

New York State Offshore Wind Workforce Gap Analysis, 2022



Final Report | Report Number 22-25 | September 2022



NYSERDA

NYSERDA's Promise to New Yorkers:

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

Our Vision:

New York is a global climate leader building a healthier future with thriving communities; homes and businesses powered by clean energy; and economic opportunities accessible to all New Yorkers.

Our Mission:

Advance clean energy innovation and investments to combat climate change, improving the health, resiliency, and prosperity of New Yorkers and delivering benefits equitably to all.

New York State Offshore Wind Workforce Gap Analysis, 2022

Final Report

Prepared for

New York State Energy Research and Development Authority

Albany, NY

Jessica Dealy

Senior Policy Advisor, Offshore Wind

Prepared by:

BW Research Partnership

Wrentham, MA

Philip Jordan

Vice President & Principal Researcher

Notice

This report was prepared by BW Research in the course of performing work contracted for and sponsored by the New York State Energy Research and Development Authority (hereafter “NYSERDA”). The opinions expressed in this report do not necessarily reflect those of NYSERDA or the State of New York, and reference to any specific product, service, process, or method does not constitute an implied or expressed recommendation or endorsement of it. Further, NYSERDA, the State of New York, and the contractor make no warranties or representations, expressed or implied, as to the fitness for particular purpose or merchantability of any product, apparatus, or service, or the usefulness, completeness, or accuracy of any processes, methods, or other information contained, described, disclosed, or referred to in this report. NYSERDA, the State of New York, and the contractor make no representation that the use of any product, apparatus, process, method, or other information will not infringe privately owned rights and will assume no liability for any loss, injury, or damage resulting from, or occurring in connection with, the use of information contained, described, disclosed, or referred to in this report.

NYSERDA makes every effort to provide accurate information about copyright owners and related matters in the reports we publish. Contractors are responsible for determining and satisfying copyright or other use restrictions regarding the content of reports that they write, in compliance with NYSERDA’s policies and federal law. If you are the copyright owner and believe a NYSERDA report has not properly attributed your work to you or has used it without permission, please email print@nyserda.ny.gov

Information contained in this document, such as web page addresses, are current at the time of publication.

Abstract

The following report includes projected supply gaps for specific occupations within the offshore wind industry, based on the assumption of a 9 gigawatt (GW) increase in Offshore Wind capacity in New York State. Occupational supply gaps were classified into mild, moderate, or severe based on the difference in the projected need or demand from baseline economic conditions, plus offshore wind-specific industry demand. The report also details key wind energy-specific training programs in the State, as well as general training programs in related construction and manufacturing fields that would benefit the offshore wind labor market.

Keywords

offshore wind, gap analysis, supply gap, offshore wind training, offshore wind job growth, offshore wind industry, offshore wind occupations, workforce gaps

Table of Contents

- Noticeii**
- Abstract.....ii**
- Keywordsiii**
- List of Figuresiv**
- List of Tablesiv**
- Acronyms and Abbreviationsv**
- Executive Summary.....ES-1**
- 1 Key Findings1**
 - 1.1 Projected Job Growth, Geographic Distribution, and Gap Analysis 1
 - 1.2 Education and Training 2
- 2 Projected Job Growth in New York State’s Offshore Wind Industry3**
 - 2.1 Growth by Industry, 2019–2050 3
 - 2.2 Growth by Broad Occupational Groups, 2019–2030 5
- 3 Offshore Wind Occupational Analysis.....6**
 - 3.1 Project Development Phases 6
 - 3.2 Offshore Wind-Related Occupations by Project Phase 7
 - 3.3 Geographic Distribution of Offshore Wind-Related Occupations..... 9
 - 3.4 Projected Workforce Gaps 11
 - 3.5 Typical Educational Attainment 13
- 4 Training Program Overview15**
 - 4.1 Wind-Specific Training Programs 15
 - 4.2 General Training Programs 18
- 5 References22**
- Appendix A. New York State Offshore Wind Related Occupation DatabaseA-1**
- Appendix B. Offshore Wind-Related Occupation DemographicsB-1**
- Endnotes EN-1**

List of Figures

Figure 1. Projected Offshore Wind Employment Growth (Scenario 1—Low Carbon Fuels) by Industry, 2019–2050.....4

Figure 2. Projected Offshore Wind Employment Growth (Scenario 2—Accelerated Transition) by Industry, 2019–2050.....4

Figure 3. Projected Distribution of Offshore Wind Employment by Occupational Group in 20305

Figure 4. Offshore Wind Project Phases.....7

Figure 5. Heat Map of OSW-Related Occupations by REDC, 2021 Q2 10

Figure 6. Projected OSW-Related Occupational Gaps 13

Figure 7. Typical Educational Attainment of OSW-Related Occupations 14

Figure 8. Wind-Specific Training Programs in New York State 16

Figure 9. Training Programs for In-Demand OSW Occupations (Offering Programs Listed in Table 8)20

List of Tables

Table 1. OSW-Related Occupations by Project Phase, 2021 Q28

Table 2. Concentration of Critical OSW-Related Jobs by State, 2021 Q2.....9

Table 3. OSW-Related Occupations by REDC, 2021 Q2.....10

Table 4. OSW-Related Occupations by Project Phase and REDC, 2021 Q2.....11

Table 5. Supply Gap Type and Definition12

Table 6. Educational Requirements for Top 10 Occupations with Projected Gap 14

Table 7. Wind-Specific Training Programs in New York State 17

Table 8. Program Completions for In-Demand OSW Occupations, 2019-2020 19

Table 9. Construction and Manufacturing-Related Training Programs in New York State21

Acronyms and Abbreviations

| | |
|------|--|
| OWT | Offshore Wind Training Institute |
| OSW | Offshore Wind |
| MW | Megawatts |
| REDC | Regional Economic Development Council |
| CNC | Computer Numerically Controlled Machinists or Tool Programmers |
| ETPL | Eligible Training Provide List |
| LQ | Location Quotient |
| FTEs | Full-Time Equivalents |

Executive Summary

With a goal to produce 9,000 megawatts (MW) of offshore wind-powered electricity, New York State is poised to become a central player in the rapidly growing national offshore wind (OSW) industry. In order to meet the demands of these ambitious targets, the State's labor market will require job growth across a number of key occupations that support each phase of offshore wind project development. Importantly, local planners—including educational institutions and other workforce development organizations—will require a deeper understanding of what types of jobs are required to grow and develop a local offshore wind supply chain as well as how best to ensure an adequate domestic labor supply to meet the State's OSW goals.

Integral to developing a comprehensive OSW workforce development plan and training ecosystem for New York State is understanding the overall supply and demand of these jobs that are pivotal to the development of an OSW project. Quantifying expected demand growth alongside projected supply can ensure that academic programs and resources are aligned with labor market needs over the coming years.

The following analysis was conducted to help provide the Offshore Wind Training Institute (OWTI) with an enhanced understanding of the workforce impacts of OSW development in the State, including projected supply gaps for specific occupations. Working under the assumption of an increase in OSW capacity by 9 GW, the research team identified which jobs are most likely to experience severe supply gaps. In addition to identifying occupational supply gaps, this memorandum provides an overview of some key wind energy-specific training programs in New York State as well as general training programs in related construction and manufacturing fields that are likely to be beneficial to the offshore wind labor ecosystem. The focus of this memo is to provide an overall understanding of the State's OSW industry relating to:

- Projected employment growth.
- Types and distributions of OSW-related occupations.
- In-state training programs available for OSW careers.
- Projected labor supply gaps for OSW-related occupations.

1 Key Findings

1.1 Projected Job Growth, Geographic Distribution, and Gap Analysis

| | |
|---|--|
| <p>New York State’s offshore wind workforce will grow significantly by 2040, with much of this growth concentrated in the manufacturing, construction, and induced industries.ⁱ</p> | <p>Between 2019 and 2040, the State is projected to see offshore wind jobs grow by 18,000 to 23,000 jobs, depending on various investment and policy scenarios enacted over the next several years based on the 2021 New York State Climate Action Council Draft Scoping Plan. The majority of job growth will be concentrated in the manufacturing, construction, and induced industries. Together, manufacturing and construction will account for about six in ten offshore wind jobs (56.5 percent) in 2040.</p> |
| <p>By 2030, management/professional positions and installation/repair jobs will account for the largest share of OSW occupations.</p> | <p>Together, these two occupational categories, or groupings, will represent roughly six in ten offshore wind jobs in 2030 (63.3 percent), with management and professional service positions accounting for a slightly higher share of occupations (34.5 percent), followed by installation and repair (28.8 percent). Production and manufacturing positions will account for about two in ten offshore wind jobs in 2030 (19.7 percent). Between 2019 and 2030, the greatest job growth will occur in management/professional, installation or repair, production/manufacturing, and administrative positions.</p> |
| <p>There are 117 distinct offshore wind occupations that are critical to developing a local OSW supply chain.</p> | <p>These 117 “offshore wind-related” occupations are spread across five project phases: Planning and Development, Manufacturing and Assembly, Construction and Installation, and Operations and Maintenance. Many OSW-related jobs, such as engineers, electricians, and welders will be required across multiple phases of OSW project development.</p> |
| <p>New York State has an above-average concentration of jobs required for the planning and development phase of OSW project development.</p> | <p>These are mainly professional services occupations, such as engineers and technicians, managers, analysts, lawyers, and architects involved in the initial stages of OSW project design and development. OSW-related planning and development jobs are roughly or nine percent more concentrated in New York State compared to the national average, indicating that the State is already positioned to supply the engineers and architects needed to support the initial planning and design phases for the State’s OSW project pipeline.</p> |
| <p>Jobs in manufacturing, operations and maintenance, and construction are less concentrated in New York compared to the national average.</p> | <p>These are the key components of developing a successful domestic OSW industry, and they represent the bulk of job creation. Altogether, these three phases are estimated to account for 65 percent of job growth from OSW-related industry expansion. These jobs are engaged throughout project construction and buildout and during the project’s lifespan, which is typically 20 years or more. In particular, developing a local supply chain by leveraging in-State manufacturing capacity to support wind turbine and other component equipment production and assembly will be pivotal to ensuring further in-State job growth from OSW industry growth; this is especially important given the Senate Bill requiring the use of in-State manufacturers currently in committee review.ⁱⁱ</p> |
| <p>The coastal, downstate regions are positioned to support a growing OSW industry in New York.</p> | <p>Due to geographic proximity, these areas will most likely experience higher volumes of the increased demand from a growing OSW industry. Current employment data shows that the majority of OSW-related occupations are concentrated in two regions specifically—New York City and Long Island. These two Regional Economic Development Council regions (REDCs) account for six out of every ten (60.4 percent) OSW-related jobs in the State.</p> |
| <p>However, a few occupations that are pivotal to OSW development are projected to have severe workforce gaps.</p> | <p>The occupations with the most severe workforce gaps are Plant and System Operators, Hoist and Winch Operators, Continuous Mining Machine Operators, and Wind Turbine Service Technicians. The top six occupations with “moderate” projected supply gaps include Metal-Refining Furnace Operators and Tenders, Metal Workers and Plastic Workers, Computer Numerically Controlled (CNC) Tool Programmers, Structural Metal Fabricators and Fitters, Plating Machine Setters, Operators, and Tenders, and Engine and Other Machine Assemblers.</p> |

1.2 Education and Training

| | |
|--|--|
| <p>Typical educational attainment for the majority of OSW-related occupations is split between apprenticeship/postsecondary training and a bachelor’s degree.</p> | <p>Thirty-seven percent of occupations in the database typically require an apprenticeship or postsecondary training and another 37 percent typically require a bachelor’s degree. However, the top 10 occupations with projected severe or moderate workforce gaps require either an apprenticeship/ postsecondary training or a high school diploma.</p> |
| <p>Much of the “wind-specific” training is geared towards engineering and professional services.</p> | <p>Out of the 12 wind energy-specific training programs identified in the State, 10 programs are focused on either electrical or structural and materials engineering. These programs offer courses or tracks that cover wind energy turbine technologies and applications.</p> |
| <p>New York has a wide swath of vocational trade programs that could support offshore wind workforce development.</p> | <p>The research team identified more than 750 programs through New York State’s Eligible Training Provider List (ETPL) and the National Center for Education Statistics (NCES) that offer programs for key occupations in the offshore wind supply chain, such as electricians, machinists, technicians, and equipment operators. Though these trade programs may not currently contain offshore wind specific material, the baseline knowledge remains key and applicable to the construction and operations phases of OSW project development.</p> |
| <p>In general, there is an abundance of programs for occupations with mild gaps but fewer programs for those occupations with projected severe to moderate workforce gaps, such as wind energy technicians or CNC machinists.</p> | <p>According to the ETPL and the NCES, there are more than 300 program offerings across the State for welders, electricians, and line installers/repairers. In the occupational gap analysis, these occupations were more likely to have mild workforce gaps. By contrast, there are fewer than 100 program offerings for wind turbine service technicians and computer numerically controlled (CNC) machinists—occupations that are projected to have severe to moderate workforce gaps.</p> |

2 Projected Job Growth in New York State's Offshore Wind Industry

2.1 Growth by Industry, 2019–2050

A recently published report by the New York State Energy Research and Development Authority (NYSERDA) provides an analysis of projected offshore wind employment growth across New York State from 2019 through 2050, based on two separate policy and investment scenarios taken from the 2021 New York State Climate Action Council Draft Scoping Plan.

