GOVERNOR'S
Energy Office

2022 Maine
Clean Energy
Workforce Analysis Report

PRODUCED FOR THE STATE OF MAINE, GOVERNOR'S ENERGY OFFICE

[bw] RESEARCH PARTNERSHIP

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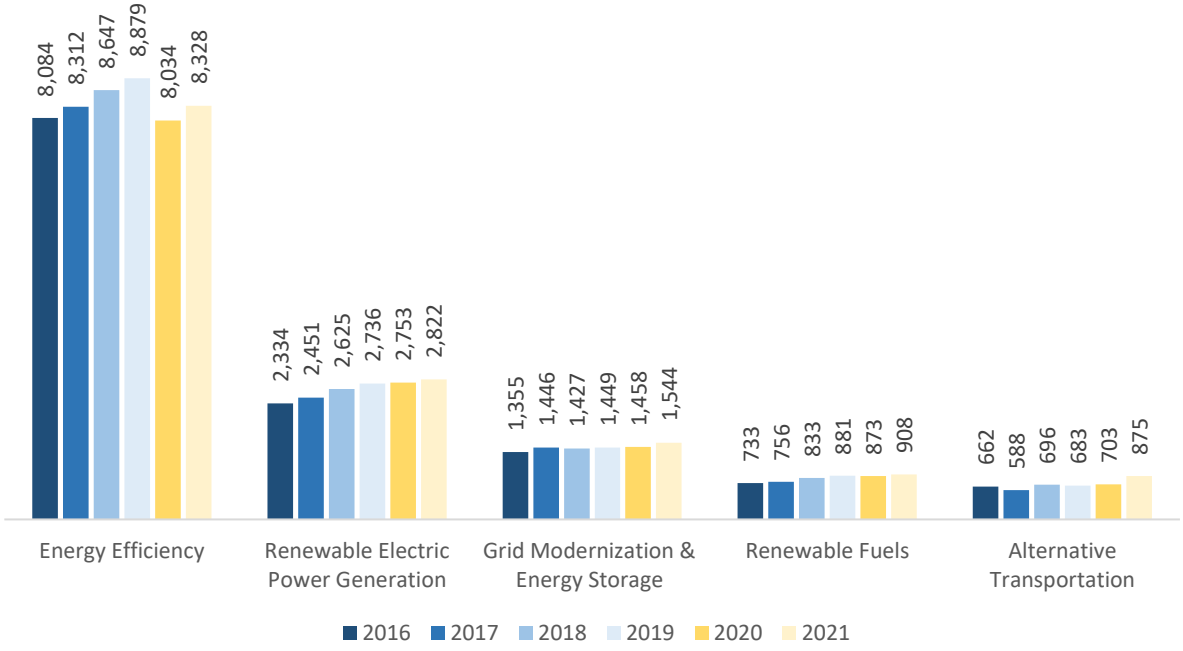
Introduction

The Governor's Energy Office for the State of Maine commissioned BW Research Partnership to conduct primary and secondary research into the workforce and hiring landscape for Maine's clean energy industry. This report is the third in a series of reports focused on supporting clean energy workforce development literature and research in Maine, including the 2021 Maine Clean Energy Industry Report and the 2022 Maine Offshore Wind Talent Analysis. The conclusions that arise out of the collective research across these three efforts complement each other to produce the strategic recommendations that can be found in this Clean Energy Workforce Analysis Report.

As of the end of 2021, there were roughly 14,500 clean energy workers across Maine. The sector saw significant job growth prior to the global pandemic; from 2016 through 2019 clean energy businesses grew their workforce by 11 percent—creating roughly 1,500 jobs in three years.[1] This report also found that across all clean energy-related occupations—jobs that could be conducting clean energy work but are not necessarily doing so currently, such as electricians or HVAC mechanics—there were a total 142,287 clean energy-related jobs across Maine.[2]

FIGURE 1. CLEAN ENERGY EMPLOYMENT IN MAINE, 2016-2021[3]



Over the next decade, the state's environmental and clean energy statutory requirements and goals will create continued demand for clean energy jobs. A recent report released by the National Renewable Energy Laboratory (NREL) highlights the projected employment growth over the next decade across key

[1] This data is taken from the annual United States Energy and Employment Report published by DOE. Maine is also releasing a 2021 Maine Clean Energy Industry Report, which includes full detail on clean energy jobs in the state.
[2] For more information on clean energy-related employment, please see the Clean Energy Labor Supply section of this report.
[3] Department of Energy, U.S. Energy and Employment Report.

technology sectors in Maine, including solar, wind, battery, and energy efficiency.[4] Maine's overall Economic Development Strategy workforce goals include to attract 75,000 workers and increase wages by 10 percent, and Governor Mills has announced a clean energy-specific goal to create 30,000 clean energy jobs by 2030.

To support the continued expansion of Maine's clean energy sector, this research is aimed at better understanding the needs, challenges, and bottlenecks for clean energy businesses across the state.

The primary objectives of this research effort are as follows:

1. Identify the workforce needs and hiring challenges of clean energy firms, including skill and education requirements

2. Profile the landscape of clean energy training opportunities as well as other business assets and resources offered by federal and state agencies

3. Understand the overall awareness, priorities, preferences, and interests of potential clean energy workers

4. Identify program needs and partnership opportunities across stakeholders in the clean energy sector

The research presented here is a synthesis of surveys with clean energy businesses and workers and the general population in Maine; executive interviews with employers, utilities, union groups, and business associations; and secondary data on current labor market trends for clean energy-related occupations, training programs, and other assets and resources.

For more information on the survey methodology for this research, please refer to Appendix A of this report.

[4] NREL. State-Level Employment Projections for Four Clean Energy Technologies in 2025 and 2030. March 2022. https://www.nrel.gov/docs/fy22osti/81486.pdf.

Executive Summary

Key Findings

Overall, Maine's clean energy workforce is strong, economically resilient, and growing, with building electrification, weatherization, and other energy efficient measures accounting for most of the clean energy work in the state. Clean energy employers are also optimistic about continued growth, with 45 percent of surveyed businesses indicating that they will grow their workforce over the next 12 months.

With clean energy workers in the state indicating high satisfaction with their careers, Maine has a significant opportunity to bridge the workforce gap by expanding outreach and raising awareness of the benefits of clean energy careers amongst key populations in the state, including individuals seeking asylum, individuals with refugee status, migrant workers and their families, middle and high schoolers, and disenfranchised or underserved communities.

The key findings from this research are broken out into the following sections:

1. Clean Energy Occupational Overview
2. Clean Energy Careers Profile
3. Clean Energy Employer Needs & Challenges
4. Clean Energy Awareness, Perceptions, & Interest

CLEAN ENERGY OCCUPATIONAL OVERVIEW

As of the end of 2021, there were about 14,500 clean energy workers in Maine and 142,287 clean energy-related workers. These 14,500 workers spend at least some amount of their labor hours dedicated to clean energy goods and services and are spread across multiple technology sectors. Energy efficiency accounts for the majority of employment, with more than half of all clean energy jobs in the state. The remaining jobs are spread across renewable electric power generation, grid modernization and energy storage, renewable fuels, and alternative transportation technologies.[5] In addition to these clean energy-specific jobs, there were a total 142,287 clean energy-related jobs across Maine.[6] This includes all workers in occupations that are clean energy-related, such as electricians and HVAC mechanics, that are not necessarily conducting clean energy work currently but could in the future.

Maine had an above-average concentration of clean energy-related construction jobs compared to the national, Northeast, and New England average. In 2021, the concentration of clean energy-related construction jobs in Maine was 1.2 times greater compared to the concentration across the U.S., 1.37 times more than the Northeast concentration, and 1.27 times more than the New England concentration. There were 33,306 clean energy-related construction workers in Maine in the third quarter of 2021, representing 5.1% of all jobs in Maine. The state also has above-average concentrations of clean energy-related installation, maintenance, and repair; production; transportation and material moving; and agriculture jobs compared to both national and regional averages (see Table 2).

[5] https://www.energy.gov/policy/us-energy-employment-jobs-report-useer
[6] For more information on clean energy-related employment, please see the Clean Energy Labor Supply section of this report.

Solar photovoltaic installers in Maine experienced the second largest percentage increase in employment between 2015 and 2021. Behind only farmworkers and laborers of crop, nursery, and greenhouses, solar photovoltaic installers grew by 60.1% between the third quarter of 2015 to the third quarter of 2021.

Employment in clean energy-related sales and administrative support occupations declined by 10.6% between 2015 to 2021. This decline may be attributed in part to the impacts of the COVID-19 pandemic. Between the first quarter of 2015 to the fourth quarter of 2019, employment in the clean energy-related sales and administrative support occupations had an average quarterly percentage decrease of 0.4%. As of the third quarter of 2021, there were 13,690 clean energy-related sales and administrative support occupations in Maine. Clean energy-related sales and administrative support occupations accounted for 9.6% of Maine's clean energy-related occupations in the third quarter of 2021.

Maine had a significantly higher concentration of layout workers in metal and plastic compared to the national, Northeast, and New England average. In the third quarter of 2021, the concentration of layout workers in metal and plastic in Maine was 22.8 times greater compared to the U.S. average, 18.77 times more than Northeast concentration, and 6.93 times more than the New England concentration.

CLEAN ENERGY CAREERS PROFILE

Experience and professional licenses and certifications are key to working in the clean energy industry. Survey results from both current clean energy workers and clean energy employers highlight the importance of work experience and professional certifications. Most clean energy workers indicated that their highest level of educational attainment was either a high school diploma or vocational technical training, and the majority either already have a professional license or certification or are currently working towards one. Most clean energy workers also had at least several months of experience before landing their current clean energy position, with 58.5 percent noting that they had more than three years of related work experience. Similarly, employers indicated that experience is key, particularly for their entry-level production/assembly and installation/repair workers.

Clean energy workers have the opportunity for upward wage mobility and other career benefits. Many surveyed workers began their careers with annual wages that were less than $50,000 but have since grown their salaries to $50,000 to $100,000 per year; about a quarter of surveyed clean energy workers indicated earning more than $100,000 per year. Clean energy employees also indicated other career benefits, including healthcare, retirement, paid vacation and sick time, flexible work hours and schedules, company vehicles, the ability to work from home, tuition support, and transportation stipends.

Career satisfaction is high among clean energy workers. About nine in ten surveyed clean energy workers are satisfied (very or somewhat satisfied) with their current careers (87.8 percent). At least six in ten workers are satisfied with each of the following aspects of their clean energy careers: sense of belonging and acceptance at their company for individuals of all backgrounds, opportunities for promotion and higher wages, opportunities to learn new skills and move up a promising career ladder,

current wages, and the overall benefits packages received from their employers. These high levels of satisfaction indicate that career retention in the clean energy industry is also high.

Clean energy careers offer opportunities for career advancement. Most surveyed clean energy workers expect to advance in their career either within their current company or at another company in the clean energy industry. Just under half of individuals expecting advancement indicated that they project to move into leadership roles, such as directors, executives, or managers, and the majority of surveyed clean energy workers projected career advancement indicated that their do not foresee any obstacles to their promotion.

Career navigation in the clean energy industry most often relies on word of mouth; internships and apprenticeships are low on the list of job search resources. Six in ten current clean energy workers indicated that they regularly rely on word of mouth when searching for new job opportunities. Fewer than 11 percent of respondents reported regularly connecting to new job opportunities via apprenticeships or internships.

Participation in on-the-job training through clean energy apprenticeships and internships is low. Few surveyed clean energy workers indicated having participated in an apprenticeship or internship program related to their current position. About a third of surveyed clean energy workers (32.6 percent) reported that they had participated in a related apprenticeship program and only 15 percent indicated they had participated in an internship program. Of those who participated in these programs, fewer than 40 percent noted that it improved their ability to land a job.

CLEAN ENERGY EMPLOYER NEEDS & CHALLENGES

Clean energy employers are projecting job growth over the next 12 months. Forty-five percent of surveyed clean energy employers indicated that they will hire more full-time employees in the next year, and 16.7 percent expect to add more part-time employees as well. The majority of employers predicted to have at least the same number of full-time workers (54.8 percent) and part-time workers (71.4 percent) in 12 months.

Clean energy employers have had difficulty filling open positions. Nine in ten surveyed clean energy employers reported that hiring was either very or somewhat difficult (90.5 percent), with almost half indicating it had been very difficult (47.6 percent). The most difficult positions to fill include managers and supervisors, HVAC and field or repair technicians, installation positions, and engineering positions.

Employers indicated that a small applicant pool was the greatest challenge to filling open clean energy positions. Six in ten surveyed employers agreed (strongly or somewhat) that there are not enough applicants for their firm's open positions (61.9 percent). When asked with an open-ended question the top two reasons for hiring difficulty, more than half of surveyed employers indicated it was a small applicant pool (52.6 percent) followed by lack of experience or industry-specific knowledge and insufficient non-technical skills.

