VINEYARD WIND

Vineyard Wind 1
Impact on Jobs and Economic Output

Annual Report 2

November 2023

Submitted to:

Massachusetts Department of Energy Resources
100 Cambridge St. #1020
Boston, MA 02114

Prepared by:

UMass | Dartmouth

SPRINGLINE RESEARCH GROUP

VINEYARD WIND

Vineyard Wind is currently building the nation's first utility-scale offshore wind energy project over 15 miles off the coast of Massachusetts. The project will generate clean, renewable, affordable energy for over 400,000 homes and businesses across the Commonwealth, while reducing carbon emissions by over 1.6 million tons per year.

The Vineyard Wind parent companies consists of funds managed by Copenhagen Infrastructure Partners (CIP), whose Senior Partners are pioneers with an unparalleled track record in the offshore wind industry, and Avangrid Renewables (AR), the third largest onshore wind developer in the US with operations in more than 20 states, a Lead Market Participant in the ISO-NE market and an affiliate of the Iberdrola Group, the world's largest wind developer with more than 15,000 MW of wind installed.

UMass | Dartmouth

The University of Massachusetts Dartmouth is a public research university in Dartmouth, Massachusetts. It is the southernmost campus of the University of Massachusetts system. Formerly Southeastern Massachusetts University, it was merged into the University of Massachusetts system in 1991. As a national research university, UMassD opens a world of exploration and discovery. Our students work with world-class faculty researchers and journey into real-world innovation and experiences.

SPRINGLINE RESEARCH GROUP

www.springlineresearch.com

Springline Research Group is a multidisciplinary applied research firm that specializes in projects that contribute to economic development, workforce development, public health, and community building. Collectively, our team has over 30 years of experience assisting public, private, and nonprofit organizations with research, technical assistance, and analytical services designed to help make our state, region, and communities better places to live, work, and do business.

Report Authors:

David Borges, Springline Research Group
Michael Goodman, UMass Dartmouth

Contents

Executive Summary

Vineyard Wind's *Offshore Wind Development and Reporting Agreement* executed with the Massachusetts Department of Energy Resources (MA DOER) requires Vineyard Wind to deliver written annual progress reports that summarize the company's progress in achieving the goals set forth in Section 1 of the *Agreement*. Accordingly, this analysis utilizes job and expenditure data collected from 2017 through September 2023 to measure Vineyard Wind's progress in meeting the requirements outlined in the *Agreement.*

This is the second annual report. The Year 1 annual report focused on Development phase activities from 2017 to 2021 and a partial-year analysis on Construction phase activities. The report also measured the extent to which the reported results align with the job and economic output estimates conducted by UMass Dartmouth's Public Policy Center in 2017. Importantly, the Construction phase is not complete.

The 2017 estimates were designed to gauge the economic impact of the complete construction phase of the project including economically meaningful project activities that are expected in 2024. Given that project phases span reporting years, the data contained in this report document the impact of project related construction activities through September 2023 only.

The current Year 2 report is focused on Construction activities that occurred over a two-year period:

- **Year 1:** October 2021 to September 2022
- **Year 2:** October 2022 to September 2023

Employment Impacts

How are Jobs Defined in this Report?

The labor needs of offshore wind developments are concentrated in Construction activities, which by their very nature are project based and not permanent. The actual number of workers on the project includes both full-time and part-time workers who may be on the project for several years, one-year, or less. This makes estimating employment impacts somewhat less intuitive than in contexts where activities are ongoing and can be accurately defined as "permanent."

Consequently, economic impact assessments of construction and other temporary project-based activities are typically reported in terms of the number of years of full-time work required. To minimize misunderstanding and to provide the most complete and accurate reporting of job impacts possible, our analysis reports employment impact in two ways – the total number of workers employed on the project or headcount (whether part-time or full), and the number of job years of work associated with the project, with one job year equal to one worker working one full-time year on the project (i.e., FTE).

Union Jobs (Headcount) and Job Years

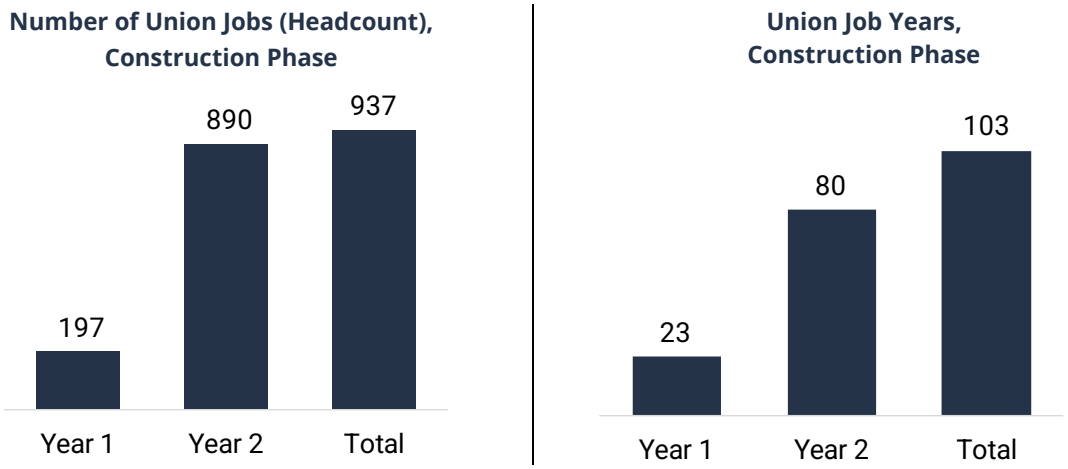
- **Jobs (Headcount):** To date, there have been 937 individual union workers employed during the Construction phase, with 197 workers in Year 1 and 890 workers in Year 2 (see Figure 1). Importantly, while some of the same employees may have worked in both Year 1 and Year 2, these jobs are only counted once in the total headcount (third bar in the chart) whether the union member worked in Year 1, Year 2, or both years. This means the total headcount over the two-year period is not the

sum of workers in Year 1 and Year 2.[1] To date, more than seventy-one percent (71.5%) of union workers on the project are residents of SEMass.

- **Job Years:** As noted, the number of workers on the project includes both full-time and part-time workers who may be on the project for several years, one year, or less. In the first two years of the project there have been 103 total union job years during the Construction phase: 23 job years in Year 1 and 80 job years in Year 2 (see Figure 1).

  Notably, the job-year calculation does not include overtime hours. The number of overtime hours is significant, accounting for 19.4% of total hours worked over the two-year period. These hours are paid at time-and-a-half or double-time and consequently have a larger economic impact in comparison to regular hours. If overtime hours are included in the job year calculation, the number of job years increases to 25.8 in Year 1, 102.4 in Year 2, and 128.1 in total.

Figure 1. Number of Union Jobs (Headcount) and Job Years Over the Construction Period, by Year



Source: UMass Dartmouth from monthly contractor reports

Union Worker Diversity, Equity, and Inclusion Goals

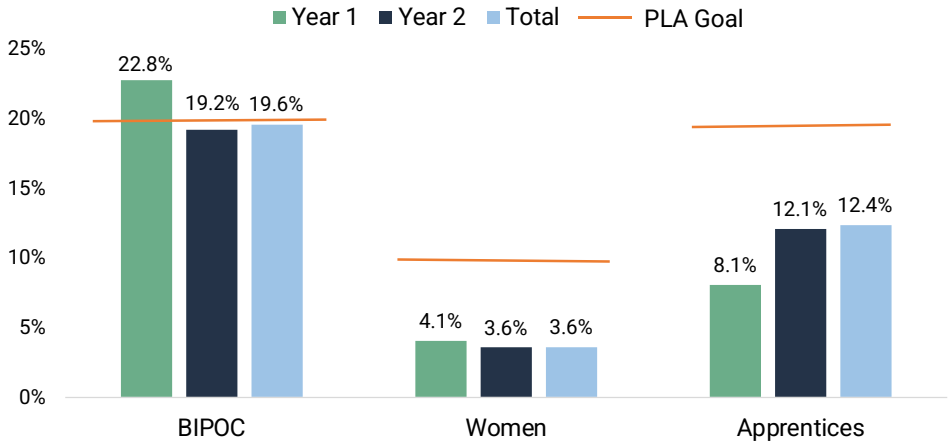
Vineyard Wind's Project Labor Agreements (PLA) with its union contractors stipulate several hiring goals related to Diversity, Equity, and inclusion (DEI) as well as the number of apprentices on the project:

1. Black, Indigenous, and People of Color (BIPOC): 20% of total union jobs (headcount)
2. Women: 10% of total union jobs (headcount)
3. Apprentice: 20% union workers (headcount)

[1] Data collection in the first two years of the project was undertaken in an environment where the project was ramping up very quickly, which resulted in incomplete reporting from some Tier 1 contractors, especially in Year 1 of the Construction phase. Consequently, the worker headcounts reported here should be considered conservative estimates.

Just under twenty percent (19.6%) of union workers on the Vineyard Wind 1 project meet the BIPOC criteria, while women comprise 3.6% of the union workforce on the project. Over twelve percent (12.4%) of workers were hired as apprentices (see Figure 2).[2]

Figure 2. Number of Union Workers Meeting PLA Goals

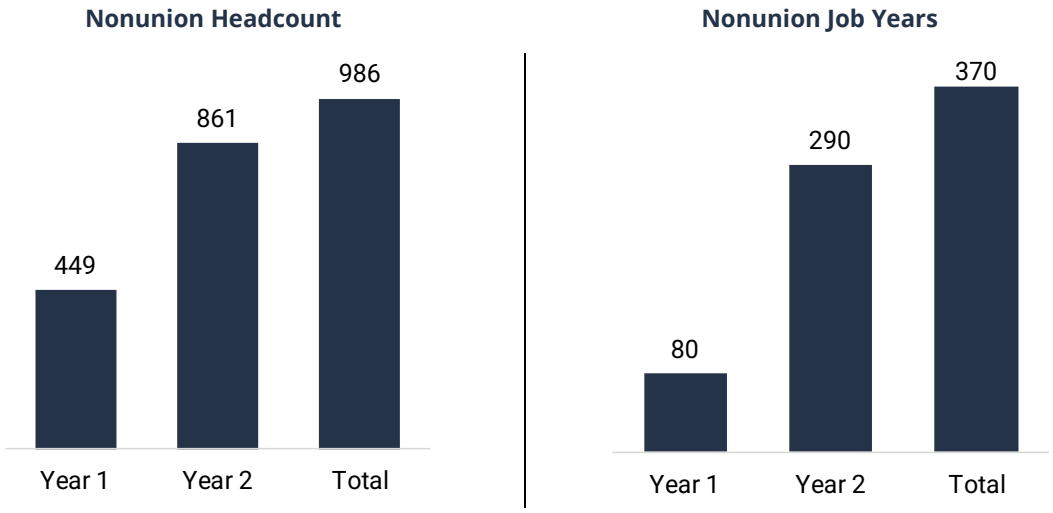


Source: UMass Dartmouth from monthly contractor reports

Nonunion Workforce, Headcount and Job Years

This section highlights the number of nonunion workers (headcount) and job years directly employed on the Vineyard Wind 1 project over the two-year Construction phase period. To date, there have been 986 unique nonunion workers employed during the Construction phase: 449 in Year 1 and 861 in Year 2 (see Figure 3). In terms of job years, as can be seen in Figure 3, there were 80 nonunion job years in Year 1, 290 in Year 2, and 370 over the two-year Construction phase.[3]

Figure 3. Nonunion Workforce, Headcount and Job Years



Source: UMass Dartmouth from monthly contractor reports

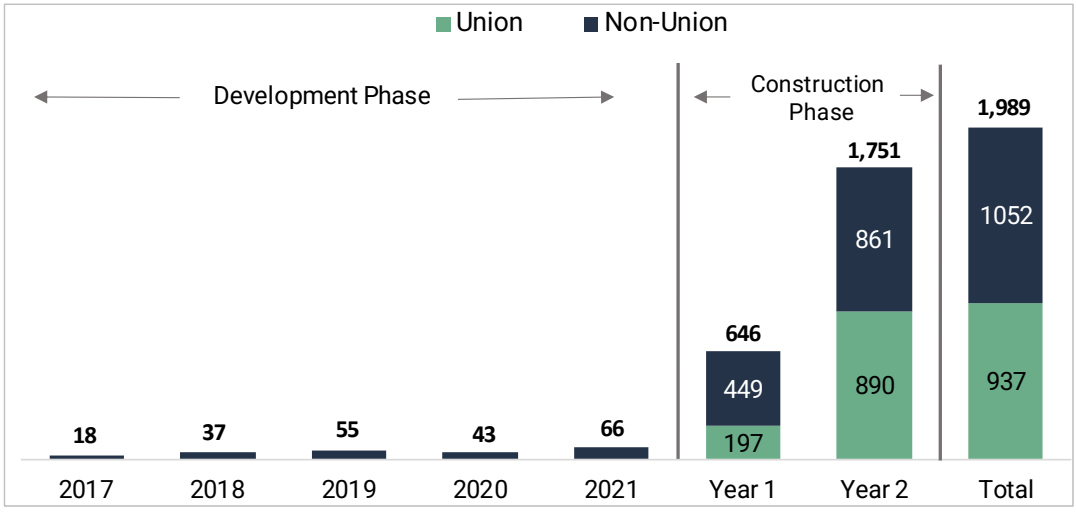
[2] BIPOC (Black, Indigenous, and people of color) is defined as any employee whose race is not White-alone.
[3] Similar to the union workforce reporting, the nonunion worker headcount is a conservative estimate due to incomplete reporting from some Tier 1 contractors..