The first scenario models offshore wind employment growth assuming significant investments in low-carbon fuels, while the second scenario highlights employment changes based on an accelerated transition away from combustion as well as early investments in grid and electrification.³ In general, the offshore wind industry in the State is projected to see peak job growth in 2040, followed by declines through 2050.

Under scenario 1, through increased investments in low-carbon fuels, New York State's offshore wind industry is projected to grow by more than 18,000 workers from 2019 through 2040. The majority of job growth will occur in the manufacturing, construction, and induced industries (Figure 1).⁴ Together, manufacturing and construction will account for about six in 10 offshore wind jobs (56.5 percent) in 2040, followed by employment in induced industries, which will represent 25.9 percent of total OSW jobs in 2040.

Projected offshore wind employment growth under scenario 2 follows similar trends but with greater total job numbers. Between 2019 and 2040, offshore wind employment under scenario 2 is projected to grow by more than 23,000 workers. The manufacturing, construction, and induced industries are expected to see the greatest gains in offshore wind employment over the next roughly two decades (Figure 2). The proportional distribution of construction, manufacturing, and induced jobs by 2040 is similar to scenario 1.

Figure 1. Projected Offshore Wind Employment Growth (Scenario 1—Low Carbon Fuels) by Industry, 2019–2050

See endnotes for more information⁵

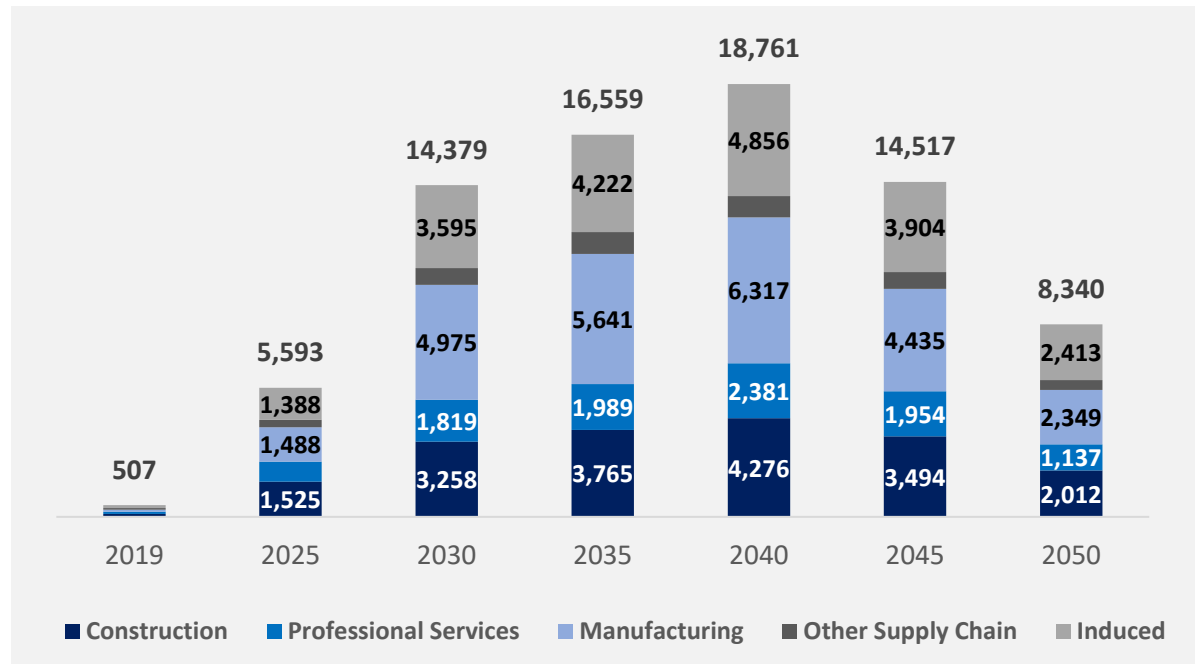
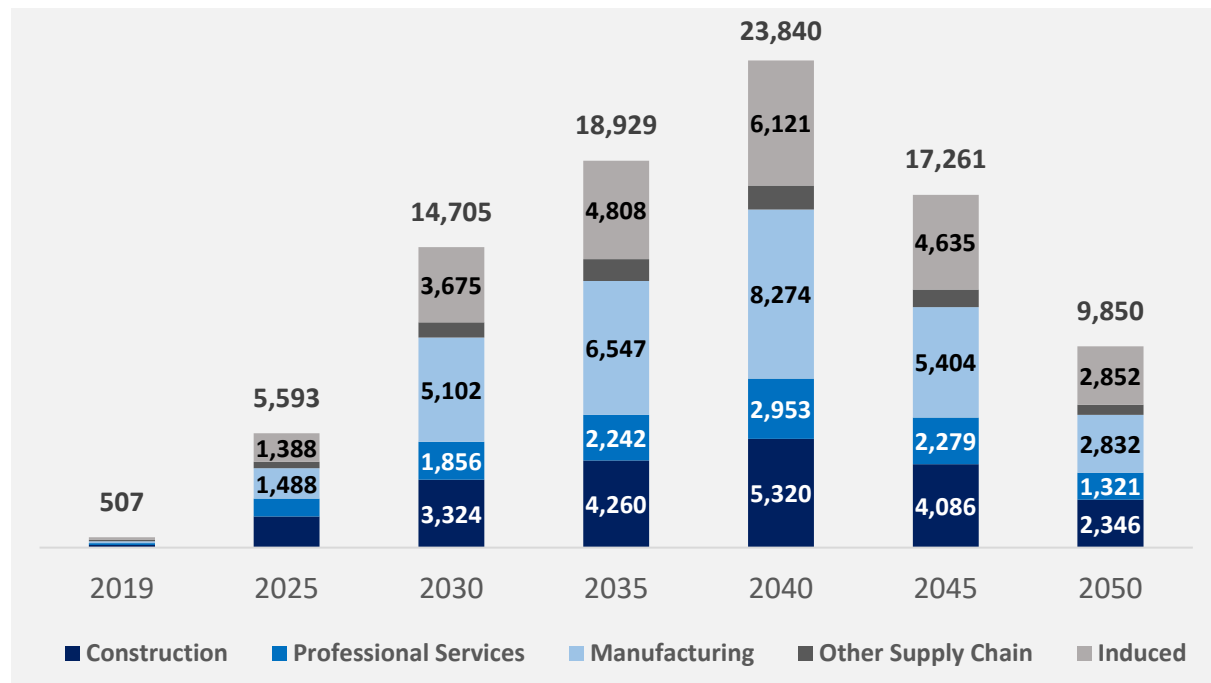


Figure 2. Projected Offshore Wind Employment Growth (Scenario 2—Accelerated Transition) by Industry, 2019–2050



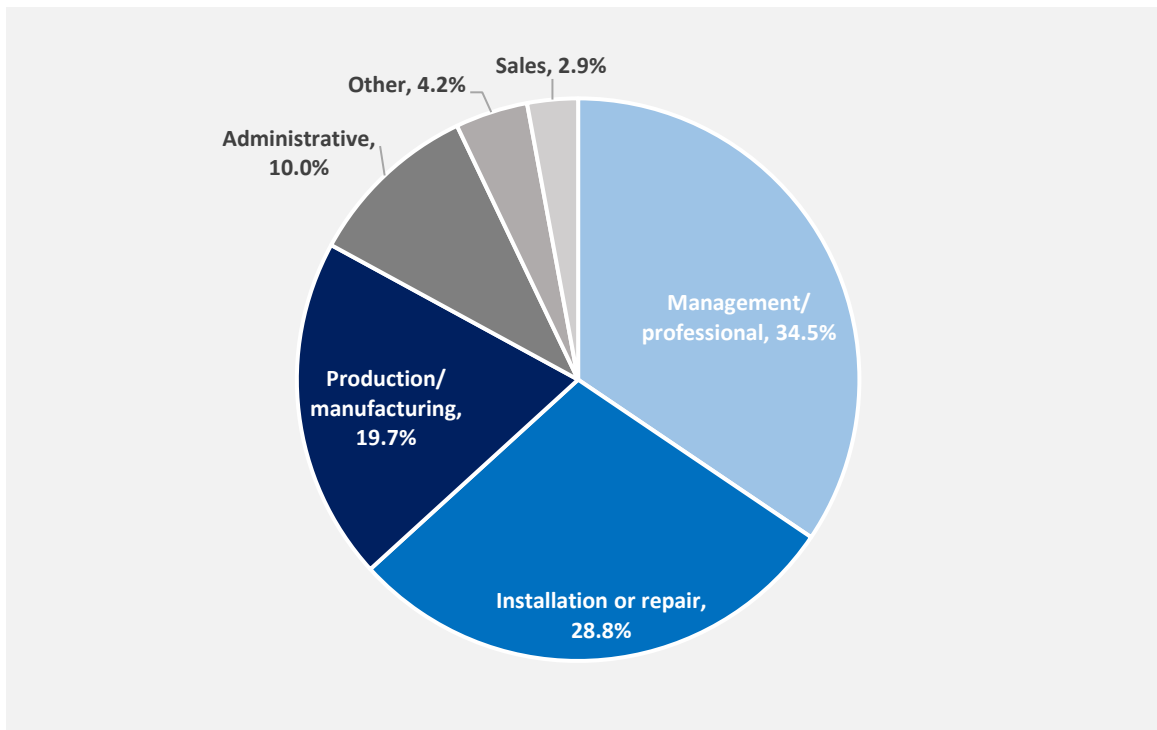
2.2 Growth by Broad Occupational Groups, 2019–2030

The NYSERDA Jobs Report also produced rough estimates of projected employment in 2030 by broad occupational categories for each of the scenarios. Figure 3 below illustrates the average distribution of projected offshore wind jobs in New York State in 2030 by these broad occupational groupings.

On average, in 2030, just over a third of jobs created in the State’s offshore wind industry will be management or professional service positions. Another roughly three in 10 jobs will be installation or repair positions, followed by production and manufacturing occupations, which represent about two in 10 jobs. One in 10 jobs created will be administrative positions, and the remainder will be sales positions or other occupations, which include agriculture, education, healthcare, and transportation or material moving occupations.

Between 2019 and 2030, the greatest job growth will occur in management/professional, installation or repair, production/manufacturing, and administrative positions.

Figure 3. Projected Distribution of Offshore Wind Employment by Occupational Group in 2030



3 Offshore Wind Occupational Analysis

3.1 Project Development Phases

Offshore wind project development can largely be delineated into one of the following five phases: Planning and Development, Manufacturing and Assembly, Construction and Installation, Operations and Maintenance, and Support Services. Across these phases, there are 117 *distinct* occupations involved in OSW project development. However, these jobs are not exclusive to each phase as some occupations, such as engineers, electricians, or welders, are needed across multiple phases of a project, which means there is overlap in occupation types across the phases. Below is a brief description of each phase:



- **Planning and Development** takes at least two years, typically longer, depending on the project.⁶ For New York State’s projected development, this phase would take roughly seven years.⁷ The phase is responsible for an estimated two percent of lifetime costs according to previous OSW projects abroad.⁸ Eventually, this stage will account for an estimated 15 percent of the direct workforce addition in the U.S. OSW industry.⁹ The database currently identifies 46 occupations within this phase, including engineers, financial analysts, and lawyers.



- The **Manufacturing and Assembly** phase takes several years—though OSW original equipment manufacturers (OEMs) will likely be involved in supplying multiple projects or orders at once. This phase is responsible for an estimated 44 percent of lifetime costs. It is estimated that job creation in this phase will account for seven percent of total job additions in the U.S. OSW industry. The database currently identifies 76 occupations within this phase, including engineers, metal workers, operators, assemblers, and administrative staff.



- **Construction and Installation** on average takes two to five years and is responsible for about 12 percent of lifetime costs. Many of the jobs in this phase are temporary but, in total, will account for an estimated 41 percent of the direct U.S. workforce increase resulting from OSW expansion. The database currently identifies 70 occupations within this phase, including crane operators, electricians, mechanical engineers, line workers, and welders.