Working with advanced technologies is common among clean energy employers, though there are some challenges and barriers to entry. About six in ten employers indicated that they do currently offer

or work with advanced technologies[7], citing reasons such as environmental benefits, customer demand, and supportive rebates and incentives. However, firms did cite some barriers to offering these technologies, including expense, lack of demand, and insufficient cost savings. Insufficient training or certification for current employees to work with advanced technologies was a particularly significant barriers; in fact, eight in ten firms who do not currently work with advanced technologies indicated that they would support a program that provided funds or reimbursement for the costs of additional training or certification that would allow their employees to work with advanced technologies.

CLEAN ENERGY AWARENESS, PERCEPTIONS, & INTEREST

Maine residents searching for a new job want better wages or benefits and a more fulfilling career that relates to their long-term goals. More than half of surveyed potential clean energy workers are searching for a new job in order to secure better pay or benefits (53.8 percent), while one in seven would like to find a career that is more fulfilling and relates to their long-term goals (15.0 percent).

Healthcare, high wages, and retirement benefits are important for potential clean energy workers. These items topped the list of tested employment characteristics, with at least 85 percent of survey respondents indicating that healthcare, high wages, and retirement benefits are either very important or important to them when they are deciding where to work. Additionally important career characteristics include opportunities for advancement, professional growth and skill development as well as flexible work schedules; these were cited as important by at least three-quarters of respondents. Half of survey respondents also indicated that the opportunity to go back to school while working and company commitment to sustainability and a positive environmental impact are also key decision points in choosing a new job.

While there is some notable interest in building a career in clean energy sectors, the general population is hesitant to apply for clean energy job listings; this may be due to lack of awareness as noted below. About three to five in ten survey respondents reported that they would be interested in building a career in the solar energy (48.6 percent), building efficiency (41.1 percent), wind energy (39.4 percent), and electric vehicle sectors (30.1 percent). However, few survey respondents indicated that they would apply for a new job listing or opportunity in the clean energy industry. More than half of potential workers indicated they were not likely to apply, and one in eight reported it depends; about a third indicated that they were very or somewhat likely to apply for a new clean energy job posting.

Potential workers are mostly unaware of what types of clean energy jobs or positions are available and where to find clean energy job postings or related training and education. When asked about their awareness of any clean energy jobs or positions, nearly all survey respondents indicated that they could not specify any job titles or occupations. Furthermore, seven in ten survey respondents indicated that they are not aware of clean energy training opportunities in their area (68.8 percent), and 54.8 percent indicated that they are not sure where to look for or find clean energy job postings.

[7] Advanced technologies include all high efficiency and ENERGY STAR-rated HVAC technologies, such as hybrid heat split systems and heat pumps, duct-free or ductless air conditioning and heating systems as well as weatherization, building insulation, and efficient lighting.

Maine's general population is largely unaware of the attributes and characteristics of clean energy careers. At least half to just over two-thirds of respondents indicated that they neither agreed nor disagreed regarding clean energy firms' salary and benefit offerings, work schedules, geographic desirability, equitable and diverse workplace environments, and opportunities for career advancement. Furthermore, few surveyed potential workers know people who work in the clean energy industry; 45.5 percent of survey respondents disagreed with this statement.

CLEAN ENERGY TRAINING LANDSCAPE

Out of all clean energy training programs examined, Maine has the highest capacity to train for construction-oriented careers which include welding, a high demand category for early-stage wind construction projects. Two major entities that offer training for careers in construction are apprenticeships offered by Portsmouth Naval Shipyard or General Dynamics Bath Iron Works. The high-level training offered by these two shipyards produces welders, pipefitters, and painters, among others, whose skills are applicable to clean energy projects. Programs training HVAC workers are mostly offered at community colleges; HVAC programs offered as apprenticeships are directly tied to industrial construction work whereas programs offered by community colleges and private companies focus on home plumbing and installation. Programs training machinists are offered by community colleges and apprenticeships, with the apprenticeship programs directly training workers for construction careers.

Over three quarters of the total identified programs are offered as apprenticeships by shipyards and community colleges. Kennebec Valley Community College (KVCC), Southern Maine Community College (SMCC), and Northern Maine Community College (NMCC) offered a combined total of over 40 programs training for careers in technologies related to renewable electric power generation and energy efficiency. While Maine has the infrastructure to train individuals from high school through the Career and Technical Education (CTE) network of high schools they already have established, less than five percent of clean energy-related programs were offered at the CTE schools.

Cumberland and Somerset counties offered the highest number of training programs.[8] Over 50 percent of the programs hosted in Cumberland County are found at Southern Maine Community College (SMCC) followed by associations offering apprenticeships at different zip codes within the county. Somerset County offered the second highest number of training programs, over 80 percent of which were offered by Kennebec Valley Community College (KVCC). Although the Maine community college system promises to be highly beneficial for residents seeking training for clean energy jobs, the high concentration of training in the zip codes where KVCC and SMCC are may pose a challenge for them in terms of access to community college programs related to clean energy.

Over 95 percent of identified training programs are related to renewable electric power generation and energy efficiency. Of the programs training for positions in electric power generation, solar and wind training make up the highest number of programs identified. Solar electric generation programs train for module installers and electricians whereas wind electric generation programs train engineers and welders for wind technician positions.

[8] Cumberland County is home to 22 percent of residents in Maine; its surrounding counties of York, Oxford, Androscoggin, and Sagadahoc account for 30 percent of the population. Somerset county is home to about four percent of the population.

Among the varied outcomes from identified programs, certificates accounted for most of the program outcomes for graduates. About 38 percent of programs result in a certification and approximately 12 percent of the training programs—offered by community colleges—result in associate degrees. Many programs also do not result in tangible certifications or degrees, but rather result in increased employability, college credits, exam prep, or internship credits. For more information, please see the Clean Energy Training Landscape section of this report.

Conclusions & Recommendations

Over the last several years, Maine's clean energy sector has continued to grow in employment. Supporting the creation of roughly 2,000 jobs over the last five years, the clean energy economy is projected to continue on this growth trajectory. At the end of 2021, there were about 14,500 clean energy workers, and the state has policy goals in place expecting to double this number by 2030.

In addition to strong job growth, Maine boasts above-average concentrations of construction and installation jobs—occupations which are pivotal to the clean energy sector. This highlights a strong regional training infrastructure for these types of jobs. At the same time, clean energy workers across the state are highly satisfied with their careers, including wages, benefits, and opportunities for upward mobility. However, the sector is facing some challenges to expansion. A small applicant pool that correlates with low unemployment, unqualified candidates, and generally low awareness of career opportunities are likely to create bottlenecks in clean energy job growth across the state. With improved connectivity, knowledge sharing, and education and outreach, the state can take advantage of its strong network of community colleges, technical schools, and union apprenticeship programs, meeting the needs of clean energy businesses today and into the future.

In order to ensure that the state's workforce and training infrastructure are able to efficiently and rapidly meet the needs of this fast-growing sector, the Governor's Energy Office commissioned this Workforce Analysis Report as well as the 2021 Maine Clean Energy Industry Report and the 2022 Maine Offshore Wind Talent Analysis. Altogether, these three research efforts provide insight into the strengths, gaps, needs, and opportunities for Maine. The following recommendations represent the culmination of collective research across these three reports.

Ultimately, given the state's marked strength in construction, energy efficiency, and the building trades as well as efforts to reduce fossil fuel reliance through the installation of heat pumps and other modes of electrification, focused workforce development efforts on the construction and building trades is poised to have a significant impact. Though many of the following recommendations may apply more broadly to the clean energy sector, it is recommended that these be taken with a more specific focus on building electrification. Many of the below recommendations should also be considered in the context of the community colleges' recent announcement of free tuition for up to two years for qualifying students. For each of the five main recommendation areas or themes presented below, the research team facilitated a human-centered design session with clean energy stakeholders in Maine to generate specific action recommendation action items that would fall under each major area.

1. **Expand access to apprenticeships and other earn-and-learn models.** There are several under-engaged populations that could potentially be transitioned into sustainable clean energy careers. Increased outreach to asylum seekers, refugees, migrant workers and their families, middle and high schoolers, disenfranchised or underrepresented groups, workers transitioning out of low wage jobs, and individuals re-entering the workforce could build a significant talent pipeline for the clean energy sector. Supporting pre-apprenticeships and pathways to apprenticeships, as well as embedding pre-apprenticeship offerings in relevant educational and workforce development programming are potential methods of support. Outreach efforts should be coupled with other employment support programs, such as wrap-around services, to ensure individuals are able to effectively participate in training programs.

2. **Increase offerings of hands-on courses and modules geared towards learning "trade skills" in early education.** Including these courses in middle and high school increases exposure to trade positions, and these additional modules could simply be built into existing math or science programs. In addition to reincorporating trade skills back into educational curriculums, generally increasing the awareness of clean energy careers among youth and young adults could boost the clean energy talent pipeline. There is generally low awareness of not only what job opportunities are available, but also the wages, benefits, satisfaction, and other details of clean energy jobs. Education and recruitment efforts can connect to young adults and show them both the career benefits and mission-oriented work in the clean energy industry, particularly in the building electrification sector. Education of teachers and counselors about job opportunities and career pathways in the trades and clean energy is a key area for support. This may be supplemented with improved marketing and communications for job listings and available training programs, career and site visits from businesses and industry leaders, or marketing videos with testimonials from current clean energy workers.

3. **Create a clearinghouse for clean energy workforce development efforts, resources, and funds in the state.** Similar to MassCEC or NYSERDA[9], Maine could benefit from a central organization that coordinates all clean energy workforce development efforts in the state. An expansion of the MCCS model, or something akin to it, where resources are centrally-housed for both employers and jobseekers. This organization could create and sustain key partnerships, holding convenings and hosting roundtables amongst education and industry stakeholders to ensure the proper programming and courses are created. Additionally, shared success stories and case studies could provide learning opportunities for others seeking to enter the industry and sharing training and career pathways with multiple tracks and benchmarks would be useful information for prospective clean energy workers. In general, a single entity through which all stakeholders—community colleges, technical schools, middle and high schools, utilities, labor unions, and businesses—coalesce their efforts would help to streamline clean energy workforce development in Maine.

4. **Offer training stipends and other incentives to support business' onboarding, recruitment, and training costs.** This is especially important to increasing the opportunities for on-the-job, hands-on learning for clean energy, and especially building electrification, careers. Creating a vocational internship program, similar to MassCEC's, would alleviate some risk for employer who are seeking to hire and train workers for open positions while at the same time connecting jobseekers to clean energy careers. This type of program would also develop partnerships amongst industry and the state, streamlining the talent search from recruitment and training to eventual onboarding. Additional support and technical assistance to help job seekers and employers navigate new resources is also key.

5. **Provide pathways to independence and entrepreneurship, particularly for lower-wage jobs in weatherization.** Though most clean energy careers offer career mobility and high job quality, there is opportunity for improvement in the weatherization sector. High-road job creation and job quality standards are generally focused on the renewable energy sector, but the buildings sector requires unique consideration. Though the same types of policy instruments may not

[9] https://www.masscec.com/ or https://www.nyserda.ny.gov/

apply for weatherization jobs as offshore wind, for example, these trades do offer the opportunity for business ownership. Subsidizing training costs for individuals to receive Building Performance Institute (BPI) certification, stipends to purchase tools and other equipment, business coaching, and other forms of entrepreneurial support could ensure more sustainable career outcomes for weatherization workers that may seek to go into business on their own.

SPECIFIC ACTION ITEMS

The above broad recommendations represent the major areas of recommended focus for clean energy workforce development in Maine. Within each of these five major categories—i.e., expanding apprenticeship access, increasing awareness in early education, creating a clearinghouse, supporting training stipends, and providing pathways to entrepreneurship—a group of stakeholders came together for a human centered design session to develop distinct action items under each of the five major recommendation areas above. Across all action items that were developed over the course of the design session, the group voted on their top items in each of the five categories.