Total Jobs and Job Years Over the Project Period (2017-2023)

Figure 4 presents the worker headcount since the Vineyard Wind 1 Development phase began in 2017.[4] A total of 1,989 workers have been employed on the project since 2017. This is a conservative estimate based on incomplete reporting from some contractors during the early phases of project work.[5]

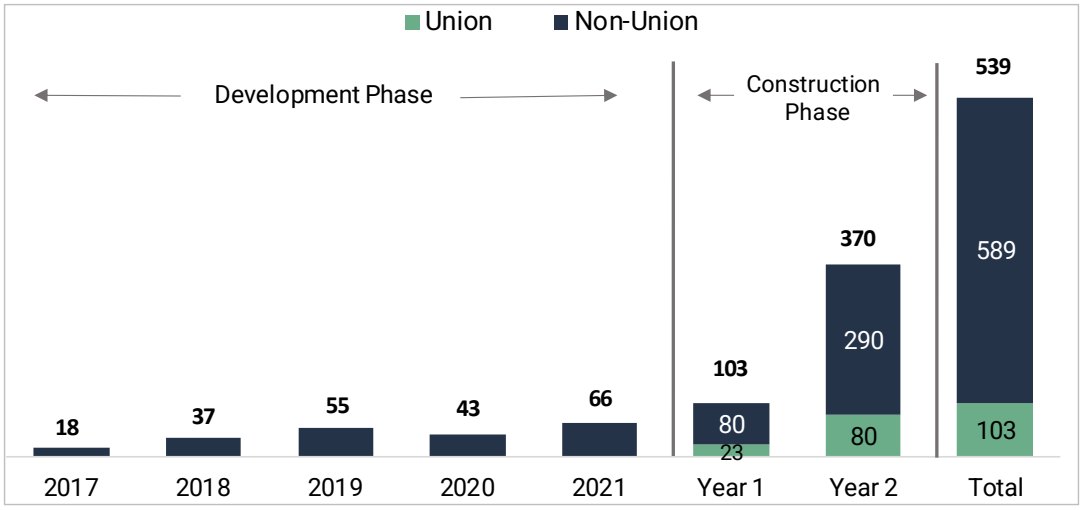
Figure 5 details the total number of job years by phase and year since development work on the project work began in 2017.

Figure 4. Jobs (Headcount), Development & Construction Phases



Source: Vineyard Wind Services Historical and Monthly Tracker Submissions

Figure 5. Job Years, Development & Construction Phases



Source: Vineyard Wind Services Historical and Monthly Tracker Submissions

[4] See the Year 1 Annual Report for more details on Development Phase employment.
[5] The total (last bar) represents the number of individual workers over the seven-year period, not the sum of the previous bars. That is, there have been 1,989 unique workers on the project since 2017. Some of these workers may have been employed on the project in multiple years.

Construction Phase Economic Impacts, Year 1 and Year 2

Table 1 displays the Construction Phase economic impacts[6] for Year 1 and Year 2 on the Commonwealth of Massachusetts. Much of the Construction phase activity in Year 1 was focused on onshore work in the Town of Barnstable. Marshalling and offshore construction activity has intensified throughout Year 2, with most of that work being staged from New Bedford.

- **Indirect Impacts:** Vineyard Wind's direct payroll and non-payroll expenditures have supported an additional 213 indirect jobs in Massachusetts during the Construction phase to date. These jobs supported $20.1 million in labor income, contributed $25.7 million in added value to the Massachusetts economy, and supported $123.1 million in new economic output during the Construction phase.
- **Induced Impacts:** The direct and indirect impacts induced an additional 305 jobs in Massachusetts that supported $22.9 million in labor income. Construction phase activities also contributed over $37.9 million in added value to the Massachusetts economy and supported $60.2 million in new economic output.
- **Total Impacts:** In total, Construction phase economic activity to date has supported 991 jobs in Massachusetts, $113.3 million in labor income, $170.7 million in value added, and 424.0 million in economic output.

Table 1. Direct, Indirect, and Induced Impacts, Construction Phase

Massachusetts Impact				
Construction Phase				
Impact Type	**Job Years**	**Labor Income**	**Value Added**	**Output**
Direct Effect	473	$ 70,225,095	$ 107,071,768	$ 240,804,191
Indirect Effect	213	$ 20,148,702	$ 25,674,995	$ 123,056,476
Induced Effect	305	$ 22,921,309	$ 37,948,404	$ 60,158,973
Total Effect	991	$ 113,295,106	$ 170,695,167	$ 424,019,641

Source: UMass Dartmouth from Implan

Total Project Impacts to Date (Development and Construction Phases)

Table 2 aggregates the impact data for the Development and Construction phases.

- **Indirect Impacts:** Vineyard Wind's direct payroll and non-payroll expenditures have supported an additional 350 indirect Massachusetts jobs during the project period. The project supported $31.7 million in labor income, contributed $42.5 million in added value to the Massachusetts economy, and supported $150.9 million in new economic output.
- **Induced Impacts:** The direct and indirect impacts induced an additional 556 Massachusetts jobs that supported $39.7 million in labor income. The project also contributed over $66.2 million in

[6] See Section 3.2 for a more detailed explanation of the distinction between direct, indirect, and induced impacts.

added value to the Massachusetts economy and supported $105.1 million in new economic output.

- **Total Impacts:** In total, the project to date has supported 1,657 jobs, $172.6 million in labor income, $66.2 million in value added, and $590.7 million in economic output.

Table 2. Total Project Impact to Date, Development & Construction Phases

Total Massachusetts Impact				
Total Project Impacts to Date				
Impact Type	**Job Years**	**Labor Income**	**Value Added**	**Output**
Direct Effect	751	$ 101,282,461	$ 141,157,270	$ 334,707,436
Indirect Effect	350	$ 31,654,226	$ 42,457,233	$ 150,877,800
Induced Effect	556	$ 39,680,528	$ 66,185,843	$ 105,083,246
Total Effect	1,657	$ 172,617,215	$ 249,800,346	$ 590,668,482

Source: UMass Dartmouth from Implan

Comparisons to 2017 PPC Estimates

The Public Policy Center (PPC) at UMass Dartmouth conducted an analysis in 2017 that described the economic contributions to employment and economic output that the proposed 800 MW Vineyard Wind 1 project would have on the Commonwealth of Massachusetts and the regional economy of Southeastern Massachusetts.

In its 2017 analysis, PPC estimated that the 800 MW Vineyard Wind 1 project would support an estimated 3,180 direct job years across all phases over the project period under the Base scenario and 3,658 direct job years in the High scenario for Massachusetts. This total includes 126 job years in the Development phase and 974 job years in the Construction phase (Base scenario) (see Table 3).[7]

Table 3. PPC Estimated Direct Job Years, Development & Construction Phase, 2017

	Development Phase	Construction Phase	Total Job Years
Base Scenario	126	974	1,100
High Scenario	126	1,426	1,552

Source: UMass Dartmouth Public Policy Center, 2017

[7] The PPC developed a Base and High scenario that varied by the assumed level of state and regional supply chain expenditures.

Construction Phase, Comparison to PPC Estimates

Table 4 presents the total impacts of the project to date on the Massachusetts economy, Importantly, the Construction phase is not complete, thus the impacts are expected to be lower than the PPC estimates, which included estimates for the full Construction period.

Direct Job Impacts

- The direct number of Construction phase job years is 473. This compares to the 2017 estimate of 974 job years, a difference of 501 job years.

Indirect and Induced Job Impacts

- **Indirect Impacts:** The number of indirect job years supported to date is 213. This compares to the 2017 estimate of 346 jobs-years, a difference of 133 job years.[8]
- **Induced Impacts:** The direct and indirect impacts of Construction phase activities have induced an additional 305 job years. This compares to the 2017 estimate of 777 job years, a difference of 472.

Economic Output Impacts

- Economic output is higher than the PPC estimates. This is primarily due to the increased cost of the project compared to the assumptions made in 2017.

Table 4. Construction Phase, Massachusetts Impacts
PPC Estimate Versus Actual

Massachusetts Impact				
Construction Phase				
	Job Years		**Output**	
Impact Type	**PPC 2017**	**Actual**	**PPC 2017**	**Actual**
Direct Effect	974	473	$ 148,485,739	$240,804,191
Indirect Effect	346	213	$ 68,758,340	$123,056,476
Induced Effect	777	305	$ 135,739,944	$ 60,158,973
Total Effect	2,097	991	$ 352,984,023	$424,019,641

Source: Estimate; Dartmouth PPC, 2017 (Base scenario). Current; UMass Dartmouth

[8] IMPLAN does not report jobs as FTEs. Accordingly, the reported jobs for the indirect and induced impacts were converted to FTEs using IMPLAN conversion tables.

Project to Date, Comparison to PPC Estimates

Table 5 presents the total impacts of the project to date on the Massachusetts economy (Development and Construction phases).

Direct Employment Impacts

- The direct number of job years is 751. This compares to the 2017 estimate of 1,100 job years, a difference of 349 jobs years.

Indirect and Induced Employment Impacts

- **Indirect Impacts:** The number of indirect job years supported to date is 350. This compares to the 2017 estimate of 373 jobs-years, a difference of 23 job years.[9]
- **Induced Impacts:** The direct and indirect impacts of project activities to date have induced an additional 556 job years. This compares to the 2017 estimate of 898 job years, a difference of 342 job years.

Economic Output Impacts

- Economic output is higher than the PPC estimates, again primarily due to the increased cost of the project compared to assumptions made in 2017, particularly during the Development phase.

Table 5. Construction Phase, Massachusetts Impacts
PPC Estimate Versus Actual

Massachusetts Impact				
Total Project to Date				
	Job Years		**Output**	
Impact Type	**PPC 2017**	**Actual**	**PPC 2017**	**Actual**
Direct Effect	1,100	751	$ 186,907,554	$334,707,436
Indirect Effect	373	350	$ 77,197,265	$150,877,800
Induced Effect	898	556	$ 169,965,557	$105,083,246
Total Effect	2,371	1,657	$ 434,070,376	$590,668,482

Source: Estimate; Dartmouth PPC, 2017 (Base scenario). Current; UMass Dartmouth

[9] IMPLAN does not report jobs as FTEs. Accordingly, the reported jobs for the indirect and induced impacts were converted to FTEs using IMPLAN conversion tables.

1 Overview

Vineyard Wind is currently building the nation's first utility-scale offshore wind energy project fifteen miles south of Martha's Vineyard. The Vineyard Wind 1 (VW1) project will consist of an array of 62 wind turbines, spaced 1 nautical mile apart, that will generate 800 megawatts (MW) of electricity and power over 400,000 homes.

Vineyard Wind's *Offshore Wind Development and Reporting Agreement* executed with the Massachusetts Department of Energy Resources (MA DOER) requires Vineyard Wind to deliver written annual progress reports that summarize the company's progress in achieving the goals set forth in Section 1 of the *Agreement*. Accordingly, this analysis utilizes job and expenditure data collected from 2017 through September 2023 to measure Vineyard Wind's progress in meeting the following eight requirements outlined in the *Agreement*:

(a) the total number of employees on Vineyard Wind Services LLC's payroll, as well as the number who reside in the Commonwealth and in which counties

(b) the total number of workers employed by subcontractors and vendors for Vineyard Wind 1 LLC, as well as the number who reside in the Commonwealth

(c) an estimate of the direct, indirect, and induced employment and economic impacts to date in Massachusetts from the Project

(d) the extent to which the reported results align with the estimates of the project's contributions to employment and economic development contained in the project proposal *Request For Proposals For Long-Term Contracts For Offshore Wind Energy Projects*

(e) any relevant lessons learned that Massachusetts officials can use to improve economic outcomes for Massachusetts and inform future state procurement and programmatic efforts

(f) the impact of projects supported by the Resiliency and Affordability Fund, specifically focusing on revenue generation and the impacts on the communities in which such projects are located

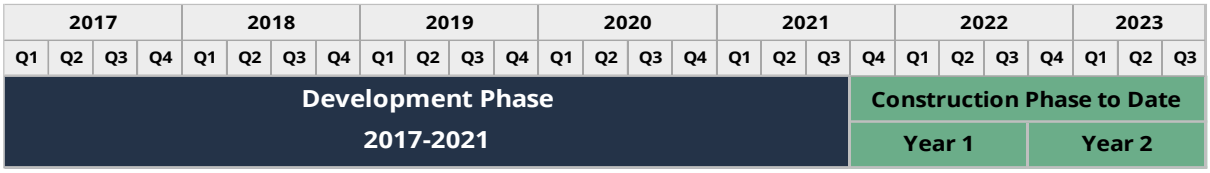
(g) how the community in Massachusetts party to a Host Community Agreement with Vineyard Wind has benefitted from the payments it received under such agreement

(h) the share of the Innovations in Marine Mammals Protection Fund spent in Massachusetts, which institutions received funding, and the projects supported

2 Project Phases and Dates Included In the Analysis

The Year 1annual monitoring report included job and expenditure estimates for the full Development phase (2017-2021). The Year 1 report also included estimates related to Construction phase jobs and expenditures from October 2021 through September 2021, although much of the construction-related activity up to that point had been focused on onshore work in the town of Barnstable. Marshalling and offshore construction began to ramp up in Q4 2022, with the bulk of the marshalling and offshore construction impacts beginning in Q2 2023. Accordingly, the current analysis includes two year-long construction periods: October 2021 through September 2022 and October 2022 through September 2023 (see Figure 6).

