturing facility are kept separate through all reporting sections of this report.

Table 24 shows the economic benefits associated with the capital expenditure period of the cable manufacturing facility. The facility generates $202.1 million in direct benefits, $59.5 million in indirect benefits, and $46.4 million in induced benefits for a total of $261.7 million in benefits between 2022 and 2027. The economic impact is expressed in 2021$ PV.

Table 24. Cable Manufacturing Benefits – CapEx period ($2021 NPV)

Cable Manufacturing	CAPEX Period
Direct Impact	
Employment (Job Years)	597
Labor Income, PV $ Millions	$44.1
Output, PV $ Millions	$202.1
Indirect Impact	
Employment (Job Years)	279
Labor Income, PV $ Millions	$20.8
Output, PV $ Millions	$59.5
Induced Impact	
Employment (Job Years)	311
Labor Income, PV $ Millions	$16.3
Output, PV $ Millions	$46.4
Total Impacts	
Employment (Job Years)	1,187
Labor Income, PV $ Millions	$64.8
Output, PV $ Millions	$261.7

Table 25 reports the annual employment benefits of the ongoing cable manufacturing activities after the Project is completed. Approximately 238 job-years are expected to be supported each year by cable manufacturing operations.

Table 25. Employment Benefits – Cable Manufacturing Operations ($2021 NPV)

Description	Annual Job Years
Direct Employment	166
Indirect Employment	20
Induced Employment	52
Total Impact	**238**

The cable manufacturing benefits are independent of the size (825 MW or 1,232 MW) of the Commonwealth Wind Project.

APPENDIX A

Appendix A contains specific tables as requested by Vineyard Wind. Tables 26 and 27 break down the impacts of specific line items that VW was interested in seeing in isolation. Note, these items are included in the other report tables above.

Table 26. VW Specified Categories 825 MW Project

Description	ECP Supply	WTG Mashalling	CST Port Lease	Salem-Partners
Direct Impact				
Employment (Job Years)	420	216	27	144
Labor Income, PV $ Millions	$38.1	$58.6	$6.5	$23.5
Output, PV $ Millions	$169.3	$123.6	$13.8	$49.7
Indirect Impact				
Employment (Job Years)	321	251	24	84
Labor Income, PV $ Millions	$21.3	$17.2	$1.7	$6.3
Output, PV $ Millions	$58.9	$43.6	$4.6	$16.7
Induced Impact				
Employment (Job Years)	272	366	36	126
Labor Income, PV $ Millions	$14.0	$18.5	$1.9	$7.0
Output, PV $ Millions	$39.7	$52.7	$5.3	$19.3
Total Direct and Indirect Impacts				
Employment (Job Years)	1,012	833	87	354
Labor Income, PV $ Millions	$73.4	$94.3	$10.2	$36.8
Output, PV $ Millions	$267.8	$219.9	$23.7	$85.7

Table 27. VW Specified Categories 1,232 MW Project

Description	ECP Supply	WTG Mashalling	CST Port Lease	Salem-Partners
Direct Impact				
Employment (Job Years)	554	272	36	144
Labor Income, PV $ Millions	$55.3	$76.1	$8.7	$23.5
Output, PV $ Millions	$169.3	$159.3	$18.4	$49.7
Indirect Impact				
Employment (Job Years)	408	320	32	84
Labor Income, PV $ Millions	$27.1	$21.9	$2.3	$6.3
Output, PV $ Millions	$77.6	$55.8	$6.2	$16.7
Induced Impact				
Employment (Job Years)	376	474	49	126
Labor Income, PV $ Millions	$19.3	$23.9	$2.6	$7.0
Output, PV $ Millions	$55.0	$68.2	$7.2	$19.3
Total Direct and Indirect Impacts				
Employment (Job Years)	1,338	1,066	117	354
Labor Income, PV $ Millions	$101.8	$121.9	$13.7	$36.8
Output, PV $ Millions	$301.8	$283.3	$31.8	$85.7

Tables 28 and 29 provide the economic benefits in nominal dollars, as requested by the Massachusetts RFP.