The ultimate result of this design session culminated into 11 specific action items that were eventually plotted by importance and difficulty for implementation. At a high level, the action items included the following:

1. Embed more pre-apprenticeship offerings
2. Support pre-apprenticeships and pathways to apprenticeships
3. Educate teachers, counselors, etc. about career pathways in the trades and clean energy
4. Increase coordination and create partnerships between industry associations, unions, and schools for programs
5. Provide support/technical assistance to help job seekers and employers navigate new resources
6. Establish a model like Maine Jobs and Recovery Plan Healthcare Coordinating Team
7. Share clear training and career pathways with multiple tracks and benchmarks for prospective clean energy workers
8. Provide flexible funding to support learners
9. Establish career navigation services similar to the Maine Jobs and Recovery Plan pilot program
10. Share success stories and case studies to provide learning opportunities
11. Incentivize business ownership to current workers through access to preferred capital

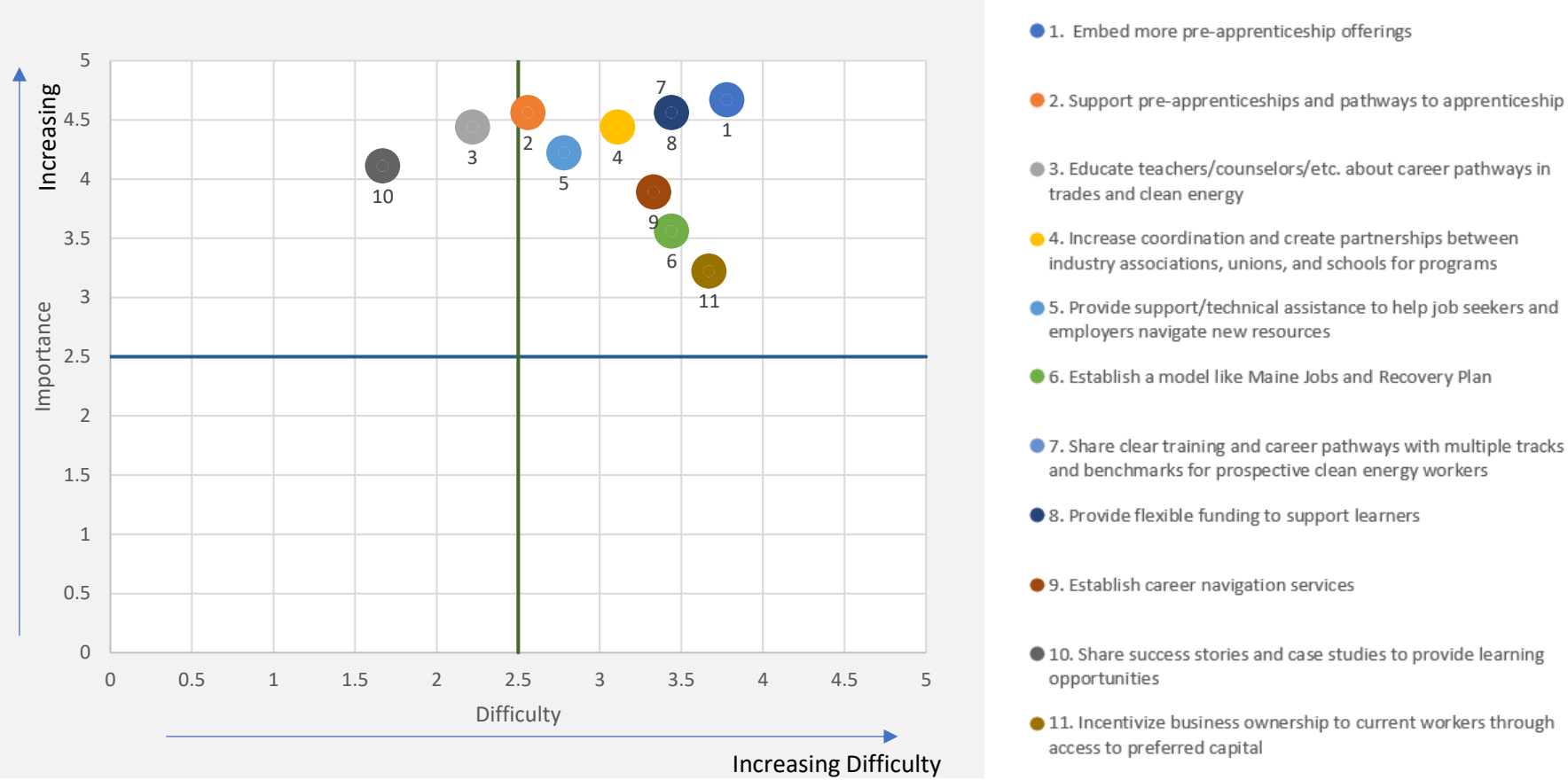
Each of these 11 action items had a high level of average importance across stakeholders, highlighting the need to establish ownership and coordination across agencies for the workforce development actions. The Clean Energy Partnership program can address some of these needs, by acting to increase coordination and create partnerships between various stakeholders to support the clean energy workforce.[10]

While most of the 11 action items received an above average difficulty rating as well, two of them—educating teachers and counselors about career pathways in the trades and clean energy as well as sharing success stories and case studies to provide learning opportunities—received a below average difficulty rating. This indicates that these two action items should top the priority list, as implementation and scaling will be relatively easy.

For a full list of all recommended action items that were discussed during the human centered design session, please refer to Appendix B of this report.

[10] Funded by the Maine Jobs and Recovery Plan, the Clean Energy Partnership is an initiative focused on preparing Maine people for jobs in the growing clean energy and energy efficiency fields, providing avenues for business support, advancing innovation in the clean energy sector, and achieving Governor Mills' goal of reaching 30,000 clean energy jobs in Maine by 2030. The Clean Energy Partnership will be led by the Governor's Energy Office (GEO) and in partnership with the Governor's Office of Policy Innovation and the Future (GOPIF), Maine Department of Labor (DOL) and Maine Department of Economic and Community Development (DECD). The strength of the Clean Energy Partnership lies in the coordinated engagement of industry, support organizations, training and educational institutions, and state government. Accordingly, the Governor's Energy Office has established an Advisory Group of public and private entities in the industry. The Advisory Group will help guide the program development and implementation of the programs established as a part of this initiative, including defining needs, monitoring progress, advising on adjustments, and designing future program development.

FIGURE 2. IMPORTANCE VS. DIFFICULTY OF RECOMMENDATION ACTION ITEMS



Survey Methodology

Maine Clean Energy Employer Survey

BW Research conducted employer interviews with clean energy organizations throughout Maine. The survey instrument was programmed internally by BW Research and each respondent was assigned a unique ID to prevent duplication. The survey was distributed to a list of known clean energy companies in the state via email. Outreach was also conducted via an anonymous link shared by the Governor's Energy Office with known clean energy firms.

The employer survey was fielded between February 22nd and March 18th, 2022 and resulted in 42 total completes. The average survey duration was 10.7 minutes.

Maine Clean Energy Current Worker Survey

BW Research also conducted online surveys of current workers in Maine that were employed in relevant clean energy segments, including:

1. Construction
2. Installation and repair
3. Buildings (building operator, energy auditor, etc.)
4. Manufacturing
5. Other clean energy-related work (incl. professional services such as consulting, engineering, finance, architecture, etc.)

Current workers were recruited through third party online panels of pre-screened potential respondents, were identified in a survey of the overall Maine workforce or were contacted by the Governor's Energy Office and asked to take the survey via an anonymous link. The survey was programmed in-house by BW Research.

The current worker survey was fielded between March 10th and April 10th, 2022. There were 53 respondents in total. The average survey duration was 9.1 minutes.

Maine Potential Worker Survey

BW Research conducted a survey of potential workers in Maine (18-64 years old). To qualify for the survey, potential respondents had to be residents of Maine and either be working, not working but looking for employment, or working and currently looking for new employment. The overview of the potential survey methodology is included in the table below. Potential worker respondents were recruited through listed sample of 18-to-64-year-olds in the state of Maine.

TABLE 1. OVERVIEW OF POTENTIAL WORKER SURVEY METHODOLOGY

Method	Online Survey (Email)
Universe	815,426[11] Residents 18 Years and Older in Maine
Number of Respondents	308 Potential Workers Completed a Survey
Average Length	6.4 minutes
Field Dates	March 10th through April 3rd, 2022
Margin of Error	The *maximum* margin of error for questions answered by all 308 respondents was +/-5.58% (95% level of confidence)

Human Centered Design Thinking Session

BW Research fielded a design session with clean energy and workforce development stakeholders in Maine on August 9, 2022 for 1.5 hours. The purpose of this session was to dive deeper into the initial conclusions and recommendations that came out of the research for this report. The design session resulted in a series of actionable recommendation items and their relative importance and difficulty for implementation.

[11] American Community Survey (ACS) 2020 1-year estimates

Clean Energy Labor Supply

The following section provides an overview of all clean energy-related occupations in Maine. Clean energy-related jobs are broken out into the following occupational categories for analysis:

1. Construction
2. Installation, Maintenance, & Repair
3. Production
4. Professional Services
5. Sales & Administrative Support
6. Transportation & Material Moving
7. Agriculture

BW Research has identified 153 potential clean energy-related occupations across the seven categories above. Because there are few "clean energy-specific" occupational titles such as solar PV installers and wind turbine technicians, most clean energy activities are embedded across traditional occupations, such as electricians, HVAC mechanics, or insulation workers. Though not all these jobs are specifically or exclusively engaged in clean energy activities, they are selected for this analysis because these jobs will support clean energy growth in Maine. The purpose of this section is to provide an overview of these clean energy-related occupations, including their current size in Maine's labor market, historical growth rates, regional concentration, and wages.

Clean Energy-Related Occupations in Maine

Overall, in the third quarter of 2021, there were 142,287 clean energy-related jobs in Maine across the 153 occupations.[12] Clean energy-related professional services occupations accounted for 37.6% of all clean energy-related jobs, while clean energy construction occupations followed, accounting for 23.1% of clean energy-related occupations. Between 2015Q3 to 2021Q3, Maine's clean energy-related occupational supply grew by 7.5%. Each of these clean energy occupational groups will be discussed in further detail in the remainder of this section.

Location quotients are a ratio that measures an area's concentration for an industry or occupational group relative to a larger geographic area. Location quotients are useful in identifying if a region specializes in a certain industry or occupational cluster compared to the national or regional average. For example, a location quotient greater than one would indicate that the region has an above-average concentration of these jobs. Clean energy-related construction jobs in Maine have a U.S. location quotient of 1.2, indicating that these occupations are 1.2 times, or 20 percent, more concentrated in Maine compared to the proportion of total jobs in the nation overall.

[12] It is important to note that this number includes the sum of all workers in clean energy-related positions that are not necessarily conducting clean energy work currently, whereas the roughly 14,000 clean energy jobs described elsewhere in this report include only workers that dedicate some amount of their labor hours to clean energy goods and services. For example, all electricians would be included in the 142,287 number, regardless of whether they are working with clean technologies, but only electricians specifically engaging with clean energy technologies are included in the 14,000 number.

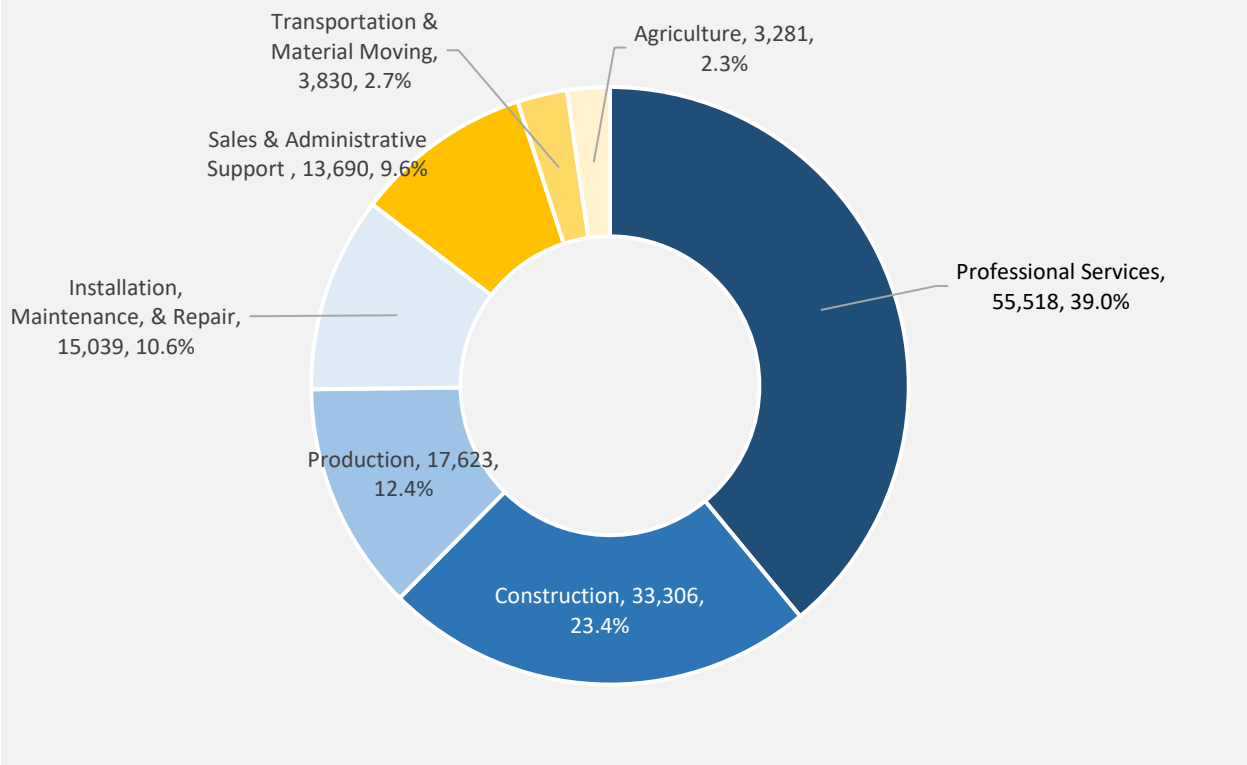
The U.S. location quotient in Table 2 measures the concentration of clean energy-related jobs in Maine compared to their concentration nationally. The Northeast and New England location quotients highlight the relative concentration of clean energy-related occupations in Maine compared to the Northeast or New England regions. In general, Maine has a higher concentration of clean energy-related construction; installation, maintenance, and repair; production; transportation and material moving; and agriculture jobs compared to both national and regional averages (Table 2).