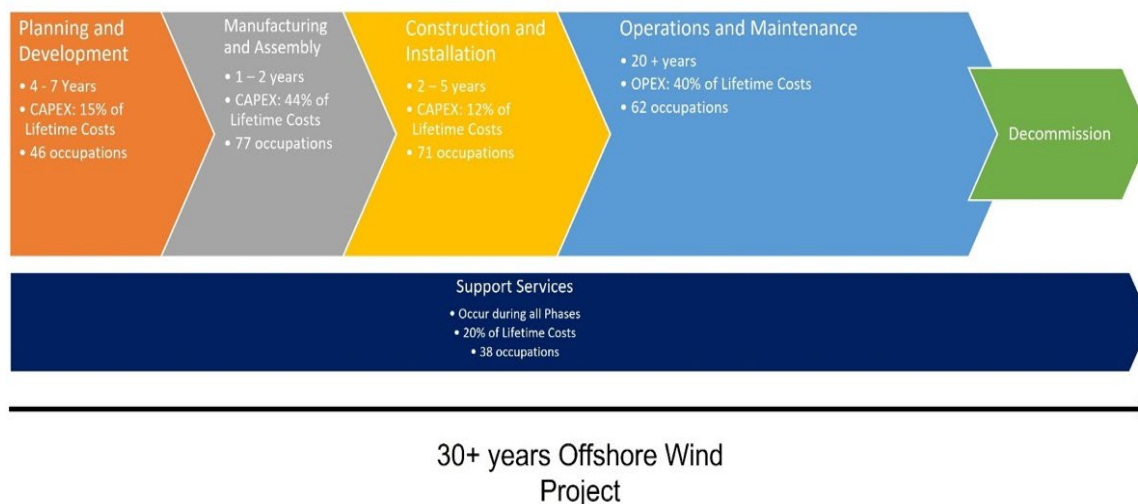


- The **Operations and Maintenance (O&M)** phase can take 20 years or more, depending on lease and energy agreements and accounts for 40 percent of lifetime costs. Workers involved in regular inspection and repair of the structure, general operations of an OSW local industry, and finances are expected to account for 17 percent of direct U.S. workforce addition from an expanded OSW industry. The database currently identifies 61 occupations within this phase, including administrative staff, wind turbine technicians, marine operators, and plant managers.



- **Support Services**—including transportation, training, research, and consulting—account for the final 20 percent of estimated direct U.S. workforce additions to arise from an expanded OSW market. These services occur during all phases, with involvement lasting months or years depending upon the project. The database currently identifies 38 occupations within this phase, including meteorologists, vessel mechanics, lawyers, and policy experts.

Figure 4. Offshore Wind Project Phases



3.2 Offshore Wind-Related Occupations by Project Phase

Table 1 below provides an overview of the number of distinct occupations within each offshore wind project development phase, the total number of jobs in New York State as of the second quarter of 2021, and a location quotient (LQ) for each phase.

Location quotients measure the relative labor supply for an industry or occupational group in New York State compared to the labor supply in the United States. In other words, the LQ metric measures a region’s specialization relative to a larger geographic area (typically the national average). For example, a location quotient of 1.5 indicates that an occupation is 1.5 times, or 50 percent, more concentrated in the State compared to its proportion of total jobs in the nation overall.

Looking at location quotients by project phase, New York State has a relatively low concentration of OSW jobs related to manufacturing and assembly. This is not surprising, as the overall manufacturing industry in the State is a small component of the New York State jobs. In 2020, the manufacturing industry comprised roughly five percent of total jobs in the State, compared to approximately 10 percent across the U.S.¹⁰

By comparison, the State has above-average representation for jobs related to the planning and development of offshore wind projects. These jobs are primarily professional service positions that support the initial phases of offshore wind project design and development and include mainly engineers and technicians, managers, analysts, lawyers, and architects.

Compared to the national average, the concentration of construction and O&M jobs in New York State is slightly lower. These two phases will ultimately account for the largest component of work in an offshore wind industry, representing an estimated 58 percent of workforce additions. There is significant overlap of job types across these phases, including construction and other trade workers, administrative support, maritime and port workers, and management positions.

Compared to other coastal states with OSW developments, New York State’s concentration of key OSW jobs is slightly higher compared to Rhode Island and slightly below New Jersey and Massachusetts. Connecticut, Virginia, and Texas support the highest relative concentration of OSW-related occupations (Table 2).

Table 1. OSW-Related Occupations by Project Phase, 2021 Q2

| Project Phase | Number of Occupations in each Category | Total Jobs in New York, 2021 Q2 ^a | Location Quotient (LQ) |
|--------------------------------|--|--|------------------------|
| Planning & Development | 46 | 1.20 million | 1.09 |
| Manufacturing & Assembly | 76 | 1.91 million | 0.92 |
| Construction & Installation | 70 | 1.86 million | 0.96 |
| Operations & Maintenance (O&M) | 61 | 1.63 million | 0.95 |
| Support Services | 38 | 731,000 | 1.05 |

* JobsEQ, 2021Q2. It should be noted that because occupations can overlap across multiple phases, the number of occupations will sum to more than the 117 distinct occupations. Similarly, total jobs will include overlap across these occupations, and double counting will occur if jobs are summed across project phases.

^a These employment estimates refer to all workers in these occupations and not only offshore wind-specific employment.

Table 2. Concentration of Critical OSW-Related Jobs by State, 2021 Q2

| | Location Quotient (LQ) |
|---------------|------------------------|
| Texas | 1.02 |
| Virginia | 0.98 |
| Connecticut | 0.98 |
| Massachusetts | 0.96 |
| New Jersey | 0.96 |
| New York | 0.91 |
| Rhode Island | 0.89 |

* These employment estimates refer to all workers in these occupations and not only offshore wind-specific employment.

3.3 Geographic Distribution of Offshore Wind-Related Occupations

Looking specifically at the 117 distinct OSW-related occupations, the majority of these jobs are concentrated in the New York City and Long Island Regional Economic Development Councils (REDCs), which together account for about six in 10 (60.4 percent) of all OSW-related jobs across the State.

Following these two regions, Mid-Hudson accounted for about one in 10 OSW-related jobs (9.7 percent), followed by Western New York, with seven percent of total OSW-related employment (7.1 percent), and the Finger Lakes region, with just over six percent of total OSW-related employment in the state (6.4 percent).

The remaining five regions—Capital Region, Central New York, Southern Tier, Mohawk Valley, and North County—together comprised 16.4 percent of all OSW-related employment across the State.

Figure 5 on the next page provides a heat map that visually displays the concentration of OSW-related occupations across REDC regions in New York State.

Table 3. OSW-Related Occupations by REDC, 2021 Q2

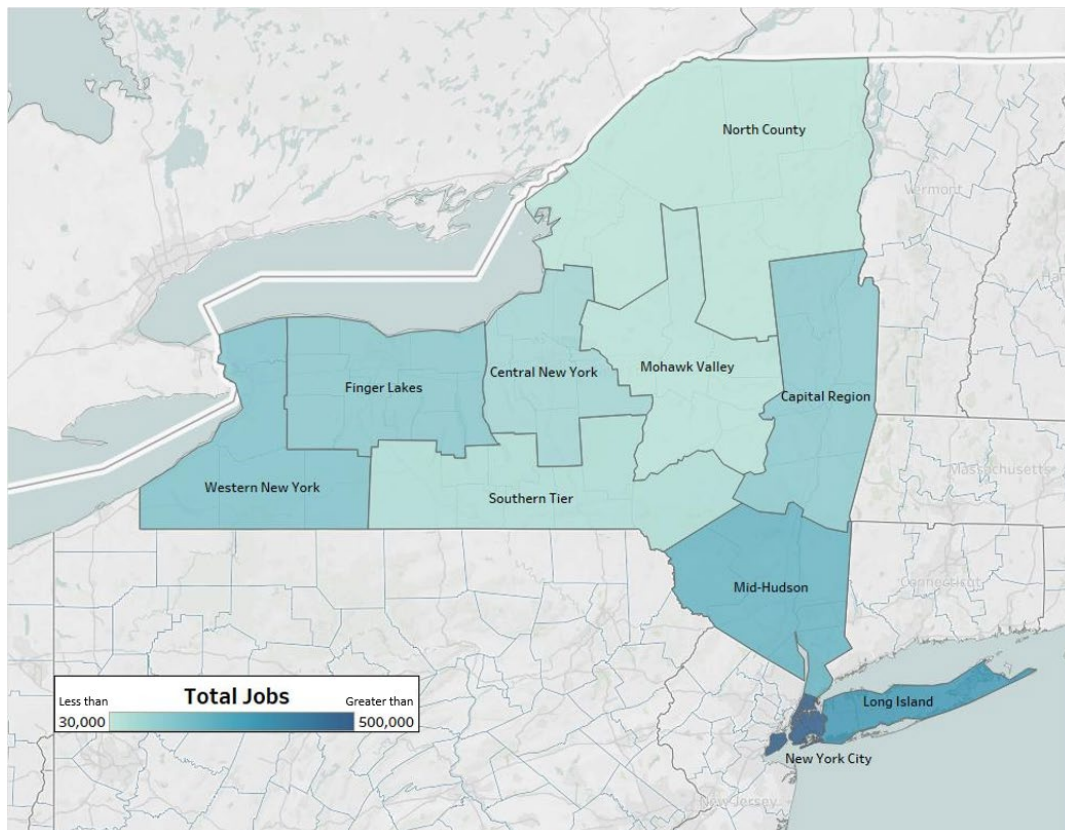
| Regional Economic Development Council (REDC) | Total OSW-Related Jobs ^a | % of Total OSW-Related Jobs |
|--|-------------------------------------|-----------------------------|
| New York City | 1,022,184 | 46.5% |
| Long Island | 305,689 | 13.9% |
| Mid-Hudson | 213,532 | 9.7% |
| Western New York | 156,203 | 7.1% |
| Finger Lakes | 140,136 | 6.4% |
| Capital Region | 131,263 | 6.0% |
| Central New York | 87,649 | 4.0% |
| Southern Tier | 64,247 | 2.9% |
| Mohawk Valley | 43,332 | 2.0% |
| North County | 33,047 | 1.5% |

* These employment estimates refer to all workers in these occupations and not only offshore wind-specific employment.

^a These employment estimates refer to all workers in these occupations and not only offshore wind-specific employment.

Figure 5. Heat Map of OSW-Related Occupations by REDC, 2021 Q2

See endnotes for more information¹¹



Given the geographic proximity of the two coastal, downstate REDC regions to OSW project developments, their high concentration of OSW-related occupations, and their general importance in supporting the labor market demand created from OSW projects, Table 4 highlights total jobs and LQs by project phase for the Long Island and New York City REDCs.

Similar to the overall statewide concentration, both Long Island and New York City have above average concentrations of offshore wind jobs for the planning and development phase, with location quotients of 1.01 and 1.19, respectively. New York City also has an above average concentration of support services for OSW project development—roughly 16 percent above the national average.

Manufacturing and assembly has the lowest relative concentration of jobs across these two REDCs compared to the national average.

Table 4. OSW-Related Occupations by Project Phase and REDC, 2021 Q2

| | Total Jobs in Long Island REDC | % of Total Jobs in NY by Project Phase | Location Quotient (LQ) | Total Jobs in New York City REDC | % of Total Jobs in NY by Project Phase | Location Quotient (LQ) |
|--------------------------------|--------------------------------|--|------------------------|----------------------------------|--|------------------------|
| Planning & Development | 155,080 | 12.9% | 1.01 | 614,015 | 50.7% | 1.19 |
| Manufacturing & Assembly | 255,032 | 13.4% | 0.89 | 882,220 | 45.9% | 0.92 |
| Construction & Installation | 250,780 | 13.5% | 0.93 | 888,735 | 47.3% | 0.99 |
| Operations & Maintenance (O&M) | 220,227 | 13.5% | 0.93 | 772,634 | 47.1% | 0.97 |
| Support Services | 95,180 | 13.0% | 0.98 | 377,208 | 51.1% | 1.16 |
| TOTAL | | 976,298 | | 3,506,000 | | |

* Employment data by REDC is taken from JobsEQ, 2021 Q2. These employment estimates refer to all workers in these occupations and not only offshore wind-specific employment.

3.4 Projected Workforce Gaps

This next section provides more detail on specific occupations within the OSW supply chain. By modeling the estimated occupation-level demands for 9,000 MW of offshore projects in New York State, the research team was able to identify the difference, or gap, between the anticipated number

of full-time equivalents (FTEs) needed during each phase of the OSW project and the share of existing available workers. This analysis highlights which occupations will likely face the greatest demand for additional workers relative to existing talent supply. The equation below illustrates how the workforce gaps were calculated.

Equation 1.

| | | |
|----------------|---|--|
| Workforce Gaps | = | $\frac{\text{Total Annual Demand for Workers} - \text{Annual Available Workers}}{\text{Total Workers Employed in the Occupation}}$ |
|----------------|---|--|

- * Total Annual Demand for Workers includes both the projected baseline demand plus the projected demand for 9,000 MW of offshore wind projects.
- ** Annual Available Workers includes the number of unemployed workers searching for work for each occupation.

The research team identified four occupations which display “severe” potential workforce gaps. These workforce gaps are categorized as “severe” because the projected shortage of workers exceeds the size of the existing talent pool within the State.¹²

Thirty-five occupations are classified as having “moderate” workforce gaps, as they have substantial projected workforce shortages, but those shortages are smaller in magnitude than the total number of workers in the State currently working in that occupation. The remaining 78 occupations are listed as having “mild” workforce gaps because these occupations have more annual workers than demanded; however, it is important to note that there may be some frictional and logistical challenges to finding and onboarding new workers in these positions.