Figure 6. Project Phases Included in the Analysis



3 Data Collection and Methodology

3.1 Data Collection

Data collection to obtain job, expenditure, and other information from Vineyard Wind and its subcontractors began in earnest in October 2021, shortly following the project's financial close. Two primary data collection tools were developed and used to monitor relevant project activity:

1) An historical spreadsheet tracker to obtain Development-related job and expenditure data from 2017 to 2021. These data were the basis for the bulk of our first annual report.[10]

2) A monthly spreadsheet tracking template that Tier 1 contractors were required to submit monthly beginning in October 2021. These tracking templates were focused on Construction phase activities. Over 300 monthly reports were received from Tier1 contractors.

Development Phase Data Collection

From the outset, conversations with subcontractors made it clear that obtaining accurate historical data from all subcontractors would be difficult, particularly from smaller companies that were no longer working on the project. Consequently, Vineyard Wind and UMass Dartmouth focused their data collection efforts on obtaining detailed job and expenditure data from companies with contracts above $1 million (n=48), which represents 90.3% of the total contract value during the Development phase. These subcontractors were asked to provide their annual Massachusetts expenditures and counts of Massachusetts-based employees over the 2017-2021 period for activities that directly supported the Vineyard Wind 1 project. Thirty-five of the forty-nine subcontractors (69%) complied.

Construction Phase Data Collection

As noted, UMass Dartmouth and Vineyard Wind created a data collection spreadsheet that was completed monthly by the Tier 1 suppliers working on the project. The tracking sheet includes inputs for labor—both union and non-union—as well as nonpayroll expenditures by three geographic levels of analysis: the U.S., Massachusetts, and Southeastern Massachusetts. Subcontractor expenditures made by the Tier 1 suppliers, as well as various diversity, equity, and inclusion (DEI) data such as race, gender, tribal affiliation, and veteran status were also tracked. Tier 1 contractors also provided the same information for their larger Tier 2 contracts, while also providing the overall contract amounts for smaller Tier 2 and Tier 3 contractors.

[10] See https://www.vineyardwind.com/press-releases/2023/2/16/report-shows-vineyard-wind-far-exceeded-job-creation-and-economic-output-projections-during-development-and-early-construction-period

3.2 Economic Impact Methodology and Definitions[11]

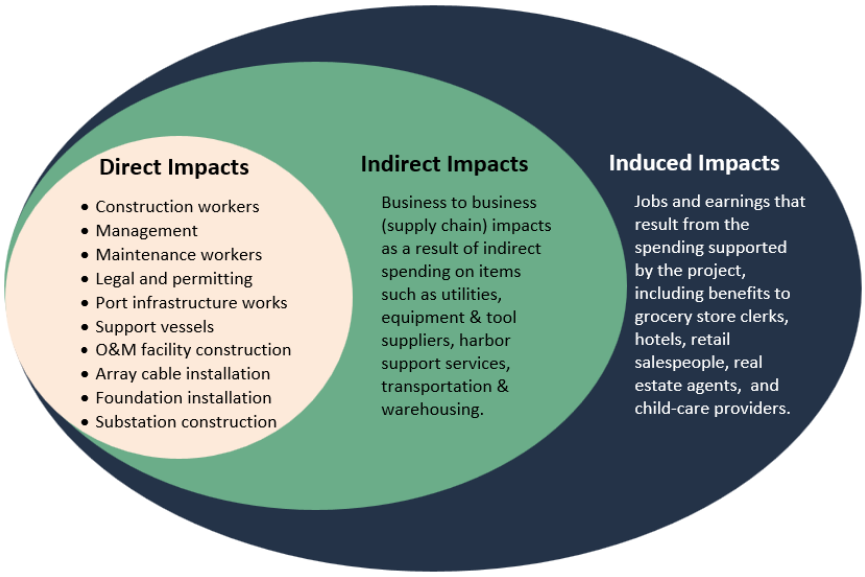
Economic impacts measure how spending associated with an industry circulates through and affects an economy. For example, employee wages and purchases made from suppliers circulate through the economy and support additional spending and job creation, that is, the original expenditures and job creation are multiplied. Measuring these ripple effects on the economy provides a fuller picture of the economic contributions an offshore wind farm's construction has on a particular region. These impacts are expressed as direct effects, indirect effects, and induced effects (see Figure 7).

- **Direct effects** result from expenditures associated with developing, constructing, and operating the wind farm, including money spent on salaries, supplies, and operating expenses. These are the data received directly from the contractors working on the project described in the previous section.

- **Indirect effects** result from the suppliers of the wind farm purchasing goods and services as a result of the direct spending on the project. Because these impacts measure interactions among businesses, they are often referred to as supply-chain impacts.[12] The indirect effects are specified using IMPLAN, which is an input-output database and model that traces a project's purchases of goods, services, and labor through an economic area.

- **Induced effects** result from the spending of employees directly involved in the development, construction, and operation of the wind farm, as well as the spending of employees of the wind farm's suppliers within the region (indirect effects). These induced effects are often referred to as consumption-driven impacts.

Figure 7. Examples of an Offshore Wind Project's Economic Effects



[11] More detail on the report's methodology can be found in Appendix A.
[12] Not including the initial round of spending, which is included in the direct effects.

3.3 Economic Impact Definitions

Economic impacts (i.e., direct, indirect, and induced) are presented in four categories: jobs, labor income, value added, and output.

Jobs

The labor needs of offshore wind developments are concentrated in Construction activities, which by their very nature are project based and not permanent. The actual number of workers on the project includes both full-time and part-time workers who may be on the project for several years, one-year, or less. For example, many of the union workers on the project work for only a month or less since individual construction workers frequently move from site-to-site and to other projects, and the number of workers on the project frequently changes based on the status of the construction project.

This makes estimating employment impacts somewhat less intuitive than in contexts where activities are ongoing and can be accurately defined as "permanent." Consequently, economic impact assessments of construction and other temporary project-based activities are typically reported in terms of the number of years of full-time work required. While less intuitive, this approach allows for more context sensitive and empirically accurate estimates of employment impacts. This is frequently misunderstood by some who reflexively and mistakenly assume construction projects last forever. To limit the chance of this misunderstanding and to provide the most complete and accurate reporting of job impacts possible, our analysis reports employment impacts in two ways – the number of workers employed on the project or headcount (whether part-time or full), and the number of job years of work associated with the project (FTE).

Labor Income

Labor Income is the sum of all payments made to employees, including wages, salaries, benefits, and payroll taxes, as well as payments received by self-employed individuals and unincorporated business owners across the defined economy.

Value Added

Value added is a measure of the contribution of a private industry or government sector to overall GDP. The components of value added consist of compensation of employees, taxes on production and imports less subsidies, and gross operating surplus.

Output

Output is the total value of a business's production and is the sum of the value of all goods and services produced by the business.

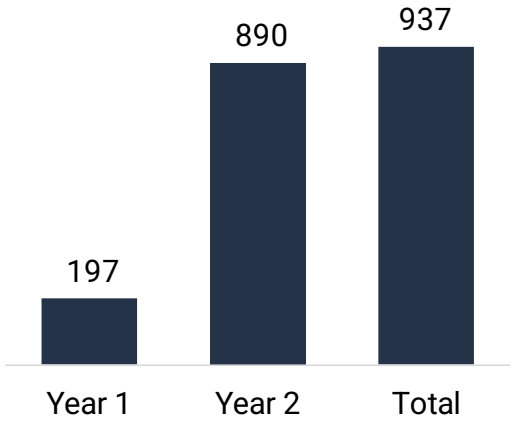
4 Construction Phase Workforce

4.1 Union Workforce – Headcount

This section highlights the number of union workers (headcount) and direct construction phase employment on the Vineyard Wind 1 project through September 2023. To date, there have been 937 unique workers employed during the Construction phase. Figure 8 presents union workers by the year in which they worked. Importantly, while some of the same workers may have worked in both Year 1 and Year 2, these jobs are only counted once in the total headcount (third bar in the chart) regardless if the union member worked in Year 1, Year 2, or both years. That is, the total headcount over the two-year period is not the sum of workers in Year 1 and Year 2.

Notably, data collection in the first two years of the project was undertaken in an environment where the project was ramping up very quickly, which resulted in incomplete reporting from some Tier 1 contractors, especially in Year 1 of the Construction phase. Consequently, the worker headcounts reported here should be considered conservative estimates.

Figure 8. Number of Union Jobs (Headcount) Over the Construction Period, by Year



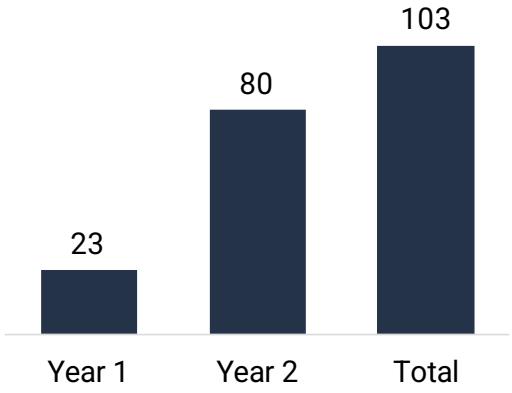
Source: UMass Dartmouth from monthly contractor reports

4.2 Union Job Years

In the first two years of the project there have been 103 total union job years during the Construction phase: 23 job years in Year 1 and 80 job years in Year 2 (see Figure 9).

As noted, the number of workers on the project includes both full-time and part-time workers who may be on the project for several years, one-year, or less. The seasonality of construction employment can also have a significant impact on the number of workers since construction work is heavily dependent on weather conditions. Construction both onshore and offshore is also governed by a series of commitments and regulations to protect communities and sensitive species which limit the times when construction can occur. This shrinks the construction season and leaves the project vulnerable to unexpected delays which can alter the timing of project employment.

Figure 9. Job Years
Over the Construction Period, by Year



Source: UMass Dartmouth from monthly contractor reports

The job year calculation also does not include overtime hours. The number of overtime hours is significant, accounting for:

- 10.4% of total hours worked in Year 1
- 21.7% of total hours worked in Year 2
- 19.4% of total hours worked over the two-year period

In fact, overtime hours accounted for 20% or greater of the total hours worked since February 2023. If overtime hours are included in the job year calculation, the number of job years increases to 25.8 in Year 1, 102.4 in Year 2, and 128.1 in total. Overtime hours are paid at time-and-a-half or double-time and consequently have a larger economic impact in comparison to regular hours.

Notably, a significant amount of overtime is expected to continue due to the intermittency of the working season combined with weather conditions that often dictate the project schedule. While these factors will not affect the number of workers on the job to a great degree, they will have an oversized impact on the economic impacts of the project since more overtime hours will be required.