TABLE 2. CLEAN ENERGY-RELATED OCCUPATIONS IN MAINE BY OCCUPATIONAL GROUP[13]

Occupational Group	Total Clean Energy-Related Jobs in Maine, 2021Q3	% Change in Employment in Maine, 2015Q3 – 2021 Q3	U.S. Location Quotient (LQ)	Northeast Location Quotient (LQ)[14]	New England Location Quotient (LQ)[15]	Median Hourly Wage in Maine
Construction	33,306	8.8%	1.20	1.37	1.27	$21
Installation, Maintenance, & Repair	15,039	7.0%	1.03	1.12	1.23	$25
Production	17,623	6.6%	0.96	1.24	1.07	$22
Professional Services	55,518	11.5%	0.94	0.94	0.83	$38
Sales & Administrative Support	13,690	-10.6%	0.94	0.95	0.94	$27
Transportation & Material Moving	3,830	-3.7%	0.98	1.23	1.64	$25
Agriculture	3,281	60.3%	1.07	2.77	2.40	$27

[13] JobsEQ & Bureau of Labor Statistics, Occupational Employment and Wage Statistics: https://www.bls.gov/oes/current/oes_me.htm.
[14] Northeast is defined by the U.S. Census Bureau as Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
[15] New England is defined by the U.S. Census Bureau as Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont.

FIGURE 3. CLEAN ENERGY-RELATED OCCUPATIONS IN MAINE (TOTAL JOBS & PERCENT OF TOTAL)



CONSTRUCTION

There are 34 clean energy-related construction occupations. In the third quarter of 2021, Maine had 33,306 jobs across the 34 construction occupations. Carpenters; construction laborers; electricians; first-line supervisors of construction trades; and plumbers, pipefitters, and steamfitters accounted for 65.5% of Maine's clean energy construction occupations.

Between the third quarter of 2015 and the third quarter of 2021, total clean energy-related construction jobs increased by 8.8%. Solar photovoltaic installers experienced the largest percentage increase during this time (60.1%), followed by electricians at 22.5% growth. Mechanical insulation workers were 2.43 times more concentrated in Maine compared to the U.S concentration and 3.73 times more than the Northeast concentration. The concentration for potential clean energy construction occupations in Maine was 1.20 times the concentration in the U.S, 1.37 times the concentration in the Northeast, and 1.27 times the concentration in New England.

All 34 potential clean energy construction occupations had a median hourly pay that is higher than Maine's minimum wage of $12.15 in 2021.[16] There were seven occupations that had a median hourly pay above $25.00 dollars in 2021. First-line supervisors of construction trades and extraction workers

[16] Maine Department of Labor: https://www.maine.gov/labor/labor_laws/minimum_wage_faq.html.

and boilermakers had the highest median hourly pay ($28.00) across all potential clean energy construction occupations in Maine (Table 3).

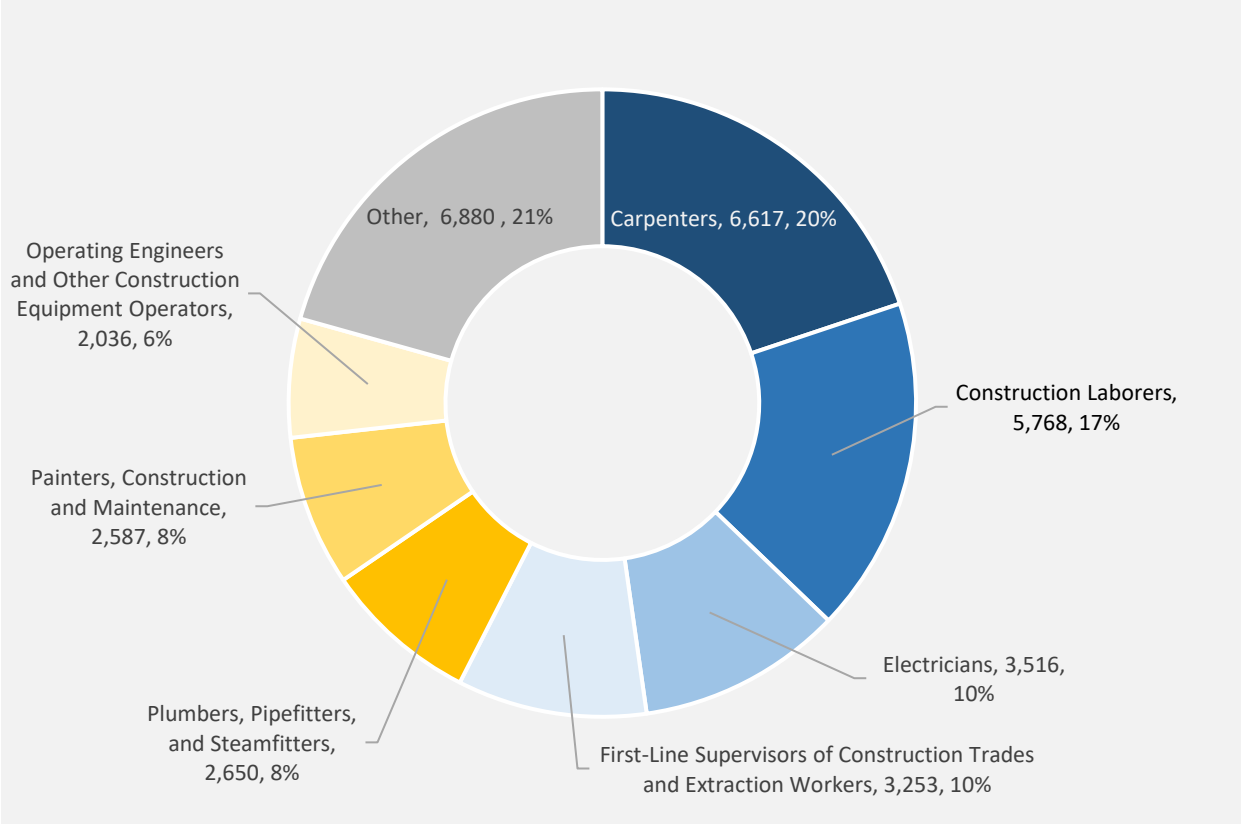
TABLE 3. CLEAN ENERGY-RELATED CONSTRUCTION OCCUPATIONS IN MAINE[17]

SOC	Occupation	Maine Total Jobs, 2021 Q3	Percent Change (2015 to 2021)	U.S. Location Quotient (LQ)	Northeast Location Quotient (LQ)	New England Location Quotient (LQ)	Entry Hourly (10th percentile)	Median Hourly	Experienced Hourly (90th percentile)
Total Construction Occupations		**33,306**	**8.8%**	**1.20**	**1.37**	**1.27**	**$15**	**$21**	**$30**
47-2031	Carpenters	6,617	1.3%	1.61	1.66	1.52	$16	$22	$30
47-2061	Construction Laborers	5,768	18.2%	1.01	1.11	1.14	$12	$17	$23
47-2111	Electricians	3,516	22.5%	1.11	1.21	1.10	$18	$27	$35
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	3,253	12.8%	1.09	1.40	1.18	$20	$28	$39
47-2152	Plumbers, Pipefitters, and Steamfitters	2,650	14.7%	1.28	1.33	1.20	$19	$26	$32
47-2141	Painters, Construction and Maintenance	2,587	4.7%	1.67	1.79	1.51	$15	$23	$30
47-2073	Operating Engineers and Other Construction Equipment Operators	2,036	6.7%	1.17	1.48	1.37	$15	$20	$30
47-2051	Cement Masons and Concrete Finishers	899	8.2%	1.05	1.84	1.88	$15	$21	$31
47-2181	Roofers	706	8.4%	1.03	1.56	1.45	$13	$18	$26
47-2211	Sheet Metal Workers	628	4.9%	1.07	1.32	1.16	$20	$27	$32
47-2081	Drywall and Ceiling Tile Installers	495	3.8%	0.92	1.11	0.99	$12	$21	$30
47-4011	Construction and Building Inspectors	493	21.9%	0.93	0.83	0.99	$20	$27	$39
47-3013	Helpers--Electricians	489	6.1%	1.52	1.66	1.74	$13	$17	$23
47-2021	Brickmasons and Blockmasons	344	-13.0%	1.16	1.12	1.16	$17	$23	$29
47-2071	Paving, Surfacing, and Tamping Equipment Operators	337	-2.6%	1.66	2.04	1.64	$13	$19	$27
47-2132	Insulation Workers, Mechanical	305	0.0%	2.43	3.76	2.10	$18	$25	$31
47-2221	Structural Iron and Steel Workers	276	16.1%	0.90	1.09	1.12	$16	$24	$31
47-3012	Helpers--Carpenters	221	-31.1%	1.65	1.72	1.51	$14	$17	$20
47-4041	Hazardous Materials Removal Workers	219	7.7%	1.14	0.98	1.03	$16	$20	$26

[17] JobsEQ & Bureau of Labor Statistics, Occupational Employment and Wage Statistics: https://www.bls.gov/oes/current/oes_me.htm.

SOC	Occupation	Maine Total Jobs, 2021 Q3	Percent Change (2015 to 2021)	U.S. Location Quotient (LQ)	Northeast Location Quotient (LQ)	New England Location Quotient (LQ)	Entry Hourly (10th percentile)	Median Hourly	Experienced Hourly (90th percentile)
47-2131	Insulation Workers, Floor, Ceiling, and Wall	201	21.7%	1.45	1.86	1.02	$12	$16	$25
47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	190	-2.0%	0.77	1.03	1.09	$13	$15	$22
47-2151	Pipelayers	165	-15.4%	1.11	2.65	2.25	$17	$22	$28
47-2121	Glaziers	125	9.5%	0.53	0.74	0.68	$16	$21	$38
47-2161	Plasterers and Stucco Masons	113	-17.8%	0.96	1.13	1.00	$13	$20	$35
47-2082	Tapers	111	-17.7%	1.15	1.72	1.19	$20	$23	$31
47-3019	Helpers, Construction Trades, All Other	102	17.4%	0.86	1.11	1.07	$12	$16	$20
47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	85	-22.2%	0.95	1.05	1.06	$16	$18	$24
47-2022	Stonemasons	84	-7.6%	1.32	1.41	1.26	$13	$19	$31
47-2171	Reinforcing Iron and Rebar Workers	71	19.1%	0.72	1.06	1.04	$14	$21	$38
47-2011	Boilermakers	64	-9.3%	0.98	1.39	1.44	$16	$28	$43
47-2231	Solar Photovoltaic Installers	46	60.1%	0.78	0.79	0.89	$16	$19	$24
47-2072	Pile Driver Operators	41	-0.6%	2.14	2.71	1.55	$14	$17	$48
47-3014	Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	37	-21.8%	0.89	1.23	1.01	$12	$13	$20
47-3016	Helpers--Roofers	33	-35.9%	0.86	1.49	1.32	$12	$14	$19

FIGURE 4. CLEAN ENERGY-RELATED CONSTRUCTION OCCUPATIONS (TOTAL JOBS & PERCENT OF TOTAL)



INSTALLATION, MAINTENANCE, & REPAIR

There are 18 clean energy-related installation, maintenance, and repair occupations. In the third quarter of 2021, Maine had 15,039 jobs across the 18 occupations. General maintenance and repair workers; heating, air conditioning, and refrigeration mechanics and installers; first-line supervisors; and industrial machinery mechanics accounted for 74.0% of Maine's clean energy installation, maintenance, and repair occupations in the third quarter of 2021. Though there are currently only 31 wind turbine technicians in Maine, these occupations grew by almost 33 percent since 2015 and will likely see continued growth as the offshore wind industry continues to develop and mature.