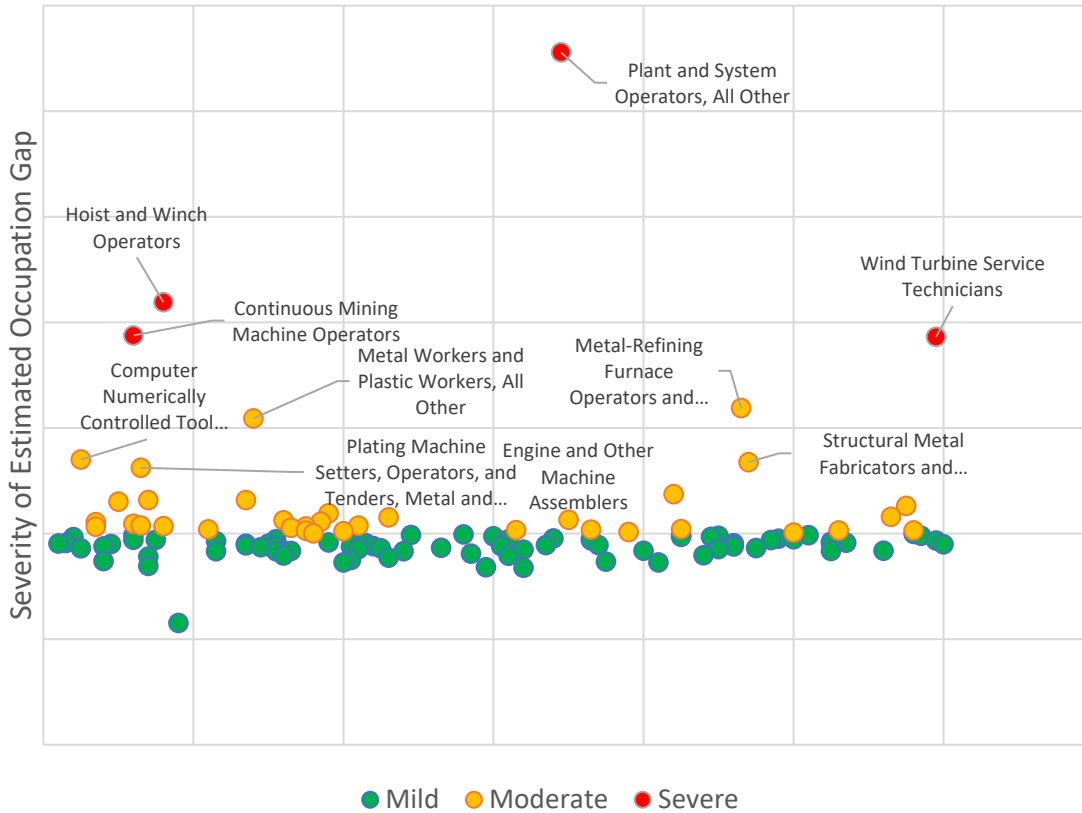
Table 5. Supply Gap Type and Definition

| | |
|----------|---|
| Severe | Demand exceeds supply <i>and</i> this gap exceeds the size of the existing workforce. |
| Moderate | Demand exceeds supply but the gap is smaller than the existing workforce. |
| Mild | Supply exceeds demand. |

The occupations with the most severe workforce gaps are Plant and System Operators, Hoist and Winch Operators, Continuous Mining Machine Operators, and Wind Turbine Service Technicians.

The top six occupations with “moderate” projected supply gaps include Metal-Refining Furnace Operators and Tenders, Metal Workers and Plastic Workers, Computer Numerically Controlled (CNC) Tool Programmers, Structural Metal Fabricators and Fitters, Plating Machine Setters, Operators, and Tenders, and Engine and Other Machine Assemblers.

Figure 6. Projected OSW-Related Occupational Gaps



3.5 Typical Educational Attainment

The majority of occupations in the OSW database—about 37 percent each—require an apprenticeship/postsecondary training or a bachelor’s degree. About two in 10 positions (20.5 percent) require a high school diploma or an associate’s degree/post-secondary training. The remaining 6.1 percent of occupations require a master’s degree or higher, including a Ph.D. or law degree.

The top 10 occupations with severe to moderate projected workforce gaps have typical minimum educational requirements of either an apprenticeship/postsecondary training or a high school diploma (Table 5).

Figure 7. Typical Educational Attainment of OSW-Related Occupations

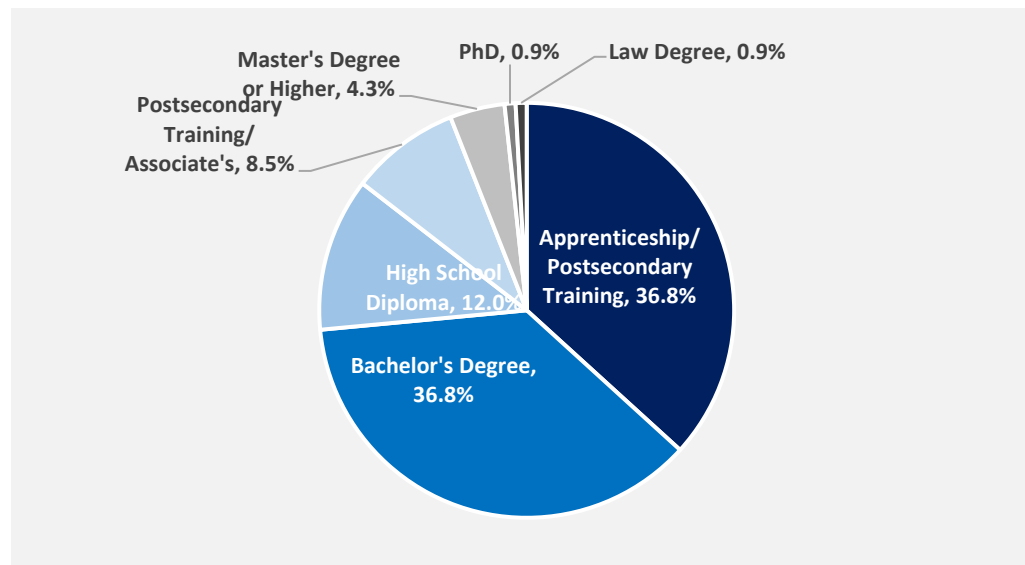


Table 6. Educational Requirements for Top 10 Occupations with Projected Gap

| SOC Code | Occupation | Total Jobs in NY, 2020 Q4 | Location Quotient, 2020 (compared to US) | Estimated Workforce Gap | Typical Education |
|----------|--|---------------------------|--|-------------------------|--|
| 51-8099 | Plant and System Operators, All Other | 228 | 0.26 | Severe | Apprenticeship/Postsecondary Training |
| 53-7041 | Hoist and Winch Operators | 130 | 0.49 | Severe | Apprenticeship/Postsecondary Training |
| 47-5041 | Continuous Mining Machine Operators | 192 | 0.20 | Severe | Post-secondary Training or Associate's |
| 49-9081 | Wind Turbine Service Technicians | 182 | 0.38 | Severe | Post-secondary Training or Associate's |
| 51-4051 | Metal-Refining Furnace Operators and Tenders | 567 | 0.64 | Moderate | High School Diploma |
| 51-4199 | Metal Workers and Plastic Workers, All Other | 338 | 0.25 | Moderate | Apprenticeship/Postsecondary Training |
| 51-9162 | Computer Numerically Controlled Tool Programmers | 847 | 0.55 | Moderate | Apprenticeship/Postsecondary Training |
| 51-2041 | Structural Metal Fabricators and Fitters | 2,362 | 0.54 | Moderate | Apprenticeship/Postsecondary Training |
| 51-4193 | Plating Machine Setters, Operators, and Tenders, Metal and Plastic | 1,076 | 0.46 | Moderate | High School Diploma |
| 51-2031 | Engine and Other Machine Assemblers | 1,251 | 0.50 | Moderate | High School Diploma |

* For the full occupational table, please refer to appendix A. For demographic details on these occupations, please refer to appendix B.

4 Training Program Overview

This section highlights the current training programs around the New York State that are presently or could be involved in developing the State's offshore wind workforce. The section covers both trainings that offer wind-specific material or expertise as well as those that are more generally related to OSW but will nevertheless be essential to training the State's OSW workforce. These are largely trade-focused programs for occupations such as electricians, welders, or assemblers.

4.1 Wind-Specific Training Programs

The research team identified 24 different wind energy-specific training programs across the State. It is important to note that some of these programs are not specific to offshore wind, but it is likely that much of this training is transferrable and can be leveraged.

The majority of programs are geared toward engineering. Bramson ORT College and the University of Buffalo offer Electrical Engineering programs that incorporate renewable, clean, or wind energy systems design courses. Eight out of the 12 programs featured in Figure 8 focus on Structural or Materials Engineering, which similarly include wind energy-specific courses or tracks that include cover wind turbine technologies and applications.

Stony Brook University offers a program geared toward Professional Services, which includes wind resource assessment, wind project design and optimization, offshore wind project economics and policy, environmental impacts, and storage and grid integration.

Farmingdale State College offers a wind program for people with different experience levels. Programs vary in length and education requirements; all focused on Wind Turbine Technology. Technical skills taught in these programs include operation and maintenance of wind turbines, training associated with motor components and controls, and inspection and repair of turbines.

The last program, which is currently in development at Suffolk County Community College, will likely be geared toward supporting New York State's growing offshore wind industry, but course and program details are not yet available.

Figure 8 highlights the distribution of these programs and Table 6 provides additional detail and program descriptions. About half of these programs are found in the downstate, coastal region, while the remainder are scattered across the northern and western portions of the State.