Table 28. VW Specific Benefits – 825 MW ($ nominal)

Description	Development	Construction	OpEx 20 years	OpEx 30 years
Direct Impact				
Employment (Job Years)	187	1,659	1,244	1,612
Output, $M Nominal	$47.4	$781.6	$785.1	$1,075.2
Indirect Impact				
Employment (Job Years)	54	1,384	1,146	1,506
Output, $M Nominal	$11.8	$281.2	$293.4	$416.3
Induced Impacts				
Employment (Job Years)	163	1,755	1,735	2,241
Output, $M Nominal	$29.7	$302.2	$366.9	$512.9
Total Impacts				
Employment (Job Years)	404	4,798	4,126	5,358
Output, $M Nominal	$88.8	$1,365.1	$1,445.4	$2,004.4

Table 29. VW Specific Benefits – 1,232 MW ($nominal)

Description	Development	Construction	OpEx 20 years	OpEx 30 years
Direct Impact				
Employment (Job Years)	194	2,239	1,425	1,815
Output, $M Nominal	$49.4	$992.1	$954.5	$1,298.2
Indirect Impact				
Employment (Job Years)	56	1,711	1,360	1,770
Output, $M Nominal	$12.2	$350.2	$349.3	$490.1
Induced Impacts				
Employment (Job Years)	169	2,177	2,096	2,691
Output, $M Nominal	$30.9	$374.1	$442.5	$614.5
Total Impacts				
Employment (Job Years)	419	6,127	4,881	6,276
Output, $M Nominal	$92.4	$1,716.4	$1,746.3	$2,402.9

Table 30 provides the benefits from VW's proposed partners. These impacts are not included in the state and regional totals benefits. Table 31 includes tax benefits of partner projects.

Table 30. Partner Specific Benefits

Description		Development	Construction	OpEx 20 years	OpEx 30 years
Direct Impact					
	Employment (Job Years)	104	637	2,983	4,981
	Partner-funded Employment		254	500	750
	Output, $M Nominal	$14.5	$267.7	$321.6	$607.3
Indirect Impact					
	Employment (Job Years)	18	345	360	601
	Output, $M Nominal	$4.2	$81.1	$103.9	$196.2
Induced Impacts					
	Employment (Job Years)	54	383	933	1,559
	Output, $M Nominal	$8.9	$64.8	$202.5	$382.4
Total Impacts					
	Employment (Job Years)	176	1,365	4,277	7,141
	Output, $M Nominal	$27.7	$413.7	$628.0	$1,185.8

Table 31: Tax Benefits of Partner Projects ($2021, NPV)

		CapEx + OpEx (20 Years)	Capital Expenditure (2021 - 2027)	OSW - Operational expenses (COD to Year 20)	OSW - Operational expenses (COD to Year 30)
	Description	Total	OSW Construction	OSW - O&M	OSW - O&M
Direct Impact					
	State Tax	$17.0	$5.8	$11.1	$17.0
	County Tax	$0.1	$0.0	$0.1	$0.1
	Municipal Tax	$7.8	$0.9	$7.0	$10.6
	Sub-Total	$24.9	*$6.7*	*$18.2*	*$27.8*
Indirect Impact					
	State Tax	$7.4	$2.3	$5.1	$7.8
	County Tax	$0.0	$0.0	$0.0	$0.1
	Municipal Tax	$7.2	$1.8	$5.4	$3.6
	Sub-Total	$14.7	*$4.1*	*$10.6*	*$11.4*
Induced Impact					
	State Tax	$9.5	$4.5	$5.0	$7.7
	County Tax	$0.1	$0.0	$0.0	$0.1
	Municipal Tax	$10.6	$3.9	$6.7	$4.4
	Sub-Total	$20.3	*$8.5*	*$11.8*	*$12.1*
	Total, PV $ Mill	$59.9	**$19.3**	**$40.6**	**$51.4**