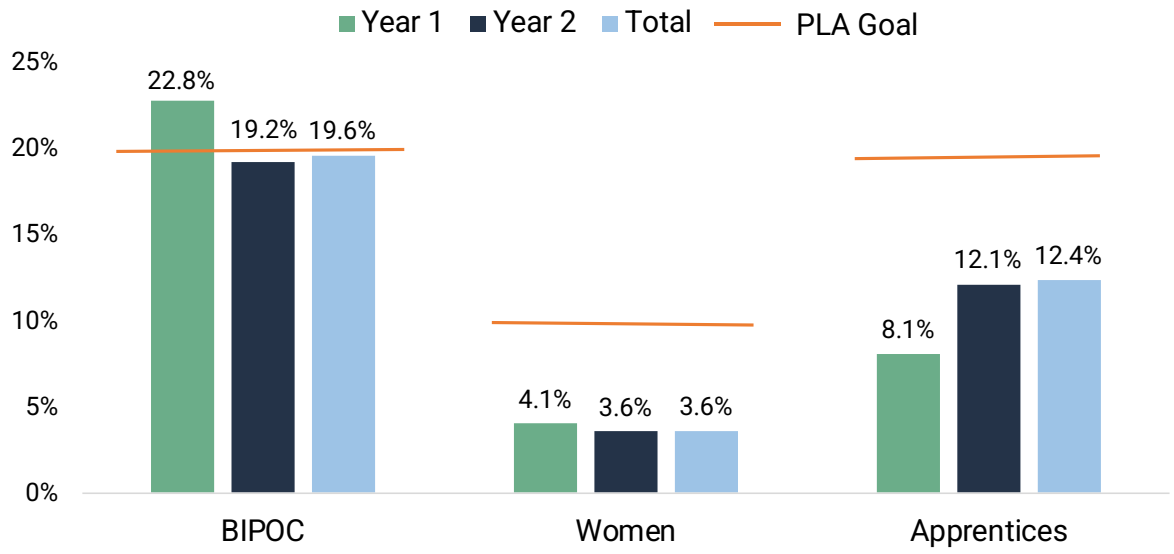
4.3 Diversity, Equity, and Inclusion Goals

Vineyard Wind's Project Labor Agreement (PLA) with its union contractors stipulate several hiring goals related to Diversity, Equity, and inclusion (DEI) as well as the number of apprentices on the project:

4. Black, Indigenous, and People of Color (BIPOC): 20% of total union jobs (headcount)
5. Women: 10% of total union jobs (headcount)
6. Apprentice: 1 in 5 union workers (headcount)

Just under twenty percent (19.6%) of union workers on the Vineyard Wind 1 project meet the BIPOC criteria, while women comprise only 3.6% of the union workforce on the project and 12.4% of workers were hired as apprentices (see Figure 10).[13]

Figure 10. Number of Union Workers Meeting PLA Goals



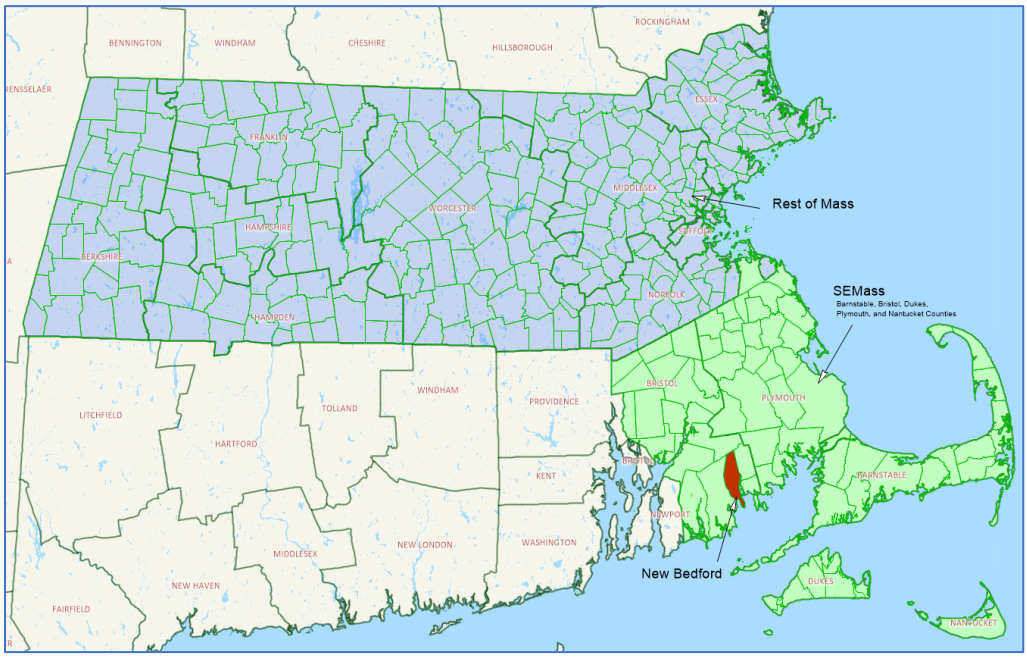
Source: UMass Dartmouth from monthly contractor reports

[13] BIPOC (Black, Indigenous, and people of color) is defined as any employee whose race is not White-alone.

4.4 Union Workers by Region

Workers' current residential ZIP Code was included in the monthly tracker template, which were then categorized into four regions: New Bedford, Southeastern Massachusetts (SEMass), remainder of Massachusetts, and out-of-state. SEMass is defined as including the counties of Barnstable, Bristol, Dukes, Nantucket, and Plymouth (see Figure 11).

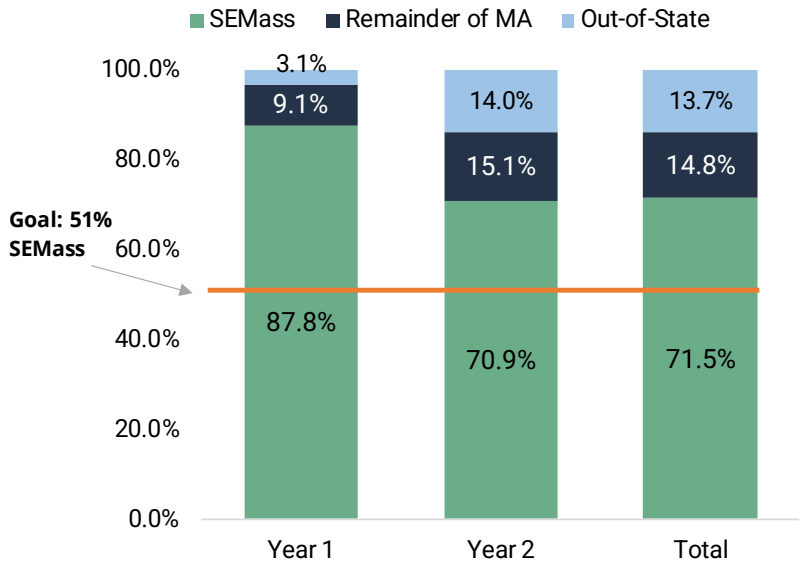
Figure 11. Region Definitions



Vineyard Wind's set a goal of having 51% of workers on the project residing in Southeastern Massachusetts (SEMass). Over the two-year Construction phase to date, 71.5% of union workers were residents of SEMass (see Figure 12). In economic impact analysis, employment is determined by the location of the job rather than the individual's place of residence. Therefore, even if a worker is brought in from outside the region, they are still considered as "local" employment for the duration of their work.

Accordingly, local employment in this report includes all employees on the job site, including workers who relocated to SEMass to work on the project. About 92 workers relocated to SEMass for the project. While counted as locals in economic impact terms, these workers obviously spend their income differently than longer-term residents. Accordingly, some modifications were made to the impact model to account for these relocated workers. See Appendix A for more detail.

Figure 12. Union Employee Place of Residence, All Workers [14]



Source: UMass Dartmouth from monthly contractor reports.

More than half (50.2%) of Massachusetts-based union workers reside in Bristol County, while 23.2 percent are Plymouth County residents and 9.1% are Barnstable County residents (see Table 6).[15]

Table 6. Union Employee Place of Residence by Massachusetts County, Massachusetts-Based Employees*

County	Number	Percent
Barnstable	69	9.1%
Bristol	380	50.2%
Dukes	1	0.1%
Essex	11	1.5%
Hampden	2	0.3%
Middlesex	28	3.7%
Norfolk	49	6.5%
Plymouth	176	23.2%
Suffolk	26	3.4%
Worcester	15	2.0%

*Table does not include out-of-state workers
Source: UMass Dartmouth from monthly contractor reports
Counties highlighted in gray are in SEMass

[14] While some of the same workers may have worked in both Year 1 and Year 2, these jobs are only counted once in the total headcount (third bar in the chart) regardless if the union member worked in Year 1, Year 2, or both years.

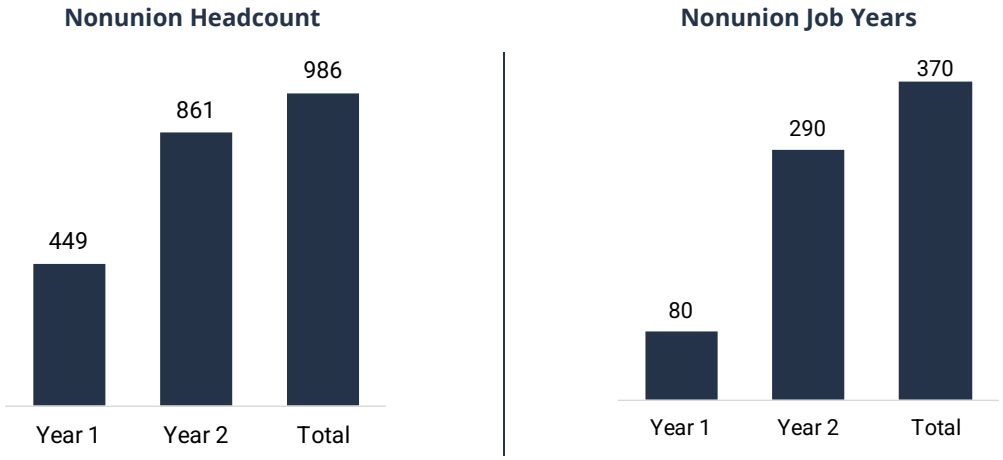
[15] Note that these figures are based on Massachusetts residents only and thus the percentages do not add to those in Figure 12, which includes out-of-state workers. There were also some missing Zip Codes in the monthly reports, thus we are unable to drill down to the county level for some workers.

4.5 Nonunion Workforce – Headcount and Job Years

This section highlights the number of nonunion workers (headcount) and job years directly employed on the Vineyard Wind 1 project over the two-year Construction phase period. To date, there have been 986 individual workers employed during the Construction phase: 449 in Year 1 and 861 in Year 2 (see Figure 13).

Figure 13 also presents the number of job years, with 80 job years in Year 1, 290 in Year 2, and 370 in total over the two-year Construction phase. Similar to the union worker headcount, while some of the same workers may have worked in both Year 1 and Year 2, these jobs are only counted once in the total headcount (third bar in the chart) regardless if the employee worked in Year 1, Year 2, or both years.

Figure 13. Nonunion Workforce, Headcount and Job Years

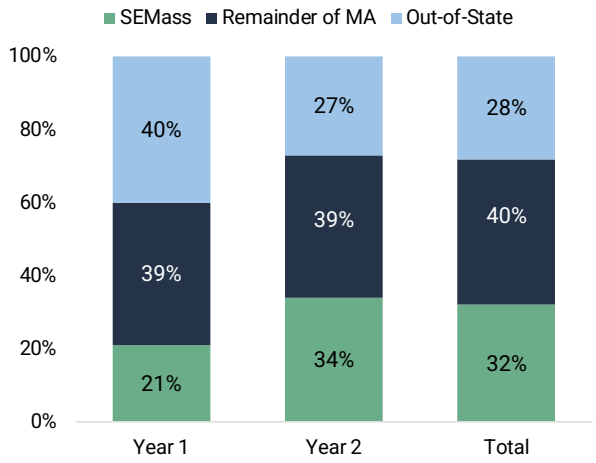


Source: UMass Dartmouth from monthly contractor reports

4.6 Nonunion Worker Residence

Thirty-two percent (32%) of nonunion workers over the Construction phase were residents of SEMass (see Figure 14). Forty percent (40%) reside in other areas of Massachusetts, while 28% reside out-of-state.

Figure 14. Nonunion Employee Place of Residence



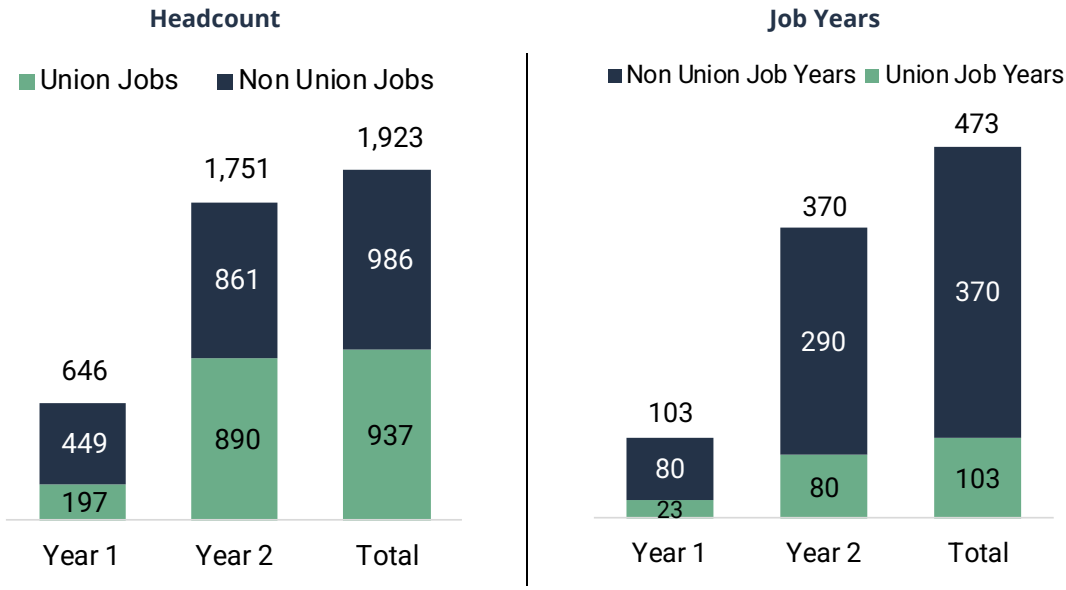
Source: UMass Dartmouth from monthly contractor reports

4.7 Total Union and Nonunion Employment, Headcount and Job Years

Total Jobs (Headcount)

Figure 15 displays the number (headcount) of reported union and non-union jobs (headcount) and job years. The total number of workers during the Construction phase rose significantly from 646 in year 1 to 1,751 in Year 2, for a total of 1,923 individual workers on the project. The number of job years also increased considerably from Year 1 (103) to Year 2 (370), for a total of 473 job years over the two-year construction phase.