Between the third quarter of 2015 and the third quarter of 2021, installation, maintenance, and repair occupations grew by 7.0%. Riggers had the largest percentage increase between the third quarter of 2015 and the third quarter of 2021 (36.8%), followed by wind turbine service technicians (32.8%). Riggers were 3.52 times more concentrated in Maine compared to the U.S. concentration, 4.65 times more than the Northeast concentration, and 3.15 times more than the New England concentration. Electrical and electronics installers, and repairers for transportation equipment followed, with a concentration 1.95 times that of the concentration for the U.S, 1.79 times more than the Northeast concentration, and 2.32 times more than the New England concentration. Overall, the concentration of potential clean energy installation, maintenance, and repair occupations was 1.03 times that of the

concentration in the U.S., 1.12 times the concentration in the Northeast, and 1.23 times the concentration in New England.

The 18 potential clean energy installation, maintenance, and repair occupations each had a median hourly pay larger than the 2021 minimum wage in Maine. There were nine occupations that earned a median hourly pay of $25.00 or higher. Electrical and electronics repairers had the highest median hourly pay ($44.00), followed by first-line supervisors of mechanics, installers, and repairers ($31.00) (Table 4).

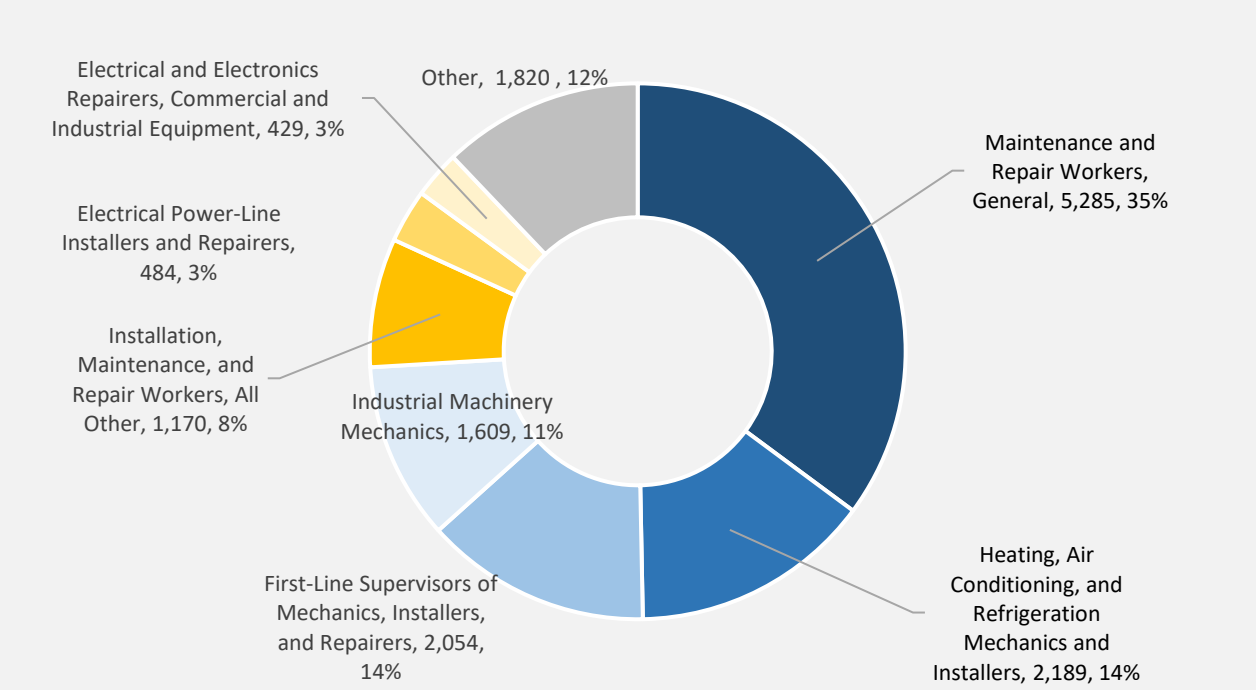
TABLE 4. CLEAN ENERGY-RELATED INSTALLATION, MAINTENANCE, AND REPAIR OCCUPATIONS IN MAINE[18]

SOC	Occupation	Maine Total Jobs, 2021 Q3	Percent Change (2015 to 2021)	U.S. Location Quotient (LQ)	Northeast Location Quotient (LQ)	New England Location Quotient (LQ)	Entry Hourly (10th percentile)	Median Hourly	Experienced Hourly (90th percentile)
Total Installation, Maintenance, and Repair Occupations		**15,039**	**7.0%**	**1.03**	**1.12**	**1.23**	**$17**	**$25**	**$35**
49-9071	Maintenance and Repair Workers, General	5,285	2.4%	0.87	0.85	1.08	$13	$19	$29
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	2,189	23.0%	1.32	1.33	1.21	$17	$24	$33
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	2,054	4.8%	1.00	1.07	1.11	$22	$31	$46
49-9041	Industrial Machinery Mechanics	1,609	16.4%	0.96	1.27	1.38	$17	$25	$34
49-9099	Installation, Maintenance, and Repair Workers, All Other	1,170	13.5%	1.58	2.00	1.74	$15	$23	$30
49-9051	Electrical Power-Line Installers and Repairers	484	25.0%	0.94	1.22	1.12	$20	$30	$40
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	429	-17.9%	1.87	2.00	1.75	$20	$28	$38
49-9098	Helpers--Installation, Maintenance, and Repair Workers	332	-16.3%	0.82	1.00	1.11	$12	$14	$23
49-9096	Riggers	328	36.8%	3.52	4.65	3.15	$20	$27	$31
49-9044	Millwrights	288	-5.3%	1.51	2.29	2.81	$18	$27	$37
49-9043	Maintenance Workers, Machinery	253	-0.6%	0.89	1.12	1.02	$15	$21	$29

[18] JobsEQ & Bureau of Labor Statistics, Occupational Employment and Wage Statistics: https://www.bls.gov/oes/current/oes_me.htm.

SOC	Occupation	Maine Total Jobs, 2021 Q3	Percent Change (2015 to 2021)	U.S. Location Quotient (LQ)	Northeast Location Quotient (LQ)	New England Location Quotient (LQ)	Entry Hourly (10th percentile)	Median Hourly	Experienced Hourly (90th percentile)
49-3041	Farm Equipment Mechanics and Service Technicians	196	26.3%	1.00	2.33	2.50	$14	$18	$24
49-9031	Home Appliance Repairers	139	-23.5%	1.01	1.12	1.21	$12	$21	$30
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	81	5.1%	0.81	0.70	1.50	$32	$44	$56
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	81	-23.5%	1.95	1.79	2.32	$17	$24	$32
49-2092	Electric Motor, Power Tool, and Related Repairers	75	-9.9%	0.96	1.22	1.21	$13	$21	$34
49-9081	Wind Turbine Service Technicians	31	32.8%	0.91	1.60	1.36	$18	$25	$38
49-9092	Commercial Divers	16	19.5%	0.93	1.16	1.30	$16	$25	$51

FIGURE 5. CLEAN ENERGY-RELATED INSTALLATION, MAINTENANCE, AND REPAIR OCCUPATIONS (TOTAL JOBS & PERCENT OF TOTAL)



PRODUCTION

There are 31 potential clean energy production occupations. In the third quarter of 2021, Maine had 17,623 jobs across the 31 occupations. The following occupations accounted for 65.0% of Maine's clean energy production occupations in the third quarter of 2021: team assemblers, first-line supervisors of production and operating workers, welders, cutters, solderers, and brazers, machinists, and layout workers in metal and plastic.

Between the third quarter of 2015 and the third quarter of 2021, potential clean energy production occupations increased by 6.6%. Multiple machine tool setters, operators, and tenders of metal and plastic experienced the largest percentage increase during this period (34.9%). Computer numerically controlled tool programmers followed, increasing by 22.5%. The concentration of layout workers in metal and plastics in Maine was 22.80 times more than the U.S concentration, 18.77 times more than the Northeast concentration, and 6.93 times more than the New England concentration. The concentration for milling and planing machine setters, operators, and tenders in metal and plastic followed, with a concentration 4.56 times larger than the concentration in the U.S, 5.01 times more than the Northeast concentration, and 3.08 times more than the New England concentration. The concentration of potential clean energy production jobs in Maine was 0.96 times that of the concentration in the U.S, 1.24 times more than the Northeast concentration, and 1.07 times more than the New England concentration.

All 31 production occupations had a median hourly pay higher than the 2021 Maine minimum wage. There were six production occupations that earned a median hourly pay of $25.00 dollars or higher. Power distributors and dispatchers had the highest median hourly pay ($48.00), followed by first-line supervisors of production and operating workers ($32.00) (Table 5).

TABLE 5. CLEAN ENERGY-RELATED PRODUCTION OCCUPATIONS IN MAINE[19]

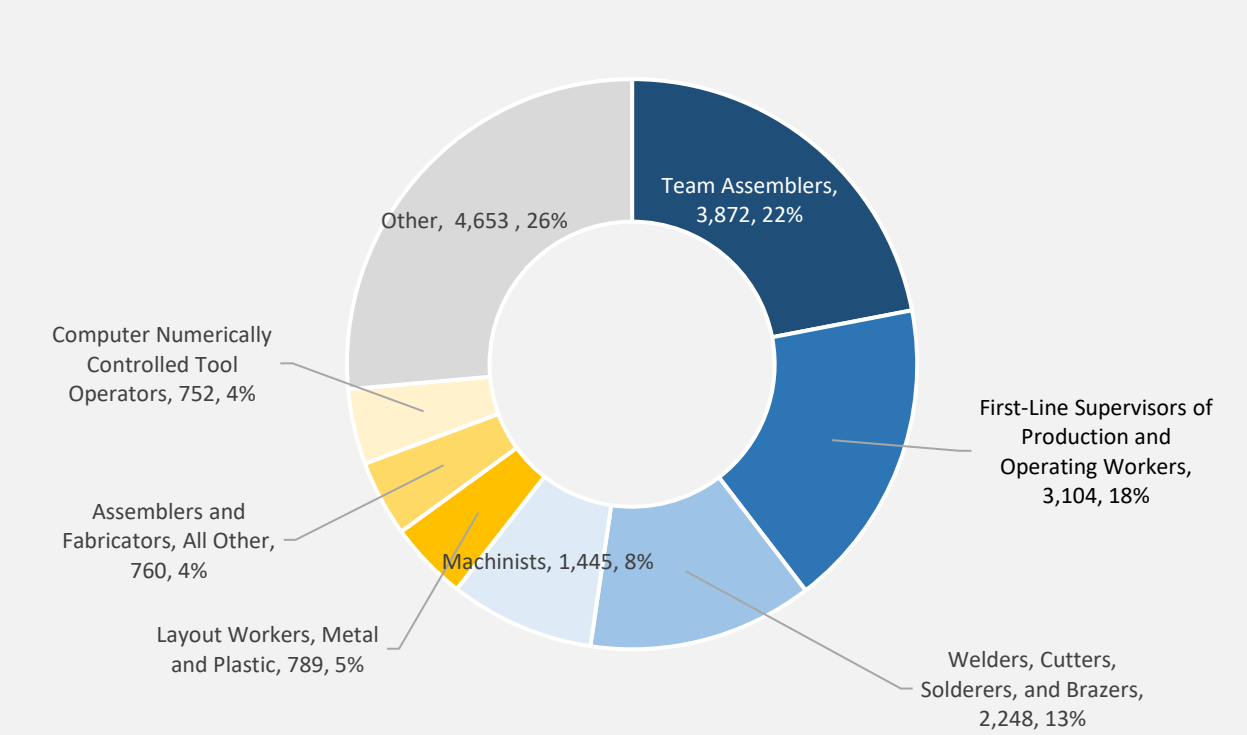
2018 SOC	2018 SOC Title	Maine Total Jobs, 2021 Q3	Percent Change (2015 to 2021)	U.S. Location Quotient (LQ)	Northeast Location Quotient (LQ)	New England Location Quotient (LQ)	Entry Hourly (10th percentile)	Median Hourly	Experienced Hourly (90th percentile)
Total Production Occupations		**17,623**	**6.6%**	**0.96**	**1.24**	**1.07**	**$16**	**$22**	**$32**
51-2092	Team Assemblers	3,872	12.5%	0.81	1.20	1.12	$13	$18	$25
51-1011	First-Line Supervisors of Production and Operating Workers	3,104	4.3%	1.17	1.36	1.23	$20	$32	$46
51-4121	Welders, Cutters, Solderers, and Brazers	2,248	18.6%	1.25	1.96	2.08	$18	$26	$31

[19] JobsEQ & Bureau of Labor Statistics, Occupational Employment and Wage Statistics: https://www.bls.gov/oes/current/oes_me.htm.