Figure 8. Wind-Specific Training Programs in New York State

See endnotes for more information¹³

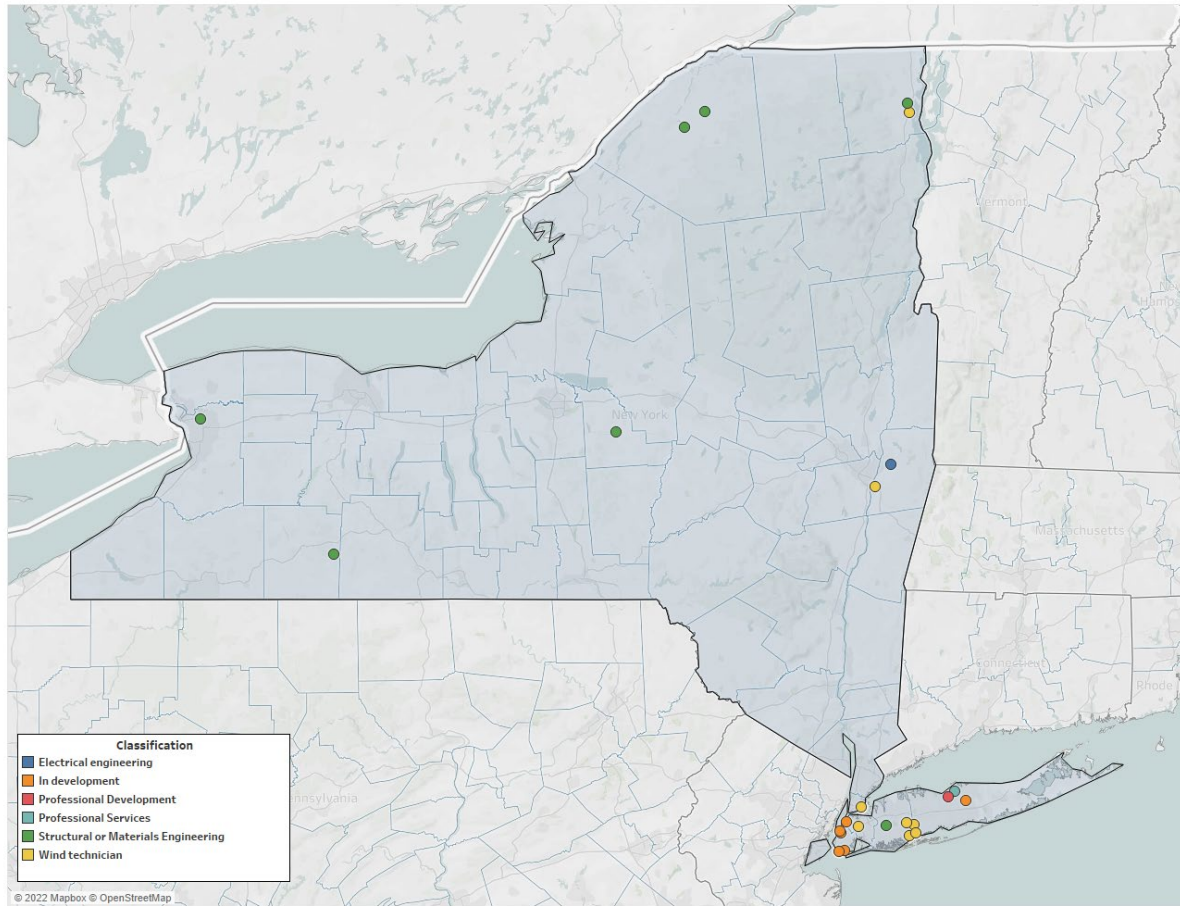


Table 7. Wind-Specific Training Programs in New York State

| Program Host | City | Classification | Program Description |
|---|-------------|-------------------------------------|---|
| Alfred University | Alfred | Structural or materials engineering | Renewable Energy Engineering major that includes a wind energy course and other renewable energy material. |
| Bramson ORT College | New York | Wind technician | Renewable Energy Technician Certificate with a "Wind Energy Systems Design and Installation" course. |
| City Tech | New York | In development | Developing courses on the built environment and green energy solutions. In addition, workshops and training modules will focus on geographic information systems, geospatial data analysis, remote sensing, and introducing pathways and opportunities in the OSW workforce. |
| Clarkson University | Potsdam | Structural or materials engineering | Master of Science in Energy Systems features wind energy material. |
| Clinton Community College | Plattsburgh | Structural or materials engineering | Wind Energy and Turbine Technology A.A.S. program. |
| Clinton Community College | Plattsburgh | Wind technician | Wind Turbine Service Technician Certificate prepares students for a career in wind energy, focused on industrial electricity and mechanical systems. |
| Farmingdale State College | Farmingdale | Wind technician | Wind Turbine Technical Training teaches participants basic technical skills in a hands-on intensive training for wind turbine operation and maintenance, motor components and controls, and safety, hand tools, and test equipment. |
| Farmingdale State College | Farmingdale | Wind technician | Wind Energy Technology micro-credential for engineers that provides hands-on experience to learn and apply theory by using trainers and VR simulations. |
| Farmingdale State College | Farmingdale | Wind technician | Wind Turbine Technology certificate program that prepares students for technical careers in wind energy technology. Graduates will be prepared as entry-level wind turbine technicians, capable of demonstrating skills in operating, maintaining, and troubleshooting wind energy related equipment. |
| Farmingdale State College | Farmingdale | Wind Technician | Workshop introducing the fundamentals of small scale wind technology. The course covers the design and maintenance of small scale wind systems. |
| Hudson Valley Community College | Troy | Electrical engineering | Electrical Engineering Technology Electronics degree on electrical and electronic theories and applications that prepares students for testing and manufacturing careers. |
| Hudson Valley Community College EOC | Troy | Wind technician | Welding program in the Educational Opportunity Center at HVCC aimed at people of all skill levels; specialized welding certificate for wind technology installation phase and blade repair are in development. |
| Kingsborough Community College | New York | In development | Developing program that will provide certification for relevant offshore wind occupations, specifically welding training and direct entry into the Paul Hall Center for Maritime Training affiliated with Seafarers International Union and pre-apprenticeship programs and support the development of Global Wind Organization Basic Safety Training (GWO-BST). Trainings will include working at heights, sea survival, fire awareness and manual handling. |
| La Guardia Community College + Kingsborough Community College + City Tech | New York | In development | "Bridge to Offshore Wind Program" will provide opportunities to explore OSW career pathways, and the education and training required to enter the offshore industry, with a focus on maritime, electrical, construction and supply chain subsectors. |

Table 7 continued

| Program Host | City | Classification | Program Description |
|---|-------------|-------------------------------------|---|
| La Guardia Community College + Kingsborough Community College + City Tech | New York | In development | "Bridge to Offshore Wind Program" will provide opportunities to explore OSW career pathways, and the education and training required to enter the offshore industry, with a focus on maritime, electrical, construction and supply chain subsectors. |
| La Guardia Community College + Kingsborough Community College + City Tech | New York | In development | "Bridge to Offshore Wind Program" will provide opportunities to explore OSW career pathways, and the education and training required to enter the offshore industry, with a focus on maritime, electrical, construction and supply chain subsectors. |
| Nassau Community College | Hempstead | Structural or materials engineering | Certificate in Sustainable Design and Renewable Energy with a "Wind Turbines/Solar Panels Applications" course. Program designed to provide introduction to OSW in a modular format. Open to people with a Bachelor's degree or an associate degree with 2+ years of experience in a related field. |
| Stony Brook University | Stony Brook | Professional Development | Developing program related to wind resource assessment, wind turbine and wind farm project design and optimization, offshore wind project economics, public policy, social acceptance, and environmental impacts, as well as energy storage and grid integration. |
| Stony Brook University | Stony Brook | Professional services | Developing a non-credit wind energy program. |
| Suffolk County Community College | Selden | In development | Degree in Sustainable Energy Technologies - includes one course specific to wind turbines (operations and technical applications). |
| SUNY Canton | Canton | Structural or materials engineering | Center of Excellence for Offshore Energy that will offer training programs for wind operations technicians, dynamic positioning training, and certification courses for offshore vessel operators. |
| SUNY Maritime | Bronx | Wind technician | Renewable Energy Bachelor of Technology degree with a wind-specific track. |
| SUNY Morrisville | Morrisville | Structural or materials engineering | Engineering Master of Science with a course focus in clean energy—Courses in Wind Energy Conversion, Material Design, and Wind Energy and Turbulent Flow. |
| University of Buffalo | Buffalo | Structural or materials engineering | |

4.2 General Training Programs

This section highlights additional training programs around New York State that do not contain wind-specific training material but could nonetheless prepare workers to support and work within the OSW industry. The focus here is more specifically on trade programs, which are vital to a domestic OSW labor market; these include, but are not limited to electricians, welders, machinists, technicians, and assemblers. Such trade programs may not currently contain offshore wind specific material, but the baseline knowledge is key to the construction and operations phases of OSW project development.

Table 7 specifically calls out programs for some of the occupations that were identified to have gaps. Because the data sources on program completions for these types of jobs are limited, the table highlights the latest awards data for select available occupations.

According to the National Center for Education Statistics data set, in 2020, there were only two institutions in New York State—Clinton Community College and Sullivan County Community College—that offered wind energy technology or technician programs. From 2019 through 2020, there were only two completions for this program, both of which were at Clinton Community College. Recently, however, new wind technician programs have been added to Bramson ORT College, Farmingdale State College, Hudson Valley Community College EOC, and SUNY Maritime.

Computer Numerically Controlled Machinists or Operators (CNC Machinists) are critical to the manufacturing and assembly phase of offshore wind project development. Across New York State, a total of four institutions offer certificates or degrees for this occupation.¹⁴ From 2019 through 2020, there were 31 total program completions.

Program completions for welders and electricians, which are not projected to have severe supply gaps, are in abundance across the State. From 2019 through 2020, there were a total of 640 completions across 14 institutions.

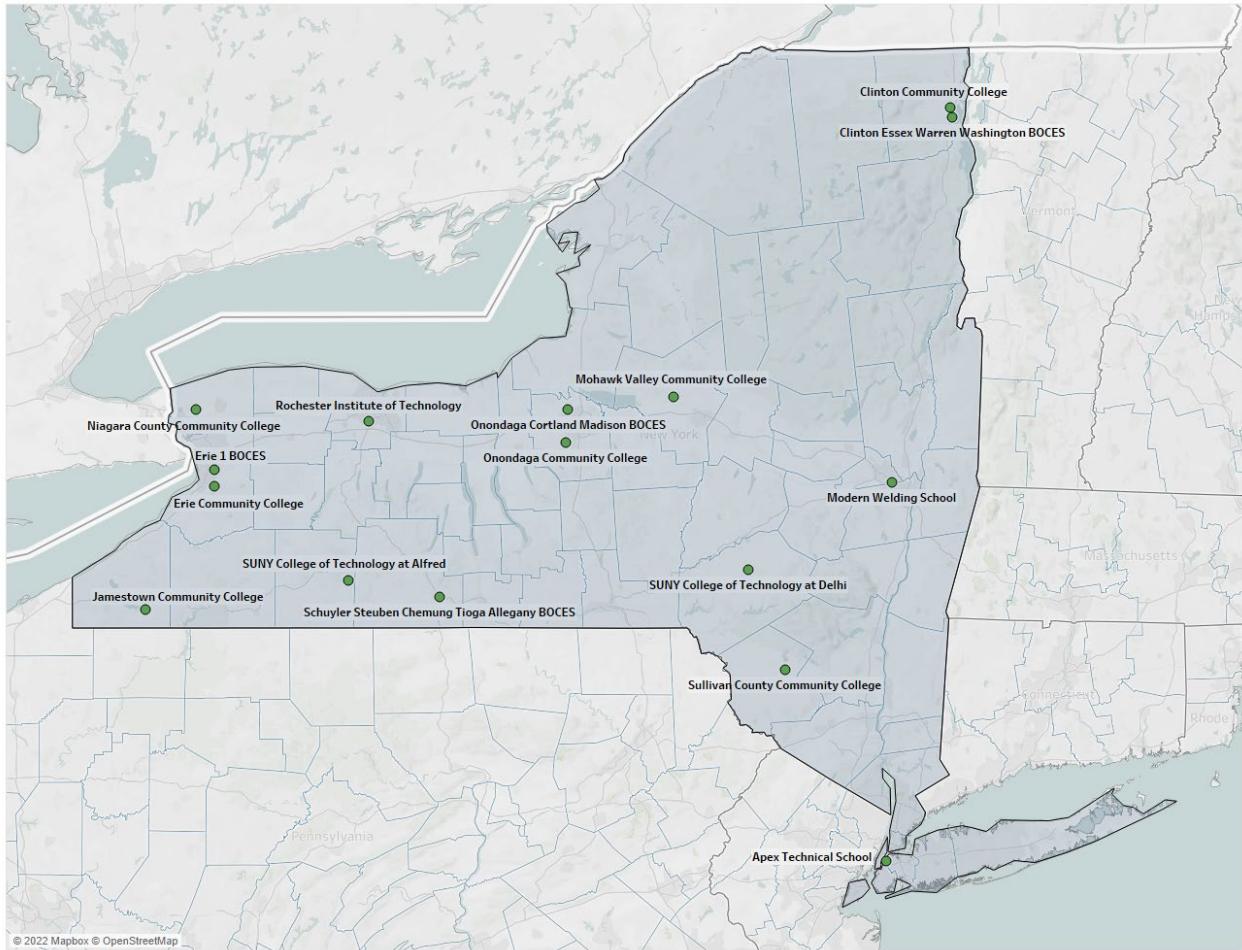
Table 8. Program Completions for In-Demand OSW Occupations, 2019-2020

| | Total Awards, 2019- |
|--------------------------------|---------------------|
| | 2 |
| | 31 |
| Welding Technology/ Welder | 343 |
| Electrician | 297 |
| Total Awards, 2019-2020 | 673 |

* JobsEQ. Data as of the 2019 to 2020 academic year from the National Center for Education Statistics.

Figure 9 below illustrates the geographical spread of institutions that provide the program offerings featured in Table 8.

Figure 9. Training Programs for In-Demand OSW Occupations (Offering Programs Listed in Table 8)



In addition to program completion data from the National Center for Education Statistics data set, the research team explored New York State’s Eligible Training Provider List (ETPL) for additional programs that could be useful for developing an offshore wind workforce in the State.

Table 8 below highlights several trade programs, such as line installers, welders, electricians, machinists, equipment operators, and sheet metal workers, that could potentially connect to offshore wind occupations. In total, there are 714 trade programs in New York State’s ETPL that could support the State’s offshore wind workforce development.

Table 9. Construction and Manufacturing-Related Training Programs in New York State

| Occupational Focus | Total Programs |
|-------------------------------------|-----------------------|
| Line Installer-Repairer | 174 |
| Welder | 102 |
| Manufacturing Production Technician | 101 |
| Basic Production Technician | 101 |
| Electrician | 100 |
| Machinist | 58 |
| Wind Technician | 44 |
| Construction Carpenter | 31 |
| Pipe Fitter | 22 |
| Construction Equipment Operator | 20 |
| Sheet Metal Worker | 5 |
| TOTAL | 758 |

* New York State Department of Labor. Eligible Training Provider List. ¹⁵

5 References

The following list captures the reports in which findings directly informed the background information and literature review for this research. Importantly, this review helped develop the database of relevant occupations that are key to growing a healthy, domestic offshore wind industry. The database is the foundation of all occupational analyses.

New York State Energy Research and Development Authority, 2019 OSW Jobs Fact Sheet.

New York State Energy Research and Development Authority, The Workforce Opportunity of Offshore Wind in New York (2017).

The New York State Senate, Senate Bill S4955 (2021).

Offshore Wind Industry Council, The U.K. Offshore Wind Industry: Supply Chain Review January 2019.

Pereira, Sydney. What New York's Offshore Wind Expansion Could Mean for Your Electricity Bill, Curbing Emissions, and Your Health (2021).

Topham and McMillan. Renewable Energy Journal, Sustainable Decommissioning of an Offshore Wind Farm (2016).

Wood Mackenzie, Economic Impact of New Offshore Wind Lease Auctions by BOEM (2021).

Workforce Development Institute, New York State and the Jobs of Offshore Wind Energy (2017).