Figure 15. Total Jobs, Headcount and Job Years[16]



Source: UMass Dartmouth from monthly contractor reports

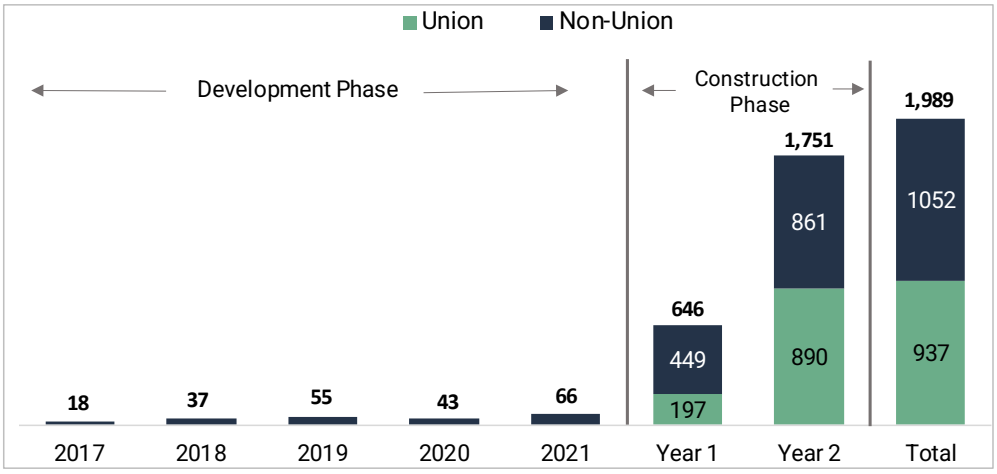
[16] As noted, while some of the same workers may have worked in both Year 1 and Year 2, these jobs are only counted once in the total headcount (third bar in the chart) whether the union member worked in Year 1, Year 2, or both years.

5 Development and Construction Phase Employment

5.1 Union and Nonunion Headcount and Job Years

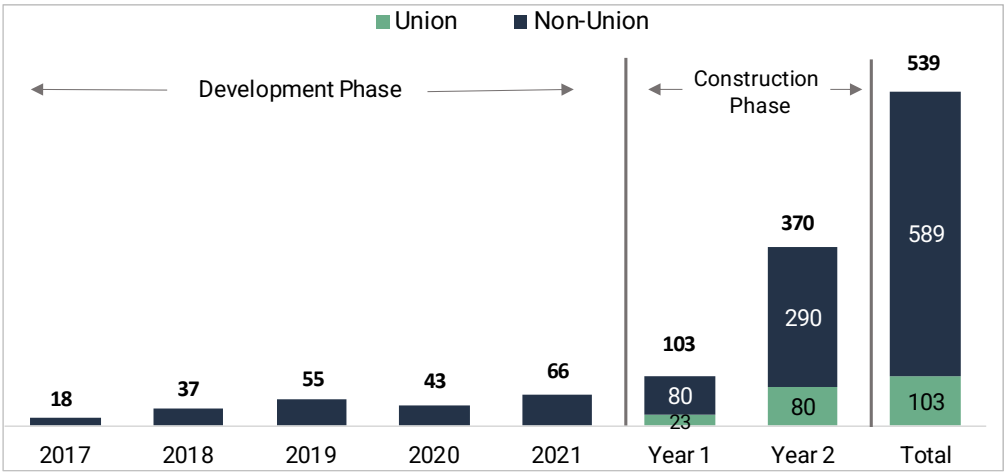
Figure 15 presents the worker headcount since the Vineyard Wind 1 Development phase began in 2017.[17] A total of 1,989 workers have been employed on the project since 2017. This is a conservative estimate based on incomplete reporting from some contractors during the early phases of project work.[18] Figure 17 details the total number of job years by phase and year since development work on the project work began in 2017.

Figure 16. Jobs (Headcount), Development & Construction Phases



Source: Vineyard Wind Services Historical and Monthly Tracker Submissions

Figure 17. Job Years, Development & Construction Phases



Source: Vineyard Wind Services Historical and Monthly Tracker Submissions

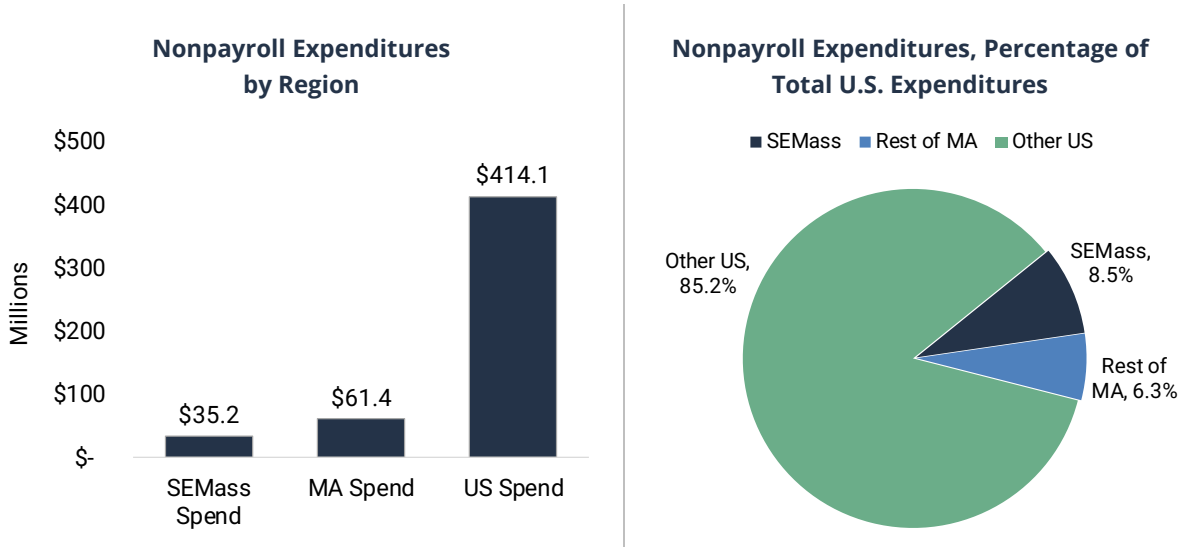
[17] See the Year 1 Annual Report for more details on Development Phase employment.
[18] The total (last bar) represents the number of individual workers over the seven-year period, not the sum of the previous bars. That is, there have been 1,989 unique workers on the project since 2017. Some of these workers may have been employed on the project in multiple years.

6 Direct Expenditures

6.1 Nonpayroll Expenditures

Vineyard Wind's contractors made a total of $35.2 million in nonpayroll expenditures to SEMass businesses during the Construction phase and $61.4 million in Massachusetts as a whole. Massachusetts expenditures accounted for 14.8% of total US expenditures (8.5% in SEMass and 6.3% in other areas of the state) over this period (see Figure 18).

Figure 18. Nonpayroll Expenditures by Region, Construction Phase



Source: UMass Dartmouth from monthly contractor reports. Includes Tier 1 contractor reported spend from monthly reports and Tier 2 and Tier 3 contractor spend estimated from Implan based on subcontractor amounts from Tier 1 reports

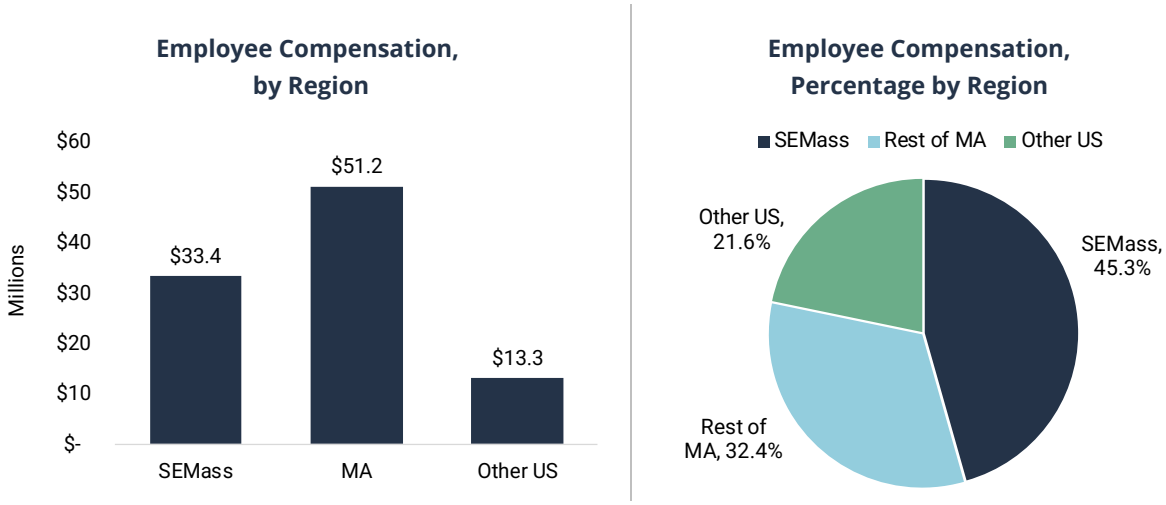
6.2 Payroll Expenditures

Massachusetts residents working on the project received a total of $51.2 million in employee compensation over the two-year Construction period. More than $33.4 million of this amount was earned by SEMass residents.[19] SEMass accounted for 45.3% of total employee compensation over the two-year period. The remaining portion of Massachusetts workers accounted for 32.4% of employee compensation and workers outside the state accounted for 21.6% (see Figure 19).[20]

[19] The state total includes SEMass.

[20] Employee compensation includes wages and benefits. Employee compensation was estimated by utilizing actual wage and benefit data detailed in each union's prevailing wage schedule. Employee compensation for nonunion workers was estimated utilizing Massachusetts occupational wage data from Lightcast and the Bureau of Labor Statistics. All union workers are considered local on the project and therefore all employee compensation for union workers is included in the Massachusetts total. Conversely, nonunion employee compensation includes compensation for Massachusetts-based workers only. Employees without a ZIP Code were categorized as out-of-state.

Figure 19. Union and Nonunion Employee Compensation by Region, Construction Phase

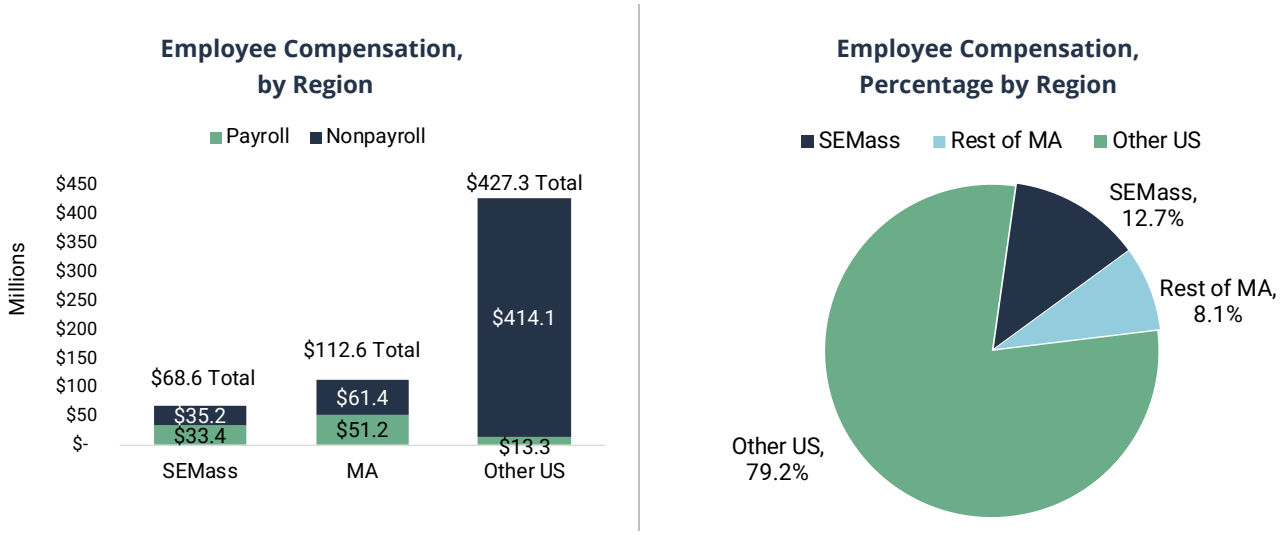


Source: UMass Dartmouth from monthly contractor reports, Emsi, and prevailing wage data by union

6.3 Total Payroll and Nonpayroll Expenditures

Total payroll and nonpayroll expenditures in Massachusetts were $112.6 million. In all, Massachusetts accounted for 20.8% of total U.S. expenditures over the two-year period (12.7% in SEMass and 8.1% in other areas of the state) (see Figure 20).