2018 SOC	2018 SOC Title	Maine Total Jobs, 2021 Q3	Percent Change (2015 to 2021)	U.S. Location Quotient (LQ)	Northeast Location Quotient (LQ)	New England Location Quotient (LQ)	Entry Hourly (10th percentile)	Median Hourly	Experienced Hourly (90th percentile)
51-4041	Machinists	1,445	-1.5%	0.93	1.07	0.76	$17	$25	$34
51-4192	Layout Workers, Metal and Plastic	789	14.4%	22.80	18.77	6.93	$21	$27	$32
51-2099	Assemblers and Fabricators, All Other	760	-9.1%	0.79	1.06	1.03	$13	$18	$25
51-9161	Computer Numerically Controlled Tool Operators	752	8.3%	1.13	1.16	0.80	$15	$22	$31
51-9124	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	730	10.1%	1.17	1.59	1.37	$16	$23	$33
51-2041	Structural Metal Fabricators and Fitters	494	-1.0%	1.65	2.26	2.07	$16	$20	$26
51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers	488	20.6%	0.40	0.42	0.30	$13	$15	$25
51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	450	18.6%	0.66	0.96	0.91	$14	$20	$30
51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	360	34.9%	0.60	0.69	0.58	$13	$18	$25
51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	301	-16.9%	4.56	5.01	3.08	$20	$23	$31
51-2051	Fiberglass Laminators and Fabricators	291	-15.9%	3.13	4.96	2.84	$15	$19	$25
51-8021	Stationary Engineers and Boiler Operators	260	-14.8%	2.08	1.33	1.96	$17	$24	$34
51-8013	Power Plant Operators	240	2.8%	1.60	1.84	1.53	$21	$31	$53
51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	187	-0.4%	0.24	0.37	0.36	$14	$19	$25

51-9141	Semiconductor Processing Technicians	134	10.5%	0.96	1.31	0.83	$14	$20	$35
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	128	-8.2%	0.84	1.23	0.87	$15	$19	$27
51-9162	Computer Numerically Controlled Tool Programmers	92	22.5%	0.81	1.01	0.70	$13	$22	$32
51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	81	2.6%	0.27	0.31	0.27	$13	$19	$30
51-2031	Engine and Other Machine Assemblers	80	20.9%	0.44	1.10	0.95	$16	$23	$33
51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	80	-11.4%	1.08	2.06	1.78	$14	$19	$29
51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	62	16.4%	0.49	0.73	0.79	$15	$22	$32
51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic	41	-34.0%	0.68	0.88	0.77	$14	$21	$31
51-4051	Metal-Refining Furnace Operators and Tenders	38	-1.7%	0.62	0.61	0.76	$14	$18	$24
51-8012	Power Distributors and Dispatchers	37	6.2%	0.84	1.04	0.76	$30	$48	$65
51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	35	-51.1%	0.90	1.31	0.97	$16	$20	$25
51-2021	Coil Winders, Tapers, and Finishers	31	-16.2%	0.58	0.75	0.64	$14	$19	$29
51-4052	Pourers and Casters, Metal	8	-15.6%	0.26	0.30	0.49	$15	$20	$31
51-4062	Patternmakers, Metal and Plastic	5	-30.7%	0.47	0.65	0.60	$15	$24	$37

FIGURE 6. CLEAN ENERGY-RELATED PRODUCTION OCCUPATIONS (TOTAL JOBS & PERCENT OF TOTAL)



PROFESSIONAL SERVICES

There are 56 potential clean energy professional services occupations. The professional services occupational group is comprised of management occupations, business and financial operations occupations, computer and mathematical occupations, architecture and engineering occupations, life, physical, and social science occupations, and legal occupations. In the third quarter of 2021, there were 55,518 jobs across the 56 clean energy-related professional services occupations. General and operations managers, accountants and auditors, farmers, ranchers, and other agricultural managers, chief executives, and lawyers accounted for 44.7% of Maine's clean energy professional services occupations.

Between the third quarters of 2015 and 2021, clean energy-related professional occupations grew by 11.5%. Biochemist and biophysicists experienced the largest percentage increase during this period (52.7%), followed by information security analysts (51.5%). The concentration of marine engineers and naval architects in Maine is 9.15 times that of the concentration in the U.S, 8.31 times more than the Northeast concentration, and 3.18 times more than the New England concentration. The concentration of clean energy-related professional services for Maine was 0.94 times that of the concentration in the U.S, 0.94 times the Northeast concentration, and 0.83 times the concentration in New England.

All 56 professional services occupations had an hourly median pay larger than Maine's 2021 minimum wage. There were 53 occupations with hourly median wages that were $25.00 or higher in 2021. Architectural and engineering managers and computer and information systems managers had the

largest hourly median pay ($60.00), followed by computer network architects and chief executives ($56.00) (Table 6).

SALES & ADMINISTRATIVE SUPPORT

There are four potential clean energy sales and administration support occupations. The sales and administration support occupations are comprised of sales and related occupations and office and administrative support occupations. In the third quarter of 2021, Maine had 13,690 jobs in clean energy-related sales and administrative support. Bookkeeping, accounting, and auditing clerks had the largest share of potential clean energy sales and administrative support occupations (54.2%).

In the third quarter of 2015, there were 15,310 sales and administration support jobs. Between the third quarter of 2015 and the third quarter of 2021, sales and administration support jobs declined by 10.6%. All four occupations experienced a decline in employment during this period. Payroll and timekeeping clerks experienced the largest percentage decrease in employment (18.7%). The concentration of clean energy-related sales and administration support occupations in Maine was 0.94 times that of the concentration in the U.S., 0.95 times the Northeast concentration, and 0.94 times the New England concentration.

All four clean energy-related sales and administration support occupations had a median hourly pay that is higher than Maine's 2021 minimum wage. Sales representatives for wholesale and manufacturing in technical and scientific products had the highest median hourly wage ($38.00) (Table 6).

TRANSPORTATION & MATERIAL MOVING

There are seven clean energy-related transportation and material moving occupations. In the third quarter of 2021, Maine had 3,830 transportation and material moving jobs. Industrial truck and tractor operators alone accounted for two-in-three (66.7%) of Maine's transportation and material moving occupations.

Between the third quarters 2015 and 2021, transportation and material moving jobs declined by 3.7%. Although the occupational group declined as a whole, dredge operators occupations increased by 15.9%. Industrial truck and tractor operators experienced the largest percentage decrease in employment during this period—a decline of 7.6%. The concentration for captain's, mates, and pilots of water vessels in Maine was 1.96 times larger than the concentration in the U.S., 2.67 times more than the Northeast concentration, and 2.37 times more than the new England concentration. The concentration of clean energy-related transportation and material moving occupations in Maine was 0.98 times that of the concentration in the U.S., 1.23 times more than the Northeast concentration, and 1.64 times more than the New England concentration.

All seven potential clean energy transportation and material moving occupations earned a higher median hourly pay than the minimum wage in Maine, with four occupations earning higher than $25.00 in 2021Q3. Captains, mates, and pilots of water vessel had the highest median hourly pay ($39.00), followed by hoist and winch operators ($29.00) (Table 6).

AGRICULTURE

There are three clean energy-related agriculture occupations. In the third quarter of 2021, Maine had 3,281 agriculture jobs across the three occupations. Farm workers and laborers in crop, nursery, and greenhouse accounted for just over three-in-four (76.1%) of Maine's potential clean energy agriculture jobs.

Between the third quarters 2015 and 2021, clean energy-related agriculture jobs increased by 60.3%, the largest increase across the seven clean energy occupational categories. Farm workers and laborers in crop, nursery, and greenhouse saw the largest percentage increase across all clean energy-related agriculture occupations during the period (70.5%). The concentration of first-line supervisors of farming, fishing, and forestry workers was 2.39 times larger in Maine than in the U.S., 4.33 times more than the Northeast concentration, and 3.17 times more than the New England concentration. The concentration of Maine's potential clean energy agriculture occupations was 1.07 times that of the concentration in the U.S., 2.77 times more than the Northeast concentration, and 2.40 times more than the New England concentration.

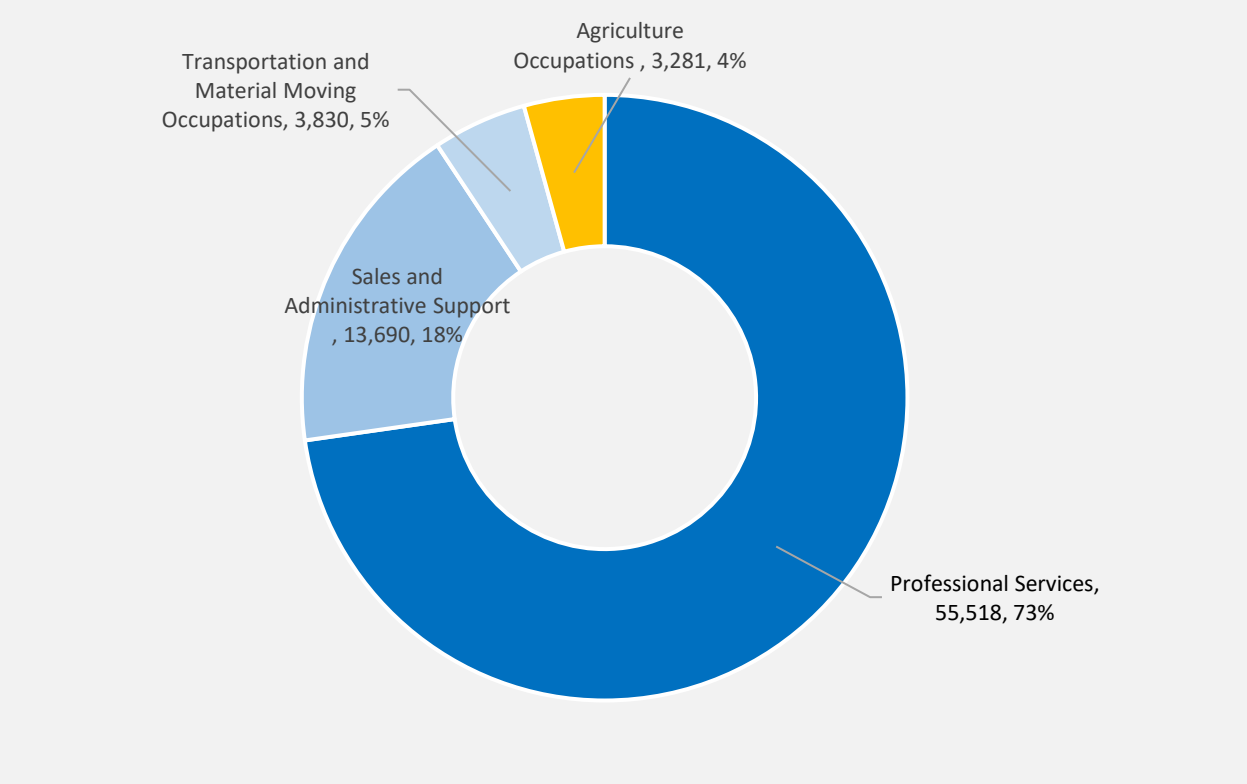
First-line supervisors of farming, fishing, and forestry workers had the highest median hourly pay among potential clean energy agriculture occupations ($24.00). Agricultural equipment operators and farm workers and laborers occupations both had a median hourly pay of $15.00 (Table 6).

TABLE 6. ALL OTHER CLEAN ENERGY-RELATED OCCUPATIONAL GROUPS IN MAINE[20]

2018 SOC Title	Maine Total Jobs, 2021 Q3	Percent Change (2015 to 2021)	U.S. Location Quotient (LQ)	Northeast Location Quotient (LQ)	New England Location Quotient (LQ)	Entry Hourly (10th percentile)	Median Hourly	Experienced Hourly (90th percentile)
Professional Services	55,518	11.5%	0.94	0.94	0.83	$25	$38	$60
Sales and Administrative Support	13,690	-10.6%	0.94	0.95	0.94	$16	$27	$47
Transportation and Material Moving Occupations	3,830	-3.7%	0.98	1.23	1.64	$15	$25	$36
Agriculture Occupations	3,281	60.3%	1.07	2.77	2.40	$13	$18	$24

[20] JobsEQ & Bureau of Labor Statistics, Occupational Employment and Wage Statistics: https://www.bls.gov/oes/current/oes_me.htm.

FIGURE 7. ALL OTHER CLEAN ENERGY-RELATED OCCUPATIONAL GROUPS (TOTAL JOBS & PERCENT OF TOTAL)



Clean Energy Worker Profile

The Clean Energy Worker Profile section provides detail on the career specifics of clean energy workers in Maine. In particular, this section provides detail on the general education and experience level of clean energy workers as well as associated compensation and work benefits. The section also highlights overall satisfaction with clean energy careers and any challenges to career navigation and advancing in the clean energy industry.