Appendix A. New York State Offshore Wind Related Occupation Database

The following table includes all occupations identified as participatory in the life cycle of an offshore wind project. The table presents the total number of jobs in New York State for each occupation and the location quotient. Data is organized by severity of estimated workforce gap.

| SOC Code | Occupation | Total Jobs in NY, 2020 Q4 | Location Quotient, 2020 (compared to US) | Estimated Workforce Gap | Typical Education |
|----------|---|---------------------------|--|-------------------------|--|
| 51-8099 | Plant and System Operators, All Other | 228 | 0.26 | Severe | Apprenticeship/Postsecondary Training |
| 53-7041 | Hoist and Winch Operators | 130 | 0.49 | Severe | Apprenticeship/Postsecondary Training |
| 47-5041 | Continuous Mining Machine Operators | 192 | 0.20 | Severe | Post-secondary Training or Associate's |
| 49-9081 | Wind Turbine Service Technicians | 182 | 0.38 | Severe | Post-secondary Training or Associate's |
| 51-4051 | Metal-Refining Furnace Operators and Tenders | 567 | 0.64 | Moderate | High School Diploma |
| 51-4199 | Metal Workers and Plastic Workers, All Other | 338 | 0.25 | Moderate | Apprenticeship/Postsecondary Training |
| 51-9162 | Computer Numerically Controlled Tool Programmers | 847 | 0.55 | Moderate | Apprenticeship/Postsecondary Training |
| 51-2041 | Structural Metal Fabricators and Fitters | 2,362 | 0.54 | Moderate | Apprenticeship/Postsecondary Training |
| 51-4193 | Plating Machine Setters, Operators, and Tenders, Metal and Plastic | 1,076 | 0.46 | Moderate | High School Diploma |
| 51-2031 | Engine and Other Machine Assemblers | 1,251 | 0.50 | Moderate | High School Diploma |
| 51-4032 | Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 144 | 0.23 | Moderate | Apprenticeship/Postsecondary Training |
| 53-7199 | Material Moving Workers, All Other | 1,130 | 0.64 | Moderate | Apprenticeship/Postsecondary Training |

Appendix A continued

| SOC Code | Occupation | Total Jobs in NY, 2020 Q4 | Location Quotient, 2020 (compared to US) | Estimated Workforce Gap | Typical Education |
|----------|---|---------------------------|--|-------------------------|---------------------------------------|
| 47-5022 | Excavating and Loading Machine and Dragline Operators, Surface Mining | 1,453 | 0.56 | Moderate | Apprenticeship/Postsecondary Training |
| 17-2121 | Marine Engineers and Naval Architects | 260 | 0.45 | Moderate | Bachelor's Degree |
| 53-5011 | Sailors and Marine Oilers | 1,168 | 0.70 | Moderate | Apprenticeship/Postsecondary Training |
| 25-1032 | Engineering Teachers, Postsecondary | 2,830 | 1.22 | Moderate | Master's Degree or Higher |
| 17-2072 | Electronics Engineers, Except Computer | 4,318 | 0.57 | Moderate | Bachelor's Degree |
| 17-2071 | Electrical Engineers | 8,727 | 0.75 | Moderate | Bachelor's Degree |
| 11-9041 | Architectural and Engineering Managers | 8,064 | 0.67 | Moderate | Master's Degree or Higher |
| 53-7021 | Crane and Tower Operators | 1,423 | 0.53 | Moderate | Apprenticeship/Postsecondary Training |
| 17-2199 | Engineers, All Other | 5,505 | 0.55 | Moderate | Bachelor's Degree |
| 17-2011 | Aerospace Engineers | 440 | 0.12 | Moderate | Bachelor's Degree |
| 53-5021 | Captains, Mates, and Pilots of Water Vessels | 1,485 | 0.79 | Moderate | Apprenticeship/Postsecondary Training |
| 49-9096 | Riggers | 872 | 0.66 | Moderate | Apprenticeship/Postsecondary Training |
| 13-1051 | Cost Estimators | 9,424 | 0.76 | Moderate | Bachelor's Degree |
| 49-9092 | Commercial Divers | 186 | 0.74 | Moderate | Apprenticeship/Postsecondary Training |
| 51-4072 | Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic | 4,219 | 0.44 | Moderate | Apprenticeship/Postsecondary Training |
| 17-2111 | Health and Safety Engineers, Except Mining Safety Engineers and Inspectors | 1,299 | 0.91 | Moderate | Bachelor's Degree |
| 15-2031 | Operations Research Analysts | 6,382 | 1.10 | Moderate | Bachelor's Degree |

Appendix A continued

| SOC Code | Occupation | Total Jobs in NY, 2020 Q4 | Location Quotient, 2020 (compared to US) | Estimated Workforce Gap | Typical Education |
|----------|---|---------------------------|--|-------------------------|--|
| 13-1081 | Logisticians | 5,017 | 0.45 | Moderate | Apprenticeship/Postsecondary Training |
| 17-3013 | Mechanical Drafters | 2,225 | 0.67 | Moderate | Bachelor's Degree |
| 19-2042 | Geoscientists, Except Hydrologists and Geographers | 973 | 0.56 | Moderate | Bachelor's Degree |
| 17-2081 | Environmental Engineers | 2,951 | 0.94 | Moderate | Bachelor's Degree |
| 17-3027 | Mechanical Engineering Technologists and Technicians | 1,682 | 0.64 | Moderate | Post-secondary Training or Associate's |
| 17-2141 | Mechanical Engineers | 10,719 | 0.59 | Moderate | Bachelor's Degree |
| 51-9021 | Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders | 1,255 | 0.62 | Moderate | High School Diploma |
| 17-2131 | Materials Engineers | 833 | 0.55 | Moderate | Bachelor's Degree |
| 11-3051 | Industrial Production Managers | 5,753 | 0.52 | Moderate | Bachelor's Degree |
| 19-2021 | Atmospheric and Space Scientists | 493 | 0.87 | Moderate | Bachelor's Degree |
| 51-8013 | Power Plant Operators | 1,931 | 0.89 | Mild | Bachelor's Degree |
| 11-9121 | Natural Sciences Managers | 1,722 | 0.42 | Mild | Ph.D. |
| 23-1011 | Lawyers | 84,894 | 1.74 | Mild | Law Degree |
| 49-9041 | Industrial Machinery Mechanics | 11,727 | 0.49 | Mild | Apprenticeship/Postsecondary Training |
| 11-3071 | Transportation, Storage, and Distribution Managers | 4,677 | 0.56 | Mild | Bachelor's Degree |
| 17-2051 | Civil Engineers | 15,001 | 0.79 | Mild | Bachelor's Degree |
| 19-1023 | Zoologists and Wildlife Biologists | 396 | 0.37 | Mild | Bachelor's Degree |
| 17-3019 | Drafters, All Other | 601 | 0.67 | Mild | Bachelor's Degree |

Appendix A continued

| SOC Code | Occupation | Total Jobs in NY, 2020 Q4 | Location Quotient, 2020 (compared to US) | Estimated Workforce Gap | Typical Education |
|----------|--|---------------------------|--|-------------------------|--|
| 19-2041 | Environmental Scientists and Specialists, Including Health | 4,391 | 0.83 | Mild | Bachelor's Degree |
| 13-2031 | Budget Analysts | 2,879 | 0.95 | Mild | Bachelor's Degree |
| 49-9051 | Electrical Power-Line Installers and Repairers | 5,978 | 0.80 | Mild | Apprenticeship/Postsecondary Training |
| 51-2028 | Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers | 12,048 | 0.71 | Mild | Apprenticeship/Postsecondary Training |
| 53-5031 | Ship Engineers | 411 | 0.86 | Mild | Post-secondary Training or Associate's |
| 17-2112 | Industrial Engineers | 11,220 | 0.64 | Mild | Bachelor's Degree |
| 47-4021 | Elevator and Escalator Installers and Repairers | 3,797 | 2.47 | Mild | Apprenticeship/Postsecondary Training |
| 19-5011 | Occupational Health and Safety Specialists | 4,464 | 0.75 | Mild | Apprenticeship/Postsecondary Training |
| 11-3061 | Purchasing Managers | 4,155 | 0.92 | Mild | Bachelor's Degree |
| 27-3031 | Public Relations Specialists | 25,177 | 1.57 | Mild | Bachelor's Degree |
| 19-4042 | Environmental Science and Protection Technicians, Including Health | 1,675 | 0.86 | Mild | Bachelor's Degree |
| 49-1011 | First-Line Supervisors of Mechanics, Installers, and Repairers | 26,568 | 0.91 | Mild | High School Diploma |
| 11-3021 | Computer and Information Systems Managers | 30,074 | 1.06 | Mild | Bachelor's Degree |
| 51-9012 | Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders | 2,058 | 0.68 | Mild | Apprenticeship/Postsecondary Training |

Appendix A continued

| SOC Code | Occupation | Total Jobs in NY, 2020 Q4 | Location Quotient, 2020 (compared to US) | Estimated Workforce Gap | Typical Education |
|----------|---|---------------------------|--|-------------------------|---------------------------------------|
| 11-3121 | Human Resources Managers | 10,442 | 1.07 | Mild | Bachelor's Degree |
| 11-3031 | Financial Managers | 47,985 | 1.17 | Mild | Bachelor's Degree |
| 13-1041 | Compliance Officers | 21,528 | 1.09 | Mild | Bachelor's Degree |
| 13-2098 | Financial and Investment Analysts, Financial Risk Specialists, and Financial Specialists, All Other | 58,670 | 2.04 | Mild | Bachelor's Degree |
| 11-9021 | Construction Managers | 19,082 | 0.68 | Mild | Bachelor's Degree |
| 13-2011 | Accountants and Auditors | 112,913 | 1.33 | Mild | Bachelor's Degree |
| 11-3012 | Administrative Services Managers | 2,241 | 1.16 | Mild | High School Diploma |
| 11-2022 | Sales Managers | 25,029 | 0.99 | Mild | Master's Degree or Higher |
| 51-9061 | Inspectors, Testers, Sorters, Samplers, and Weighers | 21,448 | 0.63 | Mild | Apprenticeship/Postsecondary Training |
| 11-3131 | Training and Development Managers | 2,771 | 1.13 | Mild | Master's Degree or Higher |
| 17-3098 | Calibration Technologists and Technicians and Engineering Technologists and Technicians, Except Drafters, All Other | 2,270 | 0.45 | Mild | Apprenticeship/Postsecondary Training |
| 19-3091 | Anthropologists and Archeologists | 194 | 0.41 | Mild | Bachelor's Degree |
| 51-2099 | Assemblers and Fabricators, All Other | 8,096 | 0.61 | Mild | Apprenticeship/Postsecondary Training |
| 53-6098 | Aircraft Service Attendants and Transportation Workers, All Other | 1,661 | 0.79 | Mild | Apprenticeship/Postsecondary Training |

Appendix A continued

| SOC Code | | Total Jobs in | Location Quotient, | Estimated | |
|----------|---|---------------|--------------------|-----------|--|
| 41-4011 | Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products | 16,088 | 0.86 | Mild | Post-secondary Training or Associate's |
| 51-4031 | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic | 4,451 | 0.40 | Mild | Apprenticeship/Postsecondary Training |
| 15-1299 | Computer Occupations, All Other | 21,012 | 0.87 | Mild | Bachelor's Degree |
| 51-1011 | First-Line Supervisors of Production and Operating Workers | 23,746 | 0.63 | Mild | High School Diploma |
| 17-3031 | Surveying and Mapping Technicians | 1,943 | 0.56 | Mild | Apprenticeship/Postsecondary Training |
| 47-2111 | Electricians | 39,089 | 0.92 | Mild | Apprenticeship/Postsecondary Training |
| 43-3031 | Bookkeeping, Accounting, and Auditing Clerks | 101,846 | 1.05 | Mild | High School Diploma |
| 11-1021 | General and Operations Managers | 153,164 | 1.06 | Mild | Bachelor's Degree |
| 51-9011 | Chemical Equipment Operators and Tenders | 3,534 | 0.63 | Mild | High School Diploma |
| 17-3023 | Electrical and Electronic Engineering Technologists and Technicians | 5,501 | 0.77 | Mild | Bachelor's Degree |
| 43-6014 | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive | 148,297 | 1.23 | Mild | Post-secondary Training or Associate's |
| 13-2053 | Insurance Underwriters | 6,653 | 1.06 | Mild | Bachelor's Degree |
| 51-4041 | Machinists | 12,418 | 0.56 | Mild | Apprenticeship/Postsecondary Training |

Appendix A continued

| SOC Code | Occupation | Total Jobs in NY, 2020 Q4 | Location Quotient, 2020 (compared to US) | Estimated Workforce Gap | Typical Education |
|----------|---|---------------------------|--|-------------------------|--|
| 47-1011 | First-Line Supervisors of Construction Trades and Extraction Workers | 27,236 | 0.67 | Mild | Post-secondary Training or Associate's |
| 23-2011 | Paralegals and Legal Assistants | 29,668 | 1.46 | Mild | Post-secondary Training or Associate's |
| 53-2012 | Commercial Pilots | 1,306 | 0.53 | Mild | Apprenticeship/Postsecondary Training |
| 13-1071 | Human Resources Specialists | 39,608 | 0.99 | Mild | Bachelor's Degree |
| 51-8021 | Stationary Engineers and Boiler Operators | 3,981 | 2.19 | Mild | Bachelor's Degree |
| 49-3031 | Bus and Truck Mechanics and Diesel Engine Specialists | 12,699 | 0.78 | Mild | Post-secondary Training or Associate's |
| 51-9199 | Production Workers, All Other | 5,882 | 0.46 | Mild | Apprenticeship/Postsecondary Training |
| 13-1161 | Market Research Analysts and Marketing Specialists | 66,875 | 1.53 | Mild | Master's Degree or Higher |
| 43-5071 | Shipping, Receiving, and Inventory Clerks | 30,639 | 0.67 | Mild | High School Diploma |
| 13-1022 | Wholesale and Retail Buyers, Except Farm Products | 6,168 | 0.92 | Mild | Bachelor's Degree |
| 13-1151 | Training and Development Specialists | 21,634 | 1.11 | Mild | Apprenticeship/Postsecondary Training |
| 53-3032 | Heavy and Tractor-Trailer Truck Drivers | 66,862 | 0.56 | Mild | Apprenticeship/Postsecondary Training |
| 49-9071 | Maintenance and Repair Workers, General | 111,100 | 1.30 | Mild | Apprenticeship/Postsecondary Training |
| 51-9124 | Coating, Painting, and Spraying Machine Setters, Operators, and Tenders | 3,761 | 0.43 | Mild | High School Diploma |
| 47-2073 | Operating Engineers and Other Construction Equipment Operators | 14,453 | 0.58 | Mild | Apprenticeship/Postsecondary Training |