Figure 20. Total Payroll and Nonpayroll Expenditures by Region, Construction Phase



Source: UMass Dartmouth from monthly contractor reports

7 Economic Impacts on the Massachusetts Economy

This section expands on the direct impacts by examining the broader economic impact of the project activities in the Development and Construction phases.

7.1 Development Phase Impacts, 2017-2021

The data in Table 7 revisit the results of our first annual report, which focused primarily on the Development phase. Results from the year-one analysis included:

- **Indirect Impacts:** Vineyard Wind's direct payroll and non-payroll expenditures supported an additional 137 indirect jobs during the Development phase. These jobs supported $11.5 million in labor income, contributed $16.8 million in added value to the Massachusetts economy, and supported $27.9 million in new economic output during the Development phase.
- **Induced Impacts:** The direct and indirect impacts induced an additional 251 jobs that supported $16.8 million in labor income. Development phase activities also contributed over $28.2 million in added value to the Massachusetts economy and supported $44.9 million in new economic output.
- **Total Impacts:** In total, Development phase economic activity supported 666 jobs, $59.3 million in labor income, $79.1 million in value added, and $166.6 million in economic output.

Table 7. Direct, Indirect, and Induced Impacts, Development Phase

Massachusetts Impact				
Development Phase (2017 - 2021)				
Impact Type	**Job Years**	**Labor Income**	**Value Added**	**Output**
Direct Effect	278	$ 31,057,366	$ 34,085,502	$ 93,903,244
Indirect Effect	137	$ 11,505,524	$ 16,782,238	$ 27,821,324
Induced Effect	251	$ 16,759,219	$ 28,237,439	$ 44,924,273
Total Effect	666	$ 59,322,109	$ 79,105,179	$ 166,648,841

Source: UMass Dartmouth from Implan

7.2 Construction Phase Impacts

Table 8 presents the impacts of Construction phase activities to date. Note that much of the Construction phase activity in Year 1 was focused on onshore work in the Town of Barnstable. Marshalling and offshore construction activity has intensified throughout Year 2, with most of that work being staged from New Bedford.[21]

- **Indirect Impacts:** Vineyard Wind's direct payroll and non-payroll expenditures have supported an additional 213 indirect jobs during the Construction phase to date. These jobs supported $20.1 million in labor income, contributed $25.7 million in added value to the Massachusetts economy, and supported $123.1 million in new economic output during the Construction phase.
- **Induced Impacts:** The direct and indirect impacts induced an additional 305 jobs that supported $22.9 million in labor income. Construction phase activities also contributed over $37.9 million in added value to the Massachusetts economy and supported $60.2 million in new economic output.
- **Total Impacts:** In total, Construction phase economic activity to date has supported 991 jobs, $113.3 million in labor income, $170.7 million in value added, and 424.0 million in economic output.

Table 8. Direct, Indirect, and Induced Impacts, Construction Phase

Massachusetts Impact				
Construction Phase				
Impact Type	**Job Years**	**Labor Income**	**Value Added**	**Output**
Direct Effect	473	$ 70,225,095	$ 107,071,768	$ 240,804,191
Indirect Effect	213	$ 20,148,702	$ 25,674,995	$ 123,056,476
Induced Effect	305	$ 22,921,309	$ 37,948,404	$ 60,158,973
Total Effect	991	$ 113,295,106	$ 170,695,167	$ 424,019,641

Source: UMass Dartmouth from Implan

[21] The job impacts are presented in job years, not number of jobs (headcount). As noted earlier, the total number of Construction phase individual workers (headcount) on the project to date is 1,927 workers.

7.3 Total Project Impact to Date

Table 9 aggregates the data in the previous two tables to present the total impacts of the Vineyard Wind 1 project through September 2023.

- **Indirect Impacts:** The project's direct payroll and non-payroll expenditures have supported an additional 350 indirect jobs during the project period. The project supported $31.7 million in labor income, contributed $42.5 million in added value to the Massachusetts economy, and supported $150.9 million in new economic output.
- **Induced Impacts:** The direct and indirect impacts induced an additional 556 jobs that supported $39.7 million in labor income. The project also contributed over $66.2 million in added value to the Massachusetts economy and supported $105.1 million in new economic output.
- **Total Impacts:** In total, the project to date has supported 1,657 jobs, $172.6 million in labor income, $66.2 million in value added, and $590.7 million in economic output.

Table 9. Direct, Indirect, and Induced Impacts, Total Project Impacts to Date

Total Massachusetts Impact				
Total Project Impacts to Date				
Impact Type	**Job Years**	**Labor Income**	**Value Added**	**Output**
Direct Effect	751	$ 101,282,461	$ 141,157,270	$ 334,707,436
Indirect Effect	350	$ 31,654,226	$ 42,457,233	$ 150,877,800
Induced Effect	556	$ 39,680,528	$ 66,185,843	$ 105,083,246
Total Effect	1,657	$ 172,617,215	$ 249,800,346	$ 590,668,482

Source: UMass Dartmouth from Implan

8 Comparison to UMass Dartmouth Public Policy Center 2017 Estimates

The Public Policy Center (PPC) at UMass Dartmouth conducted an analysis in 2017 that described the economic contributions to employment and economic output that the proposed 800 MW Vineyard Wind 1 project would have on the Commonwealth of Massachusetts and the regional economy of Southeastern Massachusetts. The analysis was undertaken in response to inquiries contained in the *Request for Proposals for Long-Term Contracts for Offshore Wind Energy Projects (RFP)* issued by the state's four electric distribution companies in coordination with the Massachusetts Department of Energy Resources (DOER).

In its 2017 analysis, PPC estimated that the 800 MW Vineyard Wind 1 project would support an estimated 3,180 direct job years across all phases over the project period under the Base scenario and 3,658 direct job years in the High scenario for Massachusetts. This total includes 126 job years in the Development phase and 974 job years in the Construction phase (Base scenario) (see Table 10).[22]

Table 10. PPC Estimated Direct Job Years, Development & Construction Phase, 2017

	Development Phase	Construction Phase	Total Job Years
Base Scenario	126	974	1,100
High Scenario	126	1,426	1,552

Source: UMass Dartmouth Public Policy Center, 2017

This section compares the extent to which the results reported here compare with the estimates of the project's contributions to employment and economic development contained in the 2017 UMass Dartmouth analysis and included as part of Vineyard Wind's proposal submission to DOER.

8.1 Development Phase

As noted in last year's annual report, the expected impacts are larger in 2022 than expected in 2017 on every dimension of the economic impact of the project to date (see Table 11 and Figure 21). The larger impact is primarily due to the two-year federal permitting delay and expanded project envelope that extended the Development phase beyond the initial expectation. The economic impact of future projects may be closer to initial estimations as project development becomes more streamlined and predictable.

Direct Employment Impacts

- The direct number of Development phase job years is 278. This compares to the 2017 estimate of 126 job years, a difference of 152 jobs.
- In all, the total job impact of Development phase activities is 666. This compares to the 2017 estimate of 274 jobs, a difference of 392 jobs.

[22] The PPC developed a Base and High scenario that varied by the assumed level of state and regional supply chain expenditures.

Indirect and Induced Employment Impacts

- **Indirect Impacts:** Vineyard Wind's direct payroll and non-payroll expenditures supported an additional 137 indirect job years during the Development phase. This compares to the 2017 estimate of 27 jobs, a difference of 110 jobs.[23]
- **Induced Impacts:** The direct and indirect impacts of the proposed project induced an estimated additional 251 jobs during the Development phase. This compares to the 2017 estimate of 121 jobs, a difference of 130 jobs.

Economic Output Impacts

- Economic output values are also much higher than the 2017 estimates. For example, total economic output (direct + indirect + induced) is estimated to be $166.6 million, which compared to $81.1 million in the 2017 estimate, a difference of $85.5 million.

Table 11. Development Phase
Massachusetts Impacts, PPC Estimate Versus Actual

Massachusetts Impact				
Development Phase				
	Job Years		Output	
Impact Type	PPC 2017	Actual	PPC 2017	Actual
Direct Effect	126	278	$ 38,421,815	$ 93,903,244
Indirect Effect	27	137	$ 8,438,925	$ 27,821,324
Induced Effect	121	251	$ 34,225,613	$ 44,924,273
Total Effect	274	666	$ 81,086,353	$166,648,841

Source: Estimate; Dartmouth PPC, 2017 (Base scenario). Current; UMass Dartmouth

Figure 21. Development Phase, Total Massachusetts Economic Impacts
UMass Dartmouth Estimate Versus Actual

Source: Estimate; UMass Dartmouth Public Policy Center (2017). Current; UMass Dartmouth and Vineyard Wind

[23] IMPLAN does not report jobs as FTEs. Accordingly, the reported jobs for the indirect and induced impacts were converted to FTEs using IMPLAN conversion tables.

8.2 Construction Phase

The 2017 estimates were designed to gauge the economic impact of the complete construction phase of the project, including economically meaningful project activities that are expected in 2024. What follows documents the impact of project related construction activities through September 2023 only.[24] Accordingly, comparisons to 2017 should be interpreted with caution and understood as a progress report rather than a true "apples to apples" comparison.

Direct Employment Impacts

- The direct number of Construction phase job years is 473. This compares to the 2017 estimate of 974 job years, a difference of 501 jobs years.

Indirect and Induced Employment Impacts

- **Indirect Impacts:** The number of indirect job years supported to date is 213. This compares to the 2017 estimate of 346 jobs-years, a difference of 133 job years.[25]
- **Induced Impacts:** The direct and indirect impacts of Construction phase activities have induced an additional 305 job years. This compares to the 2017 estimate of 777 job years, a difference of 472.

Economic Output Impacts

- Economic output to date is significantly higher than the PPC estimates. This reflects the impact of inflation and project costs, both of which have been much higher than could have been foreseen in 2017.

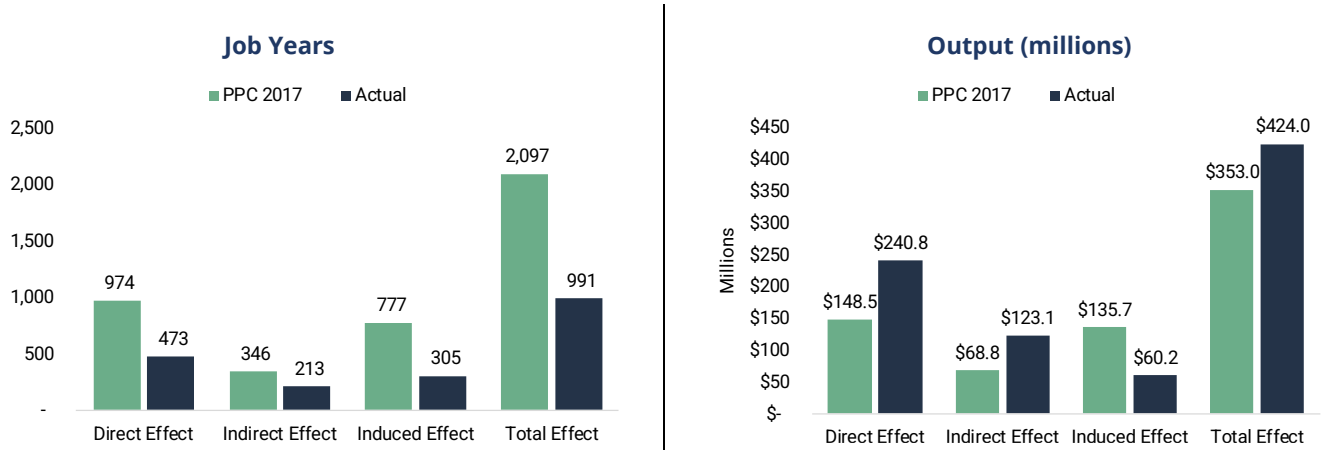
Table 12. Construction Phase, Massachusetts Impacts
PPC Estimate Versus Actual

Massachusetts Impact				
Construction Phase				
	Job Years		**Output**	
Impact Type	**PPC 2017**	**Actual**	**PPC 2017**	**Actual**
Direct Effect	974	473	$ 148,485,739	$240,804,191
Indirect Effect	346	213	$ 68,758,340	$123,056,476
Induced Effect	777	305	$ 135,739,944	$ 60,158,973
Total Effect	2,097	991	$ 352,984,023	$424,019,641

Source: Estimate; Dartmouth PPC, 2017 (Base scenario). Current; UMass Dartmouth

[24] Note again that the job impacts are presented in job years, not number of jobs (headcount).
[25] IMPLAN does not report jobs as FTEs. Accordingly, the reported jobs for the indirect and induced impacts were converted to FTEs using IMPLAN conversion tables.