This section is broken out into the follow sub-sections:

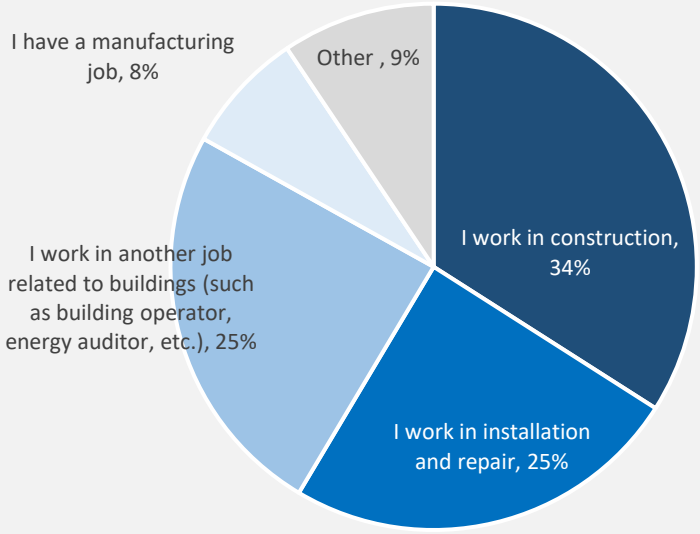
1. Overall Worker Profile
2. Education & Experience
3. Compensation & Benefits
4. Career Satisfaction & Advancement
5. Career Navigation & Challenges

It is important to note that this survey only profiles clean energy workers who reside and work in Maine. Both full- and part-time workers are included in the responses. In total, there were 134 responses to the survey, including partials, and 45 workers that made it all the way through the survey, answering all questions.

OVERALL WORKER PROFILE

Survey respondents mostly work in the construction (34.0 percent) and installation and repair industries (24.5 percent), followed by other buildings-related activities, such as building operations or energy auditing (24.5 percent), manufacturing (7.5 percent), and other activities, such as consulting or other professional services.

FIGURE 8. OCCUPATIONAL TYPE



Overall, the majority of survey respondents have been in their clean energy-related position for at least 10 years (57.7 percent), with 46.2 percent reporting having been in their current job for 15 years or more.

Though all respondents have to work with clean energy technologies to some degree, just under a third indicated that less than half of their work is related to clean energy (31.3 percent). However, most respondents reported that all or most of their work is related to clean energy (68.8 percent).

FIGURE 9. LENGTH OF EMPLOYMENT

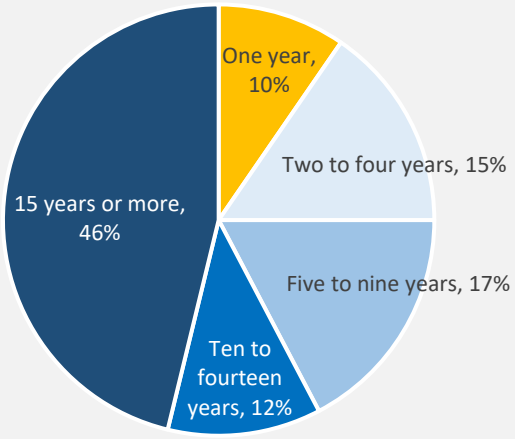
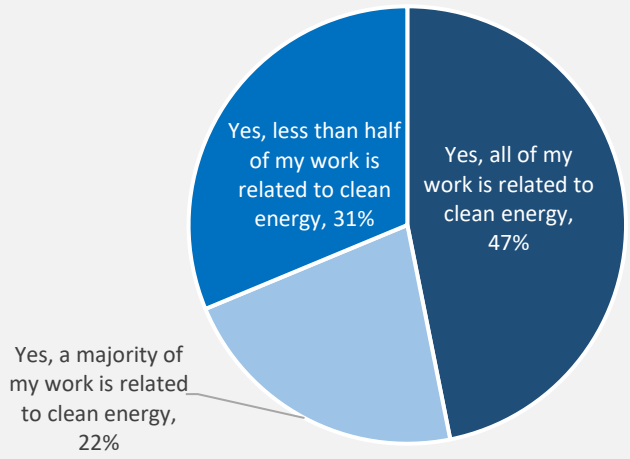


FIGURE 10. PROPORTION OF CLEAN ENERGY WORK



EDUCATION & EXPERIENCE

Educational attainment is spread across a variety of levels, though the largest group of respondents indicated that they have a high school diploma or less (35.8 percent).

Nearly half of all survey respondents indicated that they had more than five years of related work experience before landing their current position (49.1 percent). In fact, 83 percent of workers had some amount of work experience, and only 17 percent indicated they had no prior work experience before landing their current clean energy-related position.

FIGURE 11. EDUCATIONAL ATTAINMENT

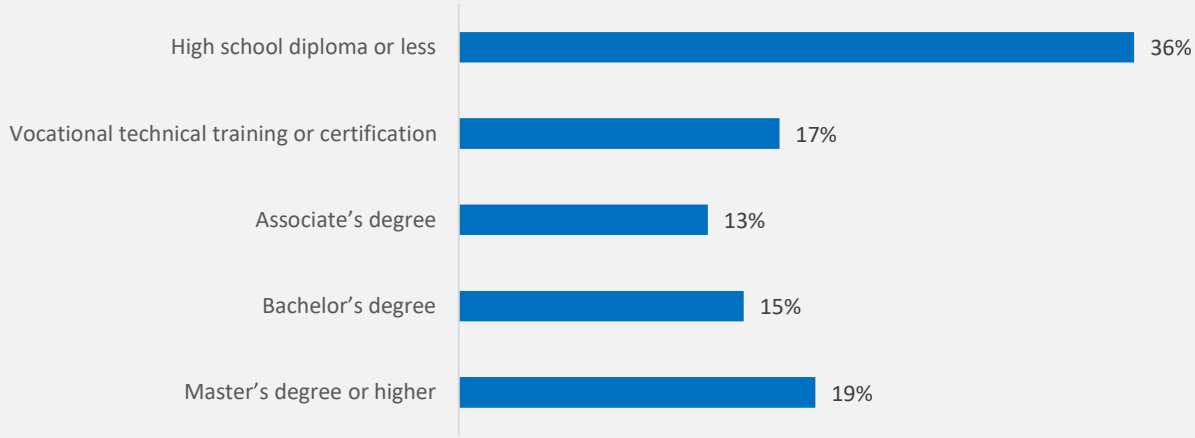
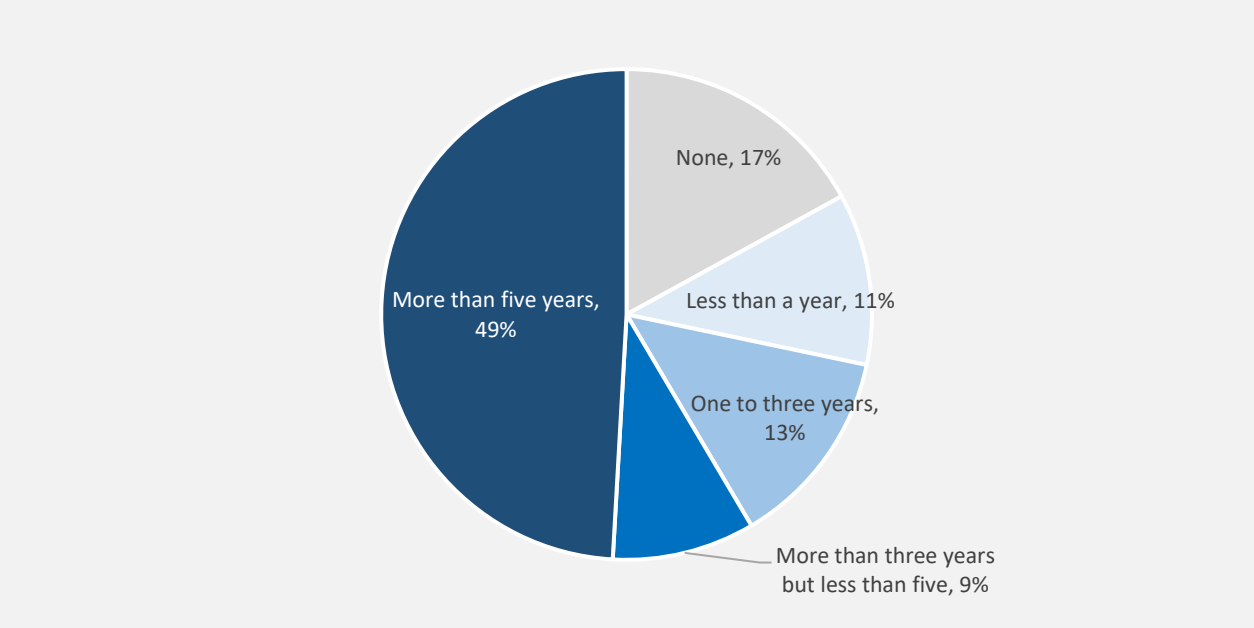
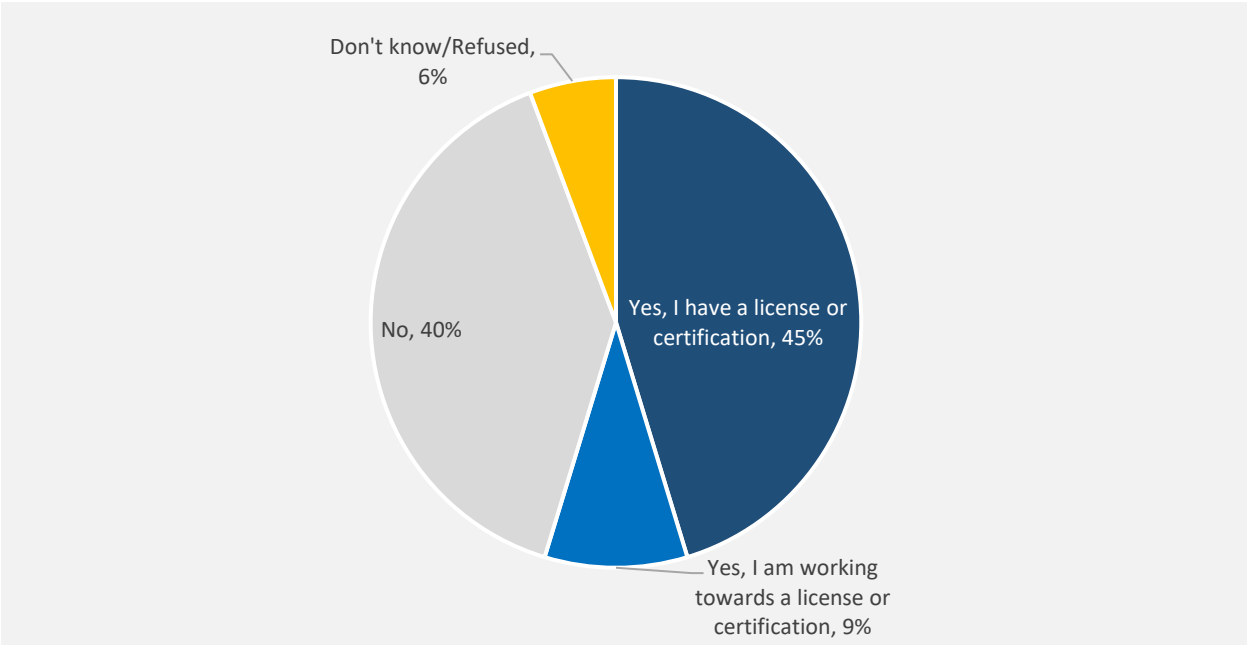


FIGURE 12. YEARS OF RELATED WORK EXPERIENCE



Just over half of respondents (54.7 percent), noted that they either already have a license or certification or are currently working towards one. About four in ten respondents (39.6 percent) noted that they have neither a license nor professional certification.

FIGURE 13. CERTIFICATIONS OR LICENSES



COMPENSATION & BENEFITS

Most surveyed clean energy workers entered their career with a starting wage of less than $50,000 per year. As individuals moved up along their career pathway, most workers indicated that their current wages sit around $50,000 to just under $200,000, though about one in ten clean energy workers (9.5 percent) indicated that, including overtime, they earn above $200,000 a year.

Just over half of clean energy workers (53.0 percent) cited that they receive some form of health insurance benefits from their company; they are either fully or partially covered. Most survey respondents also indicated receiving retirement benefits from their employer. About six in ten surveyed clean energy workers (58.9 percent) reported that they receive some type of retirement package from their company; 41.2 percent indicated they receive no retirement benefits.