Appendix A continued

| SOC Code | Occupation | Total Jobs in NY, 2020 Q4 | Location Quotient, 2020 (compared to US) | Estimated Workforce Gap | Typical Education |
|----------|--|---------------------------|--|-------------------------|--|
| 17-2151 | Mining and Geological Engineers, Including Mining Safety Engineers | 78 | 0.20 | Mild | Bachelor's Degree |
| 43-9061 | Office Clerks, General | 176,941 | 1.00 | Mild | Apprenticeship/Postsecondary Training |
| 41-9031 | Sales Engineers | 3,017 | 0.77 | Mild | Bachelor's Degree |
| 53-7065 | Stockers and Order Fillers | 111,357 | 0.82 | Mild | High School Diploma |
| 53-7051 | Industrial Truck and Tractor Operators | 18,546 | 0.46 | Mild | Apprenticeship/Postsecondary Training |
| 49-9098 | Helpers--Installation, Maintenance, and Repair Workers | 4,819 | 0.83 | Mild | High School Diploma |
| 51-4121 | Welders, Cutters, Solderers, and Brazers | 11,639 | 0.45 | Mild | Apprenticeship/Postsecondary Training |
| 53-7062 | Laborers and Freight, Stock, and Material Movers, Hand | 126,539 | 0.73 | Mild | Apprenticeship/Postsecondary Training |
| 47-2221 | Structural Iron and Steel Workers | 3,632 | 0.83 | Mild | Apprenticeship/Postsecondary Training |
| 43-4161 | Human Resources Assistants, Except Payroll and Timekeeping | 7,695 | 1.12 | Mild | Post-secondary Training or Associate's |
| 51-2092 | Team Assemblers | 33,118 | 0.50 | Mild | High School Diploma |
| 47-2051 | Cement Masons and Concrete Finishers | 6,718 | 0.55 | Mild | Apprenticeship/Postsecondary Training |
| 47-2061 | Construction Laborers | 74,110 | 0.91 | Mild | Apprenticeship/Postsecondary Training |
| 47-2171 | Reinforcing Iron and Rebar Workers | 895 | 0.75 | Mild | Apprenticeship/Postsecondary Training |

Appendix B. Offshore Wind-Related Occupation Demographics

See endnotes for more information¹⁶

| | | | | % | | | | |
|------------------------------------|---|-------|-------|-------|-------|-------|-------|------|
| New York Average (All Occupations) | | 51.3% | 48.7% | 18.2% | 69.2% | 17.1% | 10.2% | 3.5% |
| 51-8099 | Plant and System Operators, All Other | 72.5% | 27.5% | 15.4% | 69.2% | 23.2% | 4.9% | 2.7% |
| 53-7041 | Hoist and Winch Operators | 80.4% | 19.6% | 23.3% | 66.0% | 22.7% | 8.1% | 3.2% |
| 47-5041 | Continuous Mining Machine Operators | 98.0% | 2.0% | 11.2% | 93.9% | 2.3% | 0.4% | 3.3% |
| 49-9081 | Wind Turbine Service Technicians | 95.9% | 4.1% | 17.0% | 77.0% | 15.3% | 4.4% | 3.2% |
| 51-4051 | Metal-Refining Furnace Operators and Tenders | 71.6% | 28.4% | 9.3% | 85.7% | 9.6% | 2.6% | 2.1% |
| 51-4199 | Metal Workers and Plastic Workers, All Other | 77.7% | 22.3% | 26.8% | 66.1% | 23.6% | 7.2% | 3.1% |
| 51-9162 | Computer Numerically Controlled Tool Programmers | 90.8% | 9.2% | 8.2% | 83.9% | 12.6% | 3.1% | 0.3% |
| 51-2041 | Structural Metal Fabricators and Fitters | 71.7% | 28.3% | 16.1% | 75.8% | 16.3% | 5.5% | 2.4% |
| 51-4193 | Plating Machine Setters, Operators, and Tenders, Metal and Plastic | 77.1% | 22.9% | 19.3% | 75.6% | 17.2% | 4.5% | 2.7% |
| 51-2031 | Engine and Other Machine Assemblers | 71.0% | 29.0% | 9.4% | 84.2% | 10.2% | 3.3% | 2.2% |
| 51-4032 | Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic | 70.9% | 29.1% | 17.5% | 78.8% | 13.6% | 5.0% | 2.6% |
| 53-7199 | Material Moving Workers, All Other | 82.4% | 17.6% | 21.1% | 67.0% | 30.1% | 0.0% | 2.9% |
| 47-5022 | Excavating and Loading Machine and Dragline Operators, Surface Mining | 96.0% | 4.0% | 30.4% | 81.3% | 12.1% | 3.1% | 3.6% |
| 17-2121 | Marine Engineers and Naval Architects | 86.4% | 13.6% | 7.0% | 77.3% | 3.0% | 17.9% | 1.8% |
| 53-5011 | Sailors and Marine Oilers | 81.4% | 18.6% | 20.9% | 68.4% | 20.8% | 8.0% | 2.9% |
| 25-1032 | Engineering Teachers, Postsecondary | 54.0% | 46.0% | 5.8% | 75.8% | 6.4% | 14.6% | 3.2% |
| 17-2072 | Electronics Engineers, Except Computer | 90.3% | 9.7% | 5.7% | 76.9% | 3.0% | 19.1% | 1.1% |
| 17-2071 | Electrical Engineers | 90.2% | 9.8% | 6.1% | 76.4% | 3.6% | 18.9% | 1.1% |
| 11-9041 | Architectural and Engineering Managers | 92.2% | 7.8% | 3.2% | 83.9% | 2.2% | 11.6% | 2.3% |
| 53-7021 | Crane and Tower Operators | 99.2% | 0.8% | 8.9% | 87.3% | 11.9% | 0.3% | 0.5% |
| 17-2199 | Engineers, All Other | 87.3% | 12.7% | 6.9% | 73.6% | 4.3% | 20.3% | 1.7% |

Appendix B continued

| SOC Code | Occupation | % Male | % Female | % Hispanic/Latinx | % White | % Black | % Asian | % Other |
|----------|---|--------|----------|-------------------|---------|---------|---------|---------|
| 17-2011 | Aerospace Engineers | 90.7% | 9.3% | 7.4% | 82.7% | 3.8% | 12.8% | 0.7% |
| 53-5021 | Captains, Mates, and Pilots of Water Vessels | 81.7% | 18.3% | 24.2% | 61.8% | 28.4% | 6.4% | 3.3% |
| 49-9096 | Riggers | 96.1% | 3.9% | 17.6% | 67.0% | 24.7% | 5.2% | 3.2% |
| 13-1051 | Cost Estimators | 87.4% | 12.6% | 11.8% | 87.7% | 6.7% | 4.1% | 1.5% |
| 49-9092 | Commercial Divers | 96.0% | 4.0% | 23.1% | 68.7% | 21.0% | 6.4% | 3.9% |
| 51-4072 | Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic | 71.5% | 28.5% | 14.3% | 80.3% | 12.6% | 4.7% | 2.4% |
| 17-2111 | Health and Safety Engineers, Except Mining Safety Engineers and Inspectors | 80.5% | 19.5% | 3.9% | 74.7% | 2.6% | 22.0% | 0.8% |
| 15-2031 | Operations Research Analysts | 62.9% | 37.1% | 7.9% | 77.9% | 8.3% | 13.5% | 0.3% |
| 13-1081 | Logisticians | 67.4% | 32.6% | 16.0% | 79.2% | 13.4% | 6.3% | 1.1% |
| 17-3013 | Mechanical Drafters | 83.8% | 16.2% | 14.4% | 86.0% | 2.9% | 10.3% | 0.9% |
| 19-2042 | Geoscientists, Except Hydrologists and Geographers | 56.7% | 43.3% | 6.4% | 74.3% | 3.7% | 19.4% | 2.7% |
| 17-2081 | Environmental Engineers | 86.4% | 13.6% | 7.5% | 76.6% | 3.5% | 17.8% | 2.1% |
| 17-3027 | Mechanical Engineering Technologists and Technicians | 82.6% | 17.4% | 10.4% | 74.0% | 14.0% | 7.8% | 4.1% |
| 17-2141 | Mechanical Engineers | 92.7% | 7.3% | 4.2% | 81.7% | 3.1% | 12.4% | 2.8% |
| 51-9021 | Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders | 79.8% | 20.2% | 14.8% | 79.9% | 17.4% | 1.9% | 0.8% |
| 17-2131 | Materials Engineers | 78.5% | 21.5% | 3.8% | 86.2% | 2.3% | 10.3% | 1.3% |
| 11-3051 | Industrial Production Managers | 80.7% | 19.3% | 8.7% | 85.5% | 4.3% | 8.1% | 2.1% |
| 19-2021 | Atmospheric and Space Scientists | 56.3% | 43.7% | 6.6% | 72.7% | 3.2% | 21.3% | 2.8% |
| 51-8013 | Power Plant Operators | 73.5% | 26.5% | 15.5% | 73.8% | 18.3% | 5.5% | 2.4% |
| 11-9121 | Natural Sciences Managers | 65.2% | 34.8% | 8.1% | 85.6% | 5.0% | 7.4% | 2.1% |
| 23-1011 | Lawyers | 67.4% | 32.6% | 6.1% | 81.2% | 7.7% | 9.6% | 1.6% |
| 49-9041 | Industrial Machinery Mechanics | 94.9% | 5.1% | 10.7% | 82.0% | 13.4% | 3.2% | 1.4% |
| 11-3071 | Transportation, Storage, and Distribution Managers | 81.0% | 19.0% | 13.9% | 68.8% | 20.4% | 7.9% | 3.0% |
| 17-2051 | Civil Engineers | 86.6% | 13.4% | 9.5% | 78.1% | 3.4% | 18.0% | 0.5% |

Appendix B continued

| SOC Code | Occupation | % Male | % Female | % Hispanic/Latinx | % White | % Black | % Asian | % Other |
|----------|--|--------|----------|-------------------|---------|---------|---------|---------|
| 19-1023 | Zoologists and Wildlife Biologists | 59.5% | 40.5% | 7.6% | 78.3% | 3.7% | 17.1% | 0.9% |
| 17-3019 | Drafters, All Other | 84.2% | 15.8% | 16.8% | 82.1% | 3.5% | 13.5% | 1.0% |
| 19-2041 | Environmental Scientists and Specialists, Including Health | 56.5% | 43.5% | 6.5% | 73.0% | 4.0% | 20.4% | 2.7% |
| 13-2031 | Budget Analysts | 53.0% | 47.0% | 10.7% | 74.1% | 7.7% | 11.5% | 6.7% |
| 49-9051 | Electrical Power-Line Installers and Repairers | 98.8% | 1.2% | 12.1% | 78.8% | 15.6% | 2.0% | 3.6% |
| 51-2028 | Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers | 58.9% | 41.1% | 13.0% | 66.4% | 12.0% | 13.4% | 8.1% |
| 53-5031 | Ship Engineers | 81.3% | 18.7% | 20.8% | 67.4% | 21.5% | 8.3% | 2.9% |
| 17-2112 | Industrial Engineers | 79.7% | 20.3% | 3.5% | 78.7% | 3.1% | 17.4% | 0.8% |
| 47-4021 | Elevator and Escalator Installers and Repairers | 96.3% | 3.7% | 30.2% | 70.9% | 22.1% | 3.9% | 3.2% |
| 19-5011 | Occupational Health and Safety Specialists | 69.8% | 30.2% | 9.3% | 88.7% | 1.6% | 5.6% | 4.0% |
| 11-3061 | Purchasing Managers | 60.7% | 39.3% | 5.9% | 85.6% | 7.8% | 5.2% | 1.4% |
| 27-3031 | Public Relations Specialists | 46.2% | 53.8% | 12.9% | 80.0% | 10.2% | 7.1% | 2.7% |
| 19-4042 | Environmental Science and Protection Technicians, Including Health | 56.8% | 43.2% | 8.6% | 71.2% | 6.3% | 19.4% | 3.1% |
| 49-1011 | First-Line Supervisors of Mechanics, Installers, and Repairers | 91.6% | 8.4% | 13.2% | 75.8% | 15.0% | 5.1% | 4.2% |
| 11-3021 | Computer and Information Systems Managers | 77.3% | 22.7% | 5.2% | 69.2% | 6.7% | 21.6% | 2.4% |
| 51-9012 | Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders | 73.7% | 26.3% | 10.2% | 84.1% | 10.8% | 3.2% | 2.0% |
| 11-3121 | Human Resources Managers | 28.2% | 71.8% | 12.3% | 79.5% | 9.6% | 8.6% | 2.2% |
| 11-3031 | Financial Managers | 52.9% | 47.1% | 10.3% | 73.2% | 10.4% | 13.8% | 2.6% |
| 13-1041 | Compliance Officers | 48.6% | 51.4% | 7.7% | 72.8% | 10.5% | 11.6% | 5.0% |
| 13-2098 | Financial and Investment Analysts, Financial Risk Specialists, and Financial Specialists, All Other | 61.2% | 38.8% | 10.3% | 61.4% | 8.4% | 26.6% | 3.6% |
| 11-9021 | Construction Managers | 93.0% | 7.0% | 15.1% | 82.4% | 7.4% | 7.4% | 2.9% |
| 13-2011 | Accountants and Auditors | 45.7% | 54.3% | 10.5% | 70.4% | 10.1% | 17.6% | 2.0% |
| 11-3012 | Administrative Services Managers | 34.2% | 65.8% | 16.5% | 78.4% | 11.7% | 9.0% | 0.9% |
| 11-2022 | Sales Managers | 73.5% | 26.5% | 7.1% | 83.2% | 6.6% | 7.8% | 2.3% |