Figure 22. Construction Phase Massachusetts Impacts
PPC Estimate Versus Actual



Source: Estimate; Dartmouth PPC, 2017 (Base scenario). Current; UMass Dartmouth

8.3 Total Impact of the Project to Date

Table 13 and Figure 23 present project outcomes through September 2023 and should be understood as a progress report. Construction activity will continue in 2024 and the full impact of the Construction phase will not be known before that phase is complete.

Direct Employment Impacts

- The direct number of job years is 751. This compares to the 2017 estimate of 1,100 job years, a difference of 349 jobs years.

Indirect and Induced Employment Impacts

- **Indirect Impacts:** The number of indirect job years supported to date is 350. This compares to the 2017 estimate of 373 jobs-years, a difference of 23 job years.[26]
- **Induced Impacts:** The direct and indirect impacts of project activities to date have induced an additional 556 job years. This compares to the 2017 estimate of 898 job years, a difference of 342 job years.

Economic Output Impacts

- Economic output is higher than the PPC estimates. Again, this is primarily due to the increased cost of the project compared to assumptions made in 2017, particularly during the Development phase.

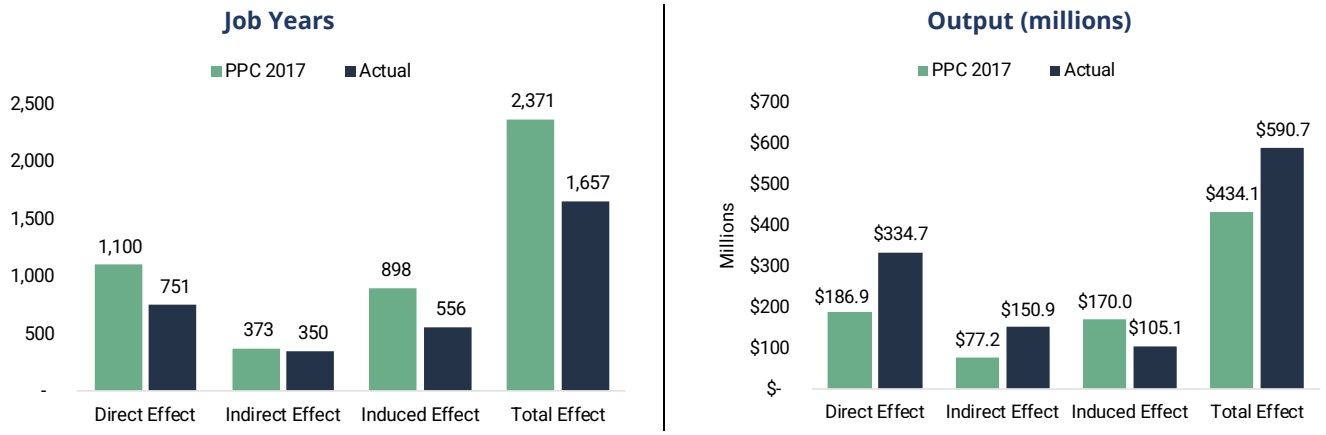
[26] An FTE assumes 2080 hours of work in a year. IMPLAN does not report jobs as FTEs. Accordingly, the reported jobs for the indirect and induced impacts were converted to FTEs using IMPLAN conversion tables.

Table 13. Construction Phase, Massachusetts Impacts
PPC Estimate Versus Actual

Massachusetts Impact				
Total Project to Date				
	Job Years		**Output**	
Impact Type	**PPC 2017**	**Actual**	**PPC 2017**	**Actual**
Direct Effect	1,100	751	$ 186,907,554	$334,707,436
Indirect Effect	373	350	$ 77,197,265	$150,877,800
Induced Effect	898	556	$ 169,965,557	$105,083,246
Total Effect	2,371	1,657	$ 434,070,376	$590,668,482

Source: Estimate; Dartmouth PPC, 2017 (Base scenario). Current; UMass Dartmouth

Figure 22. Construction Phase Massachusetts Impacts
PPC Estimate Versus Actual



Source: Estimate; Dartmouth PPC, 2017 (Base scenario). Current; UMass Dartmouth

9 Lessons Learned to Date and Research Related Recommendations

This section highlights several relevant lessons learned while conducting this research that Massachusetts officials can use to support efforts to improve economic outcomes for Massachusetts and inform future state procurement and related programmatic efforts.

Over the course of the past two years there have been two durable lessons that we have learned that improve our understanding of the statewide and regional impact of the Vineyard Wind 1 project. Both can be classified as unintended consequences of otherwise positive conditions.

9.1 Consequences of the Project Labor Agreement

The Construction work is being performed under a Project Labor Agreement (PLA) with much of the construction labor provided by local unions. A PLA specifies the wages, overtime wages, and fringe benefits to be paid on a project and is usually higher than the prevailing wage required on public projects. While the PLA has resulted in hundreds of local union workers performing work on the project with wages that meet or exceed prevailing wage, it also narrows the number of contractors that are eligible to execute contracts on the construction portion of the project to those that employ union labor.

In a recent report prepared for Vineyard Wind and the Massachusetts Clean Energy Center (MassCEC) Greentree Consulting LLC (Greentree) identified several lessons learned through the VW1 "Meet the Buyer" initiative.[27] The initiative was designed to connect local companies to key project partners and make them aware of competitive opportunities to directly benefit as subcontractors or suppliers. They identified several issues that make it difficult to make these connections. As they described it:

> *Open lists of union hall members are not easily available or accessible without membership, therefore making it difficult to quickly identify local unionized suppliers. Another challenge is to identify minority companies. Greentree did make use of the MA Certified SBA Directory, but this directory does not include any union affiliation. Nor does this list include any industry classifications, to filter the suppliers relative to offshore wind supply chain. Not impossible, but it does require more targeted research and outreach to further filter and identify union and minority suppliers.*

Greentree also noted that "buyers" (tier one contractors on the project) commented that they met several qualified suppliers, but they were not union, which would be problematic to work on Vineyard Wind 1. To the extent that a given region or community does not have a ready supply of available union construction firms, a PLA limits available contractors to the available pool of union firms. This is not an uncommon challenge in regions that do not have many large construction projects. As the industry moves forward, understanding whether PLAs will be common industry practice will allow local companies to determine whether becoming a union employer will provide better business opportunities in this sector.

Moving forward, the available supply chain directories should include information about whether a local company is signatory to unions and therefore eligible to work under a PLA.

[27] Vineyard Wind Meet-The-Buyer Initiative, Overview And Lessons Learned. Greentree Consulting, LLC.

9.2 Recruiting a Local and Diverse Workforce In a Very Tight Labor Market Is Difficult

The Vineyard Wind 1 project is being developed during a period where the state and nation are at or near record lows in unemployment. In an otherwise extremely tight regional labor market, the competition for labor in the construction and building trades sector has been particularly intense.
it is very difficult to persuade workers to pursue a new career and complete specialized training and certification in an environment where jobs paying competitive wages with no such requirements are readily available.

Additionally, small delays in the project can have cascading effects on whether local workers in the training pipeline end up working on the Vineyard Wind 1 or one of the many other traditional shoreside projects that require workers with their skills and that allow them to start work and begin earning a wage immediately. A delay as short as a week (due to weather or one of the many reasons an offshore project may face a short-term delay) can mean that the workforce who intended to perform the job seeks work elsewhere and then is unavailable to go offshore when the project is ready. Due to the relatively small workforce that has the full offshore capabilities and limited industry-specific training capacity, it is very difficult to train backup workers with short notice.

Going forward, future projects should be able to learn from these lessons and benefit from the larger supply of work-ready workers in the region who are now working in construction and building trades sector, even if not currently employed supporting offshore wind. If ongoing workforce development efforts are successful, this means that the local impact of future projects can be expected to be larger.

10 Resiliency and Affordability Fund

Vineyard Wind has established the Resiliency and Affordability Program (RAP) in Partnerships with Citizens Energy Corporation and Vineyard Power Development Fund, Inc.[28] Vineyard Wind will contribute $15 million in total funding to the RAP with the funding to be used by the program partners to support the development of distributed battery energy storage and solar projects in local host communities as well as to provide credits directly to low-income ratepayers' electric utility bills. The RAP is focused on supporting projects and delivering benefits to low-income ratepayers in New Bedford, Martha's Vineyard, Nantucket, Barnstable, and Somerset as well as to the Mashpee Wampanoag Tribe and Wampanoag Tribe of Gay Head (Aquinnah).

The RAP is in its second year and, although no resiliency projects have been funded, Citizens Energy continues to enroll low-income ratepayers from cities/towns in the CE Geographic Region into the low-income community solar program, Joe-4-Sun (J4S). J4S leverages the Massachusetts SMART program to operate low-income community shared solar projects that generate solar bill credits that are used to lower electricity bills for low-income households. Regular J4S customers receive a 50% discount on bill credits (by far the highest discount offered in the SMART program), while the VW RAP program offers eligible and enrolled customers a 100% discount on the bill credits.

At the time of reporting, 191 RAP participants were enrolled in the J4S program, a 133% increase over last year, with another 171 in the process of being enrolled, a 99% increase vs last year. Overall, this represents a year-over-year increase of 194 RAP participants. Based on the program, each household is expected to

[28] Vineyard Power Development Fund, Inc. is an affiliate entity of Vineyard Power Cooperative, Vineyard Wind's community benefits partner on Martha's Vineyard.

receive about $600 in electricity bill savings. Given the program's current capacity and remaining availability to subscribers, Citizens was able to link customers' bill savings to their household electricity consumption, providing greater benefit to RAP participants who need it most. Over the past twelve months, the participants have received about $190,000 in electricity bill savings, with half of that, $95,000, provided by the RAP funds, an average of $778 per household over that timeframe. This is not a direct calculation as the # of participants has been increasing each month, but it is an average savings per RAP participant.

It should be noted that as RAP participant enrollment continues to increase, the total $-value of bill credits allocated to each household will be adjusted to accommodate the number of enrollees while staying within the allowable budget. However, the basic construct will remain – that is, the RAP will pay for the customer's remaining 50% share of the bill credits. Based on the current enrollment, the households enrolled in the program should collectively experience annual electricity bill savings of $217,200, with half of the savings supported RAP funds.

Table 12. Joe-4-Sun Program Participation

Community	# Participants	# In Process of Enrolling	Total
Barnstable	26	36	62
Martha's Vineyard	14	11	25
Nantucket *	0	0	0
New Bedford	87	65	152
Somerset	26	24	50
Tribes**	38	35	73
Total	191	171	362

* Nantucket is not currently eligible for J4S program due to no Citizens solar projects in Nantucket territory
** Tribes includes Mashpee Wampanoag Tribe and Aquinnah Tribe of Gay Head

11 Host Community Agreements

Vineyard Wind entered into a Host Community Agreement (HCA) with the Town of Barnstable in October 2018. The HCA requires Vineyard Wind to make annual payments to the Town of at least $1.534 million each year in combined property taxes and Host Community Payments (HCP). The agreement guarantees a total HCP of $16 million, plus an additional $60,000 (adjusted for inflation annually), for each year the project is in operation beyond 25 years. To date, Vineyard Wind has made payments under the HCA of $640,000 in 2022 (Q2) $1.49 million in 2023 (Q2).

Apart from these payments, the HCA provided an opportunity for detailed review and consultation by the Town of Vineyard Wind's specifications for its new substation, including funding for the town to retain an external consultant. It also ensured close and ongoing communication and coordination between Vineyard Wind and town staff. Beyond the HCA, Barnstable and Vineyard Wind collaborated on the Town's sewer expansion effort by co-locating sewer infrastructure along the cable route, with Vineyard Wind assuming road reconstruction costs, which saved the town millions in project costs and minimized the need for future road construction, and helping to address the local environmental impact of wastewater and nitrogen loading that degrades the town's bays, estuaries, and ponds. The HCA also provided $80,000 in funding for reconstruction of the bath and restroom facilities at Covell's Beach. Future annual reports will more fully capture the impacts of the HCA collaboration.

12 Accelerator Fund

In its 83C bid into Massachusetts in 2017, Vineyard Wind committed $15 million to an Accelerator Fund, broken into three initiatives: 1) Windward Workforce ($2 million) for initiatives that will build a skilled offshore wind workforce centered in southeastern Massachusetts; 2) Industry Accelerator Fund ($10 million) to attract additional investment in infrastructure and supply chain development; and, 3) Marine Mammals Innovation Fund ($3 million) to advance technologies that will allow for greater expansion of offshore wind, while continuing to protect marine mammals. The funds were deposited into a joint trust account at financial close of the project, comanaged with the Massachusetts Clean Energy Center (MassCEC) under the Offshore Wind Accelerator Program Agreement, executed on September 29, 2021.

At time of this report, over $14 million of the total $15 million dollars has been committed to initiatives in coordination with Mass CEC. Some of the major projects funded include the below (this is not a comprehensive list of all initiatives):

12.1 Windward Workforce Fund

Building Pathways South (BPS)

The goal of this initiative is to support and advance a pre-apprenticeship program that allows Massachusetts residents to obtain the requisite qualifications to be considered for union apprenticeship opportunities in offshore wind. The primary goal of BPS is to expand access to recruit and train local and traditionally underserved populations in Massachusetts, including South Coast residents, Mashpee and Aquinnah Wampanoag tribal members, BIPOC, and women in support of efforts to diversify the unionized offshore wind workforce in the Commonwealth.