Appendix B continued

| SOC Code | Occupation | % Male | % Female | % Hispanic/Latinx | % White | % Black | % Asian | % Other |
|----------|---|--------|----------|-------------------|---------|---------|---------|---------|
| 51-9061 | Inspectors, Testers, Sorters, Samplers, and Weighers | 63.8% | 36.2% | 15.6% | 75.0% | 13.7% | 8.4% | 3.0% |
| 11-3131 | Training and Development Managers | 50.8% | 49.2% | 8.2% | 88.3% | 5.8% | 0.4% | 5.5% |
| 17-3098 | Calibration Technologists and Technicians and Engineering Technologists and Technicians, Except Drafters, All Other | 82.8% | 17.2% | 11.0% | 73.7% | 13.9% | 8.1% | 4.2% |
| 19-3091 | Anthropologists and Archeologists | 57.9% | 42.1% | 7.6% | 79.4% | 1.7% | 9.3% | 9.6% |
| 51-2099 | Assemblers and Fabricators, All Other | 68.5% | 31.5% | 21.3% | 62.4% | 23.2% | 10.9% | 3.6% |
| 53-6098 | Aircraft Service Attendants and Transportation Workers, All Other | 80.8% | 19.2% | 26.4% | 54.0% | 31.9% | 10.7% | 3.4% |
| 41-4011 | Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products | 73.9% | 26.1% | 12.0% | 84.1% | 5.4% | 7.6% | 2.8% |
| 51-4031 | Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic | 84.7% | 15.3% | 16.5% | 78.7% | 17.5% | 3.3% | 0.5% |
| 15-1299 | Computer Occupations, All Other | 76.2% | 23.8% | 10.3% | 63.7% | 10.9% | 22.0% | 3.4% |
| 51-1011 | First-Line Supervisors of Production and Operating Workers | 82.2% | 17.8% | 13.5% | 77.3% | 15.1% | 5.5% | 2.1% |
| 17-3031 | Surveying and Mapping Technicians | 90.9% | 9.1% | 6.5% | 73.3% | 14.1% | 7.3% | 5.3% |
| 47-2111 | Electricians | 97.2% | 2.8% | 24.6% | 76.5% | 16.1% | 4.6% | 2.8% |
| 43-3031 | Bookkeeping, Accounting, and Auditing Clerks | 15.2% | 84.8% | 16.8% | 74.8% | 14.9% | 8.2% | 2.1% |
| 11-1021 | General and Operations Managers | 73.2% | 26.8% | 13.7% | 76.2% | 11.1% | 8.5% | 4.3% |
| 51-9011 | Chemical Equipment Operators and Tenders | 73.8% | 26.2% | 12.6% | 82.6% | 11.3% | 4.0% | 2.2% |
| 17-3023 | Electrical and Electronic Engineering Technologists and Technicians | 97.2% | 2.8% | 10.7% | 75.2% | 10.8% | 10.7% | 3.3% |
| 43-6014 | Secretaries and Administrative Assistants, Except Legal, Medical, and Executive | 8.6% | 91.4% | 16.2% | 73.5% | 17.0% | 6.7% | 2.8% |
| 13-2053 | Insurance Underwriters | 48.2% | 51.8% | 8.7% | 78.3% | 6.1% | 10.3% | 5.2% |
| 51-4041 | Machinists | 94.2% | 5.8% | 8.1% | 89.0% | 6.9% | 3.1% | 0.9% |
| 47-1011 | First-Line Supervisors of Construction Trades and Extraction Workers | 96.8% | 3.2% | 26.9% | 80.4% | 13.3% | 3.3% | 3.1% |
| 23-2011 | Paralegals and Legal Assistants | 17.4% | 82.6% | 16.9% | 69.8% | 13.5% | 13.1% | 3.5% |
| 53-2012 | Commercial Pilots | 95.5% | 4.5% | 4.5% | 90.5% | 3.8% | 5.3% | 0.4% |

Appendix B continued

| SOC Code | Occupation | % Male | % Female | % Hispanic/ Latinx | % White | % Black | % Asian | % Other |
|----------|---|--------|----------|-----------------------|---------|---------|---------|---------|
| 13-1071 | Human Resources Specialists | 30.4% | 69.6% | 13.7% | 73.4% | 12.8% | 10.1% | 3.7% |
| 51-8021 | Stationary Engineers and Boiler Operators | 90.0% | 10.0% | 9.8% | 67.9% | 22.0% | 7.3% | 2.8% |
| 49-3031 | Bus and Truck Mechanics and Diesel Engine Specialists | 98.3% | 1.7% | 21.5% | 70.8% | 17.3% | 7.3% | 4.6% |
| 51-9199 | Production Workers, All Other | 73.4% | 26.6% | 26.0% | 65.9% | 20.9% | 9.2% | 4.0% |
| 13-1161 | Market Research Analysts and Marketing Specialists | 46.9% | 53.1% | 9.6% | 74.5% | 7.6% | 14.2% | 3.6% |
| 43-5071 | Shipping, Receiving, and Inventory Clerks | 68.8% | 31.2% | 25.4% | 66.5% | 23.5% | 7.1% | 2.9% |
| 13-1022 | Wholesale and Retail Buyers, Except Farm Products | 53.5% | 46.5% | 13.4% | 78.3% | 10.2% | 9.9% | 1.7% |
| 13-1151 | Training and Development Specialists | 48.9% | 51.1% | 13.6% | 78.0% | 14.5% | 5.3% | 2.1% |
| 53-3032 | Heavy and Tractor-Trailer Truck Drivers | 92.8% | 7.2% | 22.3% | 70.4% | 21.1% | 5.4% | 3.0% |
| 49-9071 | Maintenance and Repair Workers, General | 96.2% | 3.8% | 25.0% | 71.2% | 20.3% | 4.7% | 3.9% |
| 51-9124 | Coating, Painting, and Spraying Machine Setters, Operators, and Tenders | 91.8% | 8.2% | 27.3% | 80.4% | 13.1% | 2.8% | 3.6% |
| 47-2073 | Operating Engineers and Other Construction Equipment Operators | 96.3% | 3.7% | 21.0% | 76.6% | 17.3% | 1.4% | 4.6% |
| 43-9061 | Office Clerks, General | 20.1% | 79.9% | 21.3% | 67.3% | 17.4% | 11.9% | 3.4% |
| 41-9031 | Sales Engineers | 44.6% | 55.4% | 11.6% | 82.8% | 6.0% | 8.2% | 3.0% |
| 53-7065 | Stockers and Order Fillers | 68.1% | 31.9% | 22.6% | 65.0% | 23.1% | 6.9% | 5.0% |
| 17-2151 | Mining and Geological Engineers, Including Mining Safety Engineers | 86.1% | 13.9% | 6.9% | 77.7% | 3.1% | 17.4% | 1.9% |
| 53-7051 | Industrial Truck and Tractor Operators | 93.3% | 6.7% | 29.7% | 62.9% | 28.3% | 4.9% | 4.0% |
| 49-9098 | Helpers--Installation, Maintenance, and Repair Workers | 96.1% | 3.9% | 29.6% | 67.0% | 19.9% | 8.2% | 4.8% |
| 51-4121 | Welders, Cutters, Solderers, and Brazers | 96.2% | 3.8% | 20.0% | 80.7% | 12.0% | 4.4% | 2.9% |
| 53-7062 | Laborers and Freight, Stock, and Material Movers, Hand | 81.4% | 18.6% | 29.0% | 63.3% | 23.9% | 7.8% | 5.1% |
| 47-2221 | Structural Iron and Steel Workers | 96.1% | 3.9% | 32.3% | 76.6% | 15.6% | 4.5% | 3.4% |
| 43-4161 | Human Resources Assistants, Except Payroll and Timekeeping | 32.0% | 68.0% | 13.1% | 69.3% | 23.0% | 5.0% | 2.7% |

Appendix B continued

| SOC Code | Occupation | % Male | % Female | % Hispanic/Latinx | % White | % Black | % Asian | % Other |
|----------|--------------------------------------|--------|----------|-------------------|---------|---------|---------|---------|
| 51-2092 | Team Assemblers | 68.8% | 31.2% | 17.5% | 68.6% | 19.1% | 9.0% | 3.3% |
| 47-2051 | Cement Masons and Concrete Finishers | 97.4% | 2.6% | 56.5% | 68.2% | 18.6% | 4.2% | 9.0% |
| 47-2061 | Construction Laborers | 96.6% | 3.4% | 44.3% | 76.2% | 15.7% | 4.2% | 3.9% |
| 47-2171 | Reinforcing Iron and Rebar Workers | 96.2% | 3.8% | 45.4% | 72.1% | 17.7% | 5.5% | 4.7% |

Endnotes

- ⁱ Induced employment is a result of household spending from direct and indirect jobs created in the construction, manufacturing, professional, and other supply chain industries; the reinvestment or spending of these workers' earnings creates additional "induced" jobs in food service, retail, childcare, healthcare, etc.
- ⁱⁱ New York State Senate. Senate Bill S4955. 2021-2022 Legislative Session. <https://www.nysenate.gov/legislation/bills/2021/s4955>.
- ³ All data referenced in this section is taken from the 2021 Jobs Study published by NYSERDA in December 2021; the full report can be accessed at this link: <https://climate.ny.gov/Climate-Resources>. For more detail on each scenario's key assumptions, please refer to pages 71 and 72 of the New York State Climate Action Council Draft Scoping Plan: <file:///C:/Users/SarahLehmann/Downloads/2021-12-17-Draft-Scoping-Plan-for-Council-Consideration.pdf>.
- ⁴ Induced employment is a result of household spending from direct and indirect jobs created in the construction, manufacturing, professional, and other supply chain industries; the reinvestment or spending of these workers' earnings creates additional "induced" jobs in food service, retail, childcare, healthcare, etc.
- ⁵ Other supply chain industries largely consist of wholesale trade, utilities, and repair and maintenance.
- ⁶ All time frame estimates were compiled from the UK Offshore Wind Industry: Supply Chain Review and The Workforce Opportunity of Offshore Wind in New York reports.
- ⁷ NYSERDA: Offshore Wind Projects. <https://www.nyserd.ny.gov/All-Programs/Programs/Offshore-Wind/Focus-Areas/NY-Offshore-Wind-Projects>
- ⁸ All lifetime cost estimates were compiled from the *UK Offshore Wind Industry: Supply Chain Review* report.
- ⁹ All workforce addition estimates were compiled from the New York State and the Jobs of Offshore Wind Energy report.
- ¹⁰ Bureau of Labor Statistics, Quarterly Census of Employment and Wages (QCEW), 2020 Annual Average. Data accessed August 2021.
- ¹¹ Id.
- ¹² Worker shortages for some occupations may be overstated because the number of educational "completions" are not counted or non-existent. For example, Materials Moving Workers occupations do not require formal training, and therefore have no annual educational completions. However, this gap is still cited as moderate because the number of new workers needed exceeds supply. This may also reflect a classification issue, as materials movers may be classified under several other similar occupations. Though this occupation requires relatively little training or onboarding, current labor shortages across many occupations may exacerbate any existing shortages.
- ¹³ Note: The program at the Suffolk County Community College is still under development and the program material has not yet been finalized.
- ¹⁴ These four institutions include Erie Community College, Erie 1 BOCES, Rochester Institute of Technology, and Mohawk Valley Community College.
- ¹⁵ New York State Department of Labor. Eligible Training Provider List. <https://applications.labor.ny.gov/ETPL/Search.faces>. Accessed November 2021.
- ¹⁶ Data as of 2021Q2 from JobsEQ.

NYSERDA, a public benefit corporation, offers objective information and analysis, innovative programs, technical expertise, and support to help New Yorkers increase energy efficiency, save money, use renewable energy, and reduce reliance on fossil fuels. NYSERDA professionals work to protect the environment and create clean-energy jobs. NYSERDA has been developing partnerships to advance innovative energy solutions in New York State since 1975.

To learn more about NYSERDA's programs and funding opportunities, visit nyserda.ny.gov or follow us on Twitter, Facebook, YouTube, or Instagram.

**New York State
Energy Research and
Development Authority**

17 Columbia Circle
Albany, NY 12203-6399

toll free: 866-NYSERDA
local: 518-862-1090
fax: 518-862-1091

info@nyserda.ny.gov
nyserda.ny.gov



NYSERDA

State of New York

Kathy Hochul, Governor

New York State Energy Research and Development Authority

Richard L. Kauffman, Chair | Doreen M. Harris, President and CEO