BPS is a pre-apprenticeship program that prepares low-income men and women for careers in the building trades with a goal of increasing job-site diversity. The Building Pathways model is nationally recognized for addressing training and inclusivity in the industry and providing the critical link between diverse communities and access to family-sustaining careers that empower individuals and strengthen our communities. Through apprenticeship preparedness training, outreach to young adults, and advocacy, BPS's pre-apprenticeship program addresses the need to recruit top talent into the industry while opening career pathways to women, BIOPC, individuals with disabilities, and transitioning veterans.

Turbine Installation Training Initiative

Per the Project Labor Agreement, the work associated with offshore turbine installation includes multiple unions who are required to have additional specialized technical and Health and Safety trainings in order to perform the work. Considering this work scope is the most unique, requiring a technical skillset that cuts across several traditional union jurisdictions, the PLA established a working group comprised of the turbine supplier (General Electric), Vineyard Wind, and the relevant unions to ensure communication, coordination and financial support for identifying, recruiting and training individuals to be prepared for this work. To date, the funds have supported the Offshore Suitability Experience program at Massachusetts Maritime Academy to introduce workers to life and work offshore, and Helicopter Underwater Escape Training (HUET) offered at Survival Systems USA in Groton, CT (the only available training institution in the Northeast US).

12.2 Industry Accelerator Fund

Thayer Mahan Bubble Curtain

MassCEC and Vineyard Wind 1 funded Thayer Mahan to (a) establish the necessary equipment and operational capabilities to provide "big bubble curtain" marine noise mitigation services to offshore wind projects in southern New England and (b) deploy a secondary big bubble curtain system in a pilot demonstration campaign during the monopile foundation installation of the Vineyard Wind 1 project to mitigate underwater noise during offshore wind pile driving activity during the construction of Vineyard Wind 1 and subsequent offshore wind projects.

Business Network for Offshore Wind (BNOW) Industry Education and Training Courses

These courses support and advance offshore wind supply chain education opportunities to diverse Massachusetts vendors and contractors to increase awareness about supply chain opportunities in the offshore wind sector. This education initiative will utilize three of BNOW's existing courses: Offshore Wind 101, Offshore Wind Ready, and Foundation 2 Blade.[29]

New Bedford's Fishing Community

Through Vineyard Wind's efforts under the Accelerator Fund, twenty-three New Bedford fishing boats are now qualified to work in OSW. As of this report, financial support of the fishing fleet includes $16,842 in inspections, $86,793 in safety equipment, and $130,056 in training/ certifications/merchant mariner credentials. These funds were provided to ensure fishing vessels and fishermen have the necessary credentials and equipment to be eligible to work on the Vineyard Wind 1 project and future offshore wind projects. Once the fishermen are licensed, they are much more marketable for workboats, tug, and other maritime professions, offering career flexibility and optionality as the offshore wind industry grows.

12.3 Marine Mammal Innovation Fund

Charles River Analytics Thermal Imaging

Vineyard Wind is allocating approximately $1,000,000 from the Wind and Whales Fund to the Charles River Analytics (CRA). These funds will be used to test a thermal imaging whale detection system that may offer improved detection for vessel strike avoidance mitigation for marine mammals. This system will be deployed by CRA before and during Vineyard Wind 1 to (1) compare the performance of a thermal imaging system to that of trained professional protected species observers; (2) conduct a feasibility trial for remote, near real-time verification during Vineyard Wind 1's operations phase to reduce the need for offshore personnel, (3) evaluate the impact of vessel speed on marine mammal detection performance, and (4) compare camera configurations for optimal marine mammal detection.

Thayer Mahan Transit Passive Acoustic Monitoring

Vineyard Wind, in collaboration with the MassCEC, is funding Thayer to provide a real-time passive acoustic monitoring (PAM) and data transmission system with remote alert capabilities that can be deployed at varying locations in advance of transiting vessels during the construction of the Vineyard Wind 1 project. Through this joint initiative, Vineyard Wind and MassCEC seek to progress the technology readiness level of real-time PAM technologies as a mitigation tool for vessel strike avoidance and provide better

[29] More information can be found at BNOW's website: https://oceantic.org/education-and-training/.

protections for North Atlantic Right Whales (NARW) in the New England region. A second objective is to acoustically record and localize NARW and other mysticete vocalizations to enhance the general understanding of the species' distribution and potentially, abundance.

13 Sponsorships and Donations

Vineyard Wind provides sponsorships and donations throughout the year to various local organizations. Specifically in the past year, Vineyard Wind made $490,110 in sponsorships and donations to local organizations in the areas of education, fisheries, environment, and workforce. Examples of organizations and events supported include Juneteenth activities on Marthas Vineyard, the New Bedford Historic Society, the Cape Cod Climate Change Collaborative, Marthas Vineyard Museum, Cape Verdean Veterans Hall, New Bedford Whaling Museum, Seamen's Bethel, AHA! Night, and Leadership Southcoast.

APPENDIX A: METHODOLOGY

Data Collection

Data collection to obtain job, expenditure, and other information from Vineyard Wind and its subcontractors began in earnest in October 2021, shortly following the project's financial close. Two primary data collection tools were developed and used to monitor relevant project activity:

1) An historical spreadsheet tracker to obtain Development-related job and expenditure data from 2017 to 2021. These data were the basis for the bulk of our first annual report.

2) A monthly spreadsheet tracking template that Tier 1 contractors were required to submit monthly beginning in October 2021. These tracking templates were focused on Construction phase activities. Over 300 monthly reports were received from Tier1 contractors.

Development Phase

From the outset, conversations with subcontractors made it clear that obtaining accurate historical data from all subcontractors would be difficult, particularly from smaller companies that were no longer working on the project. Consequently, Vineyard Wind and UMass Dartmouth focused their efforts on obtaining detailed job and expenditure data from companies with contracts above $1 million (n=48), which represents 90.3% of the total contract value during the Development phase. These subcontractors were asked to provide their annual Massachusetts expenditures and counts of Massachusetts-based employees over the 2017-2021 period for activities that directly supported the Vineyard Wind 1 project. Thirty-five of the forty-nine subcontractors (69%) complied.

Construction Phase

UMass Dartmouth and Vineyard Wind created a data collection spreadsheet that was completed monthly by the Tier 1 suppliers working on the project. The tracking sheet includes inputs for labor—both union and non-union—as well as nonpayroll expenditures by three geographic levels of analysis: the U.S., Massachusetts, and Southeastern Massachusetts. Subcontractor expenditures made by the Tier 1 suppliers, as well as various diversity, equity, and inclusion (DEI) data such as race, gender, tribal affiliation, and veteran status were also tracked. Tier 1 contractors also provided the same information for their larger Tier 2 contracts, while also providing the overall contract amounts for smaller Tier 2 and Tier 3 contractors.

The following tables present the data architecture of the monthly reports.

1. Company Overview
Company Name
Primary business headquarters
Local business headquarters
Inclusion plan (Y/N)
Massachusetts SDO category:
None
Minority-Owned Business (MBE)
Women-Owned Business (WBE)
Portuguese-Owned Business (PBE)

Veteran-Owned Business (VBE)
Service-Disabled Veteran-Owned Business (SDVOBE)
Lesbian, Gay, Bisexual and Transgender-Owned Business (LGBTBE)
Disability-Owned Business (DOBE)
Other

2. Employee Data
Employee position/title
Employee current ZIP Code.
Number of monthly regular hours and OT hours for union employees
Number of weekly hours for nonunion employees
Race:
White (non-Hispanic)
Hispanic
Black or African American
American Indian
Alaska Native
Asian
Native Hawaiian or Other Pacific Islander
Two or More Races
Some Other Race
Gender:
Woman
Man
Non-binary/non-conforming
Other
Apprentice for union employees(Y/N)
Tribal status (Y/N)
Veteran status (Y/N)

3. Expenditures
Package:
Multi Package
Array cables
Construction Management
Export cable, Offshore
Foundations/ESP T&I
OPEX
OPEX Prep
Project Management/Development
Onshore Works
WTG

Expenditure categories (list populated depending on package) in SEMass, MA, US
Accommodations
Administrative and Support Services
Cable installation/Civil Works
Civil Works
Environmental, Health, Safety Monitoring
Equipment
Fabrication
Facilities/Office/Lease
Food
Insurance and Warranties
IT setup
Manufacturing/Fabrication
Materials/Supplies
New Bedford harbor operations during installation
Outreach & Governmental relation
Port Agreement
Port infrastructure works
Property Tax
Specialist Services
Surveying
Surveys
Trainings and Certifications
Travel/Airfare
Vessels
Vessels/Inspections

4. Company's US-Based Subcontractors
Subcontractor name and address
Approximate contract value
Less than $10,000
$10,000 - $50,000
$50,001 - $100,000
$100,001 - $250,000
$250,001 - $500,000
$500,001 - $1,000,000
$1,000,001 - $1.5 million
$1,500,001 - $2 million
Over $2 million
Signatory to PLA/LOA? (Y/N)

Implan Model

The economic impacts of the proposed project are specified using IMPLAN, which is an input-output database and model that traces a project's purchases of goods, services, and labor through an economic area. We constructed an input-output model for the state of Massachusetts. Model outputs are reported in 2023 dollars. The latest available IMPLAN dataset is for 2021.

Direct Inputs to the Impact Model

Employee Compensation[30]

Union employee compensation was estimated by utilizing actual wage and benefit data detailed in each union's prevailing wage schedule. Employee compensation for nonunion workers was estimated utilizing Massachusetts occupational wage data from Lightcast and the Bureau of Labor Statistics. These data served as the primary inputs to the IMPLAN model as labor income. All union workers are considered local on the project and therefore all employee compensation for union workers is included in the Massachusetts total. Conversely, nonunion employee compensation includes compensation for Massachusetts-based workers only. Employees without a ZIP Code were categorized as out-of-state.

Nonpayroll Expenditures

Nonpayroll expenditures were obtained from the Tier 1 contractor monthly reports, which as noted in the previous tables, included the expenditure category, the amount, and where the expenditure was made (i.e., SEMass, MA, Other US).

It is not possible to accurately estimate the economic impact of the Vineyard Wind 1 project's operations and capital expenditures simply by changing the output of an aggregated offshore wind industry in the econometric model because a mature offshore wind industry does not exist in the U.S. However, because expenditures were reported by category, we were able to utilize a more precise method for estimating the project's economic impacts by specifying a list of changes in the output of each industry that is a beneficiary of the project's purchases.

The table below lists the IMPLAN industry codes used in this analysis. More than 650 individual expenditures were mapped to 26 IMPLAN sectors for each scenario examined (see table below). As noted above, the model includes only those expenditures that occurred in Massachusetts.

Table 13. IMPLAN Sectors Used to Construct the Construction Phase Model for Massachusetts

Implan Code	Implan Description
28	Stone mining and quarrying
35	Drilling oil and gas wells
52	Construction of new power and communication structures
55	Construction of new commercial structures, including farm structures
216	Iron, steel pipe and tube manufacturing from purchased steel
329	Power, distribution, and specialty transformer manufacturing
360	Ship building and repairing
393	Wholesale - Professional and commercial equipment and supplies

[30] Employee compensation includes wages and benefits.

395	Wholesale - Machinery, equipment, and supplies
396	Wholesale - Other durable goods merchant wholesalers
416	Water transportation
422	Warehousing and storage
439	Nondepository credit intermediation and related activities
444	Insurance carriers, except direct life
447	Other real estate
453	Commercial and industrial machinery and equipment rental and leasing
457	Architectural, engineering, and related services
460	Computer systems design services
463	Environmental and other technical consulting services
464	Scientific research and development services
468	Marketing research and all other miscellaneous professional, scientific, and technical services
472	Employment services
476	Services to buildings
477	Landscape and horticultural services
478	Other support services
479	Waste management and remediation services

Who is Considered Local?

In economic impact analysis, employment is determined by the location of the job rather than the individual's place of residence. Therefore, even if a worker is brought in from outside the region, they are still considered as "local" employment for the duration of their work. Thus, local employment in this report includes all union employees on the job site, including workers who relocated to SEMass to work on the project. About 92 workers relocated to SEMass for the project.

Workers from outside the area spend their income differently than local residents. Consequently, we adjusted the labor income values for these workers in the IMPLAN model. However, relocated workers have impacts on the local economy because they do spend a portion of their earnings in the region. To account for this spending, we utilized per diem spending rates from the U.S. General Services Administration.

Project Years and Multiple Models

IMPLAN is an annual model and employment estimates provided by IMPLAN represent annualized employment values. However, payroll and nonpayroll expenditures will occur over multiple years. In order to account for the phases of the project and Vineyard Wind's proposed timeline, several input-output models were constructed for the Development and Construction phases depending on the year in which the expenditures were made. The results of these individual yearly models were then aggregated to produce the final impact tables.