FIGURE 14. STARTING & CURRENT WAGES, INCLUDING OVERTIME

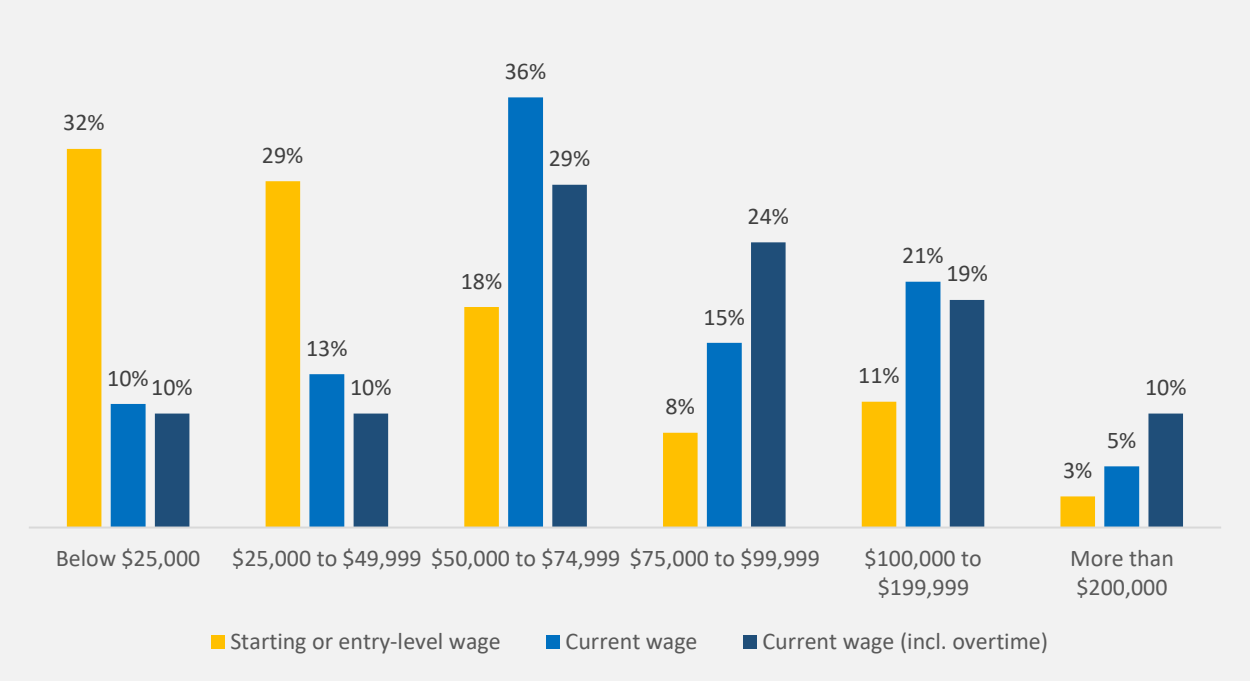


FIGURE 15. HEALTHCARE BENEFITS

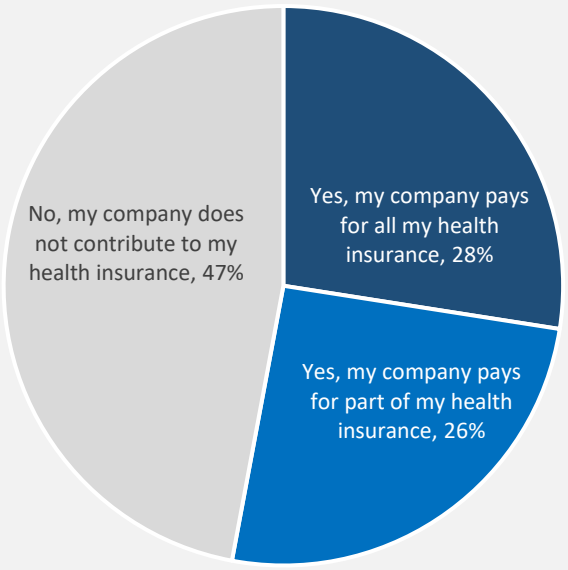
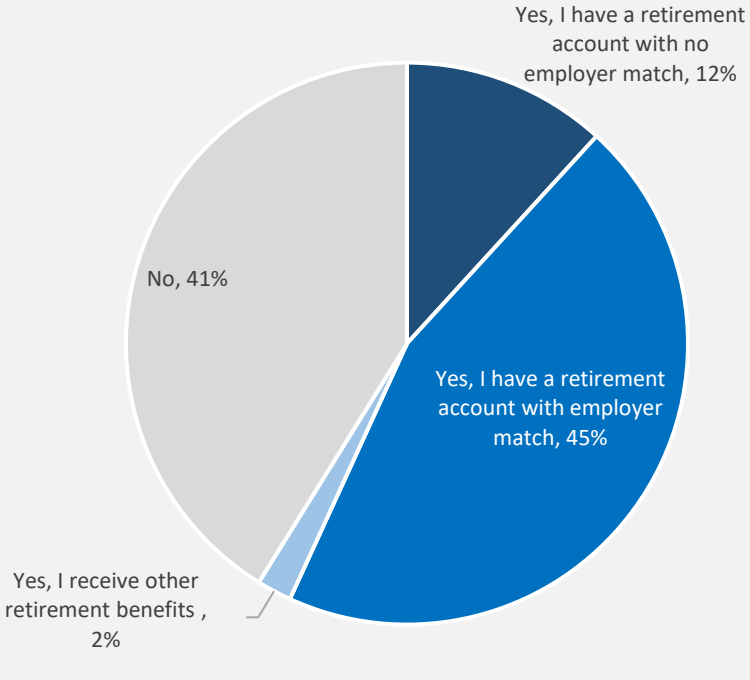


FIGURE 16. RETIREMENT BENEFITS



The majority of workers indicated receiving paid vacation from their employers (56.0 percent), and just under half (46.0 percent) also receive sick time. Of those receiving paid vacation, 89.3 percent receive at least 25 hours, with 42.9 percent indicating they receive more than 120 hours. Most workers receiving sick time indicated receiving 16 to 80 hours (78.3 percent).

Additional benefits include flexible schedule and work hours, which about four in ten surveyed workers receive (42.9 percent), followed by a company vehicle (34.7 percent), the ability to work from home (28.6 percent), tuition support (26.5 percent), and transportation stipends (22.4 percent).

FIGURE 17. PAID VACATION & SICK TIME

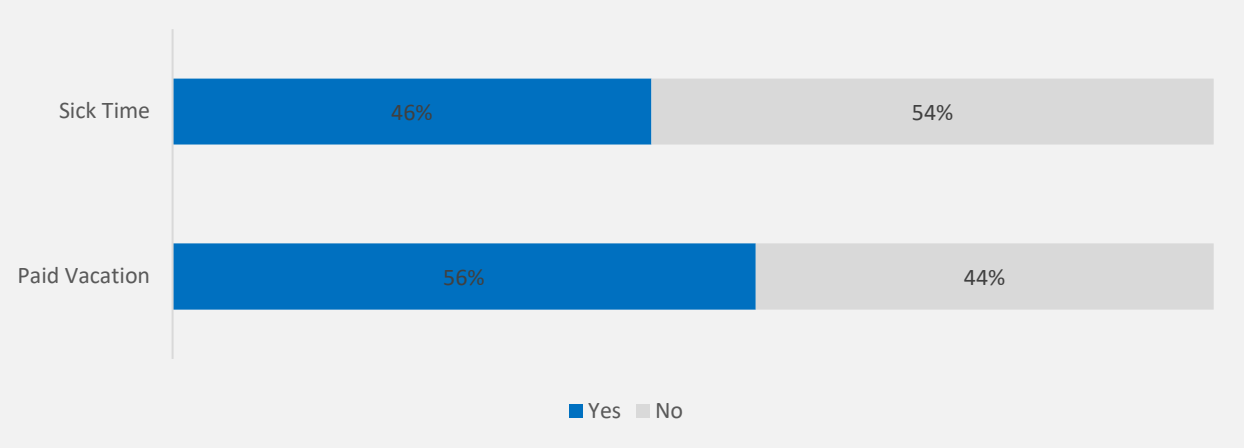
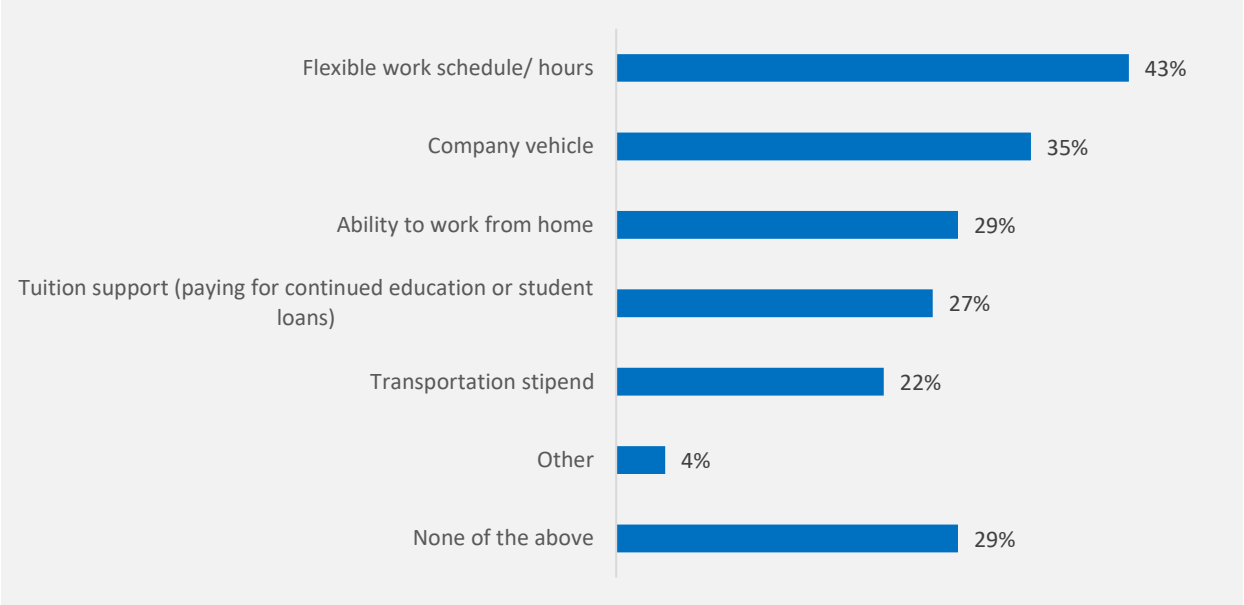


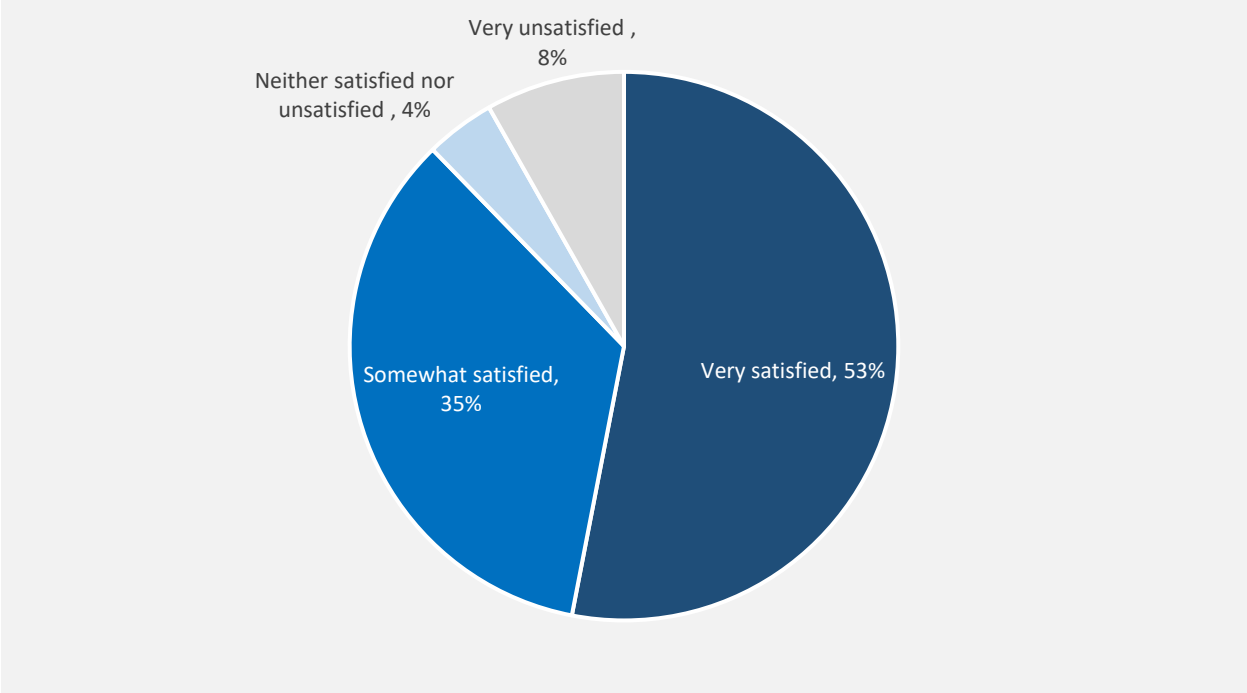
FIGURE 18. ADDITIONAL EMPLOYMENT BENEFITS



CAREER SATISFACTION & ADVANCEMENT

The majority of surveyed clean energy workers are satisfied with their career. About nine in ten clean energy workers indicated they are either very or somewhat satisfied with their career (87.8 percent). Only 8.2 percent of survey respondents indicated that they are very unsatisfied with their current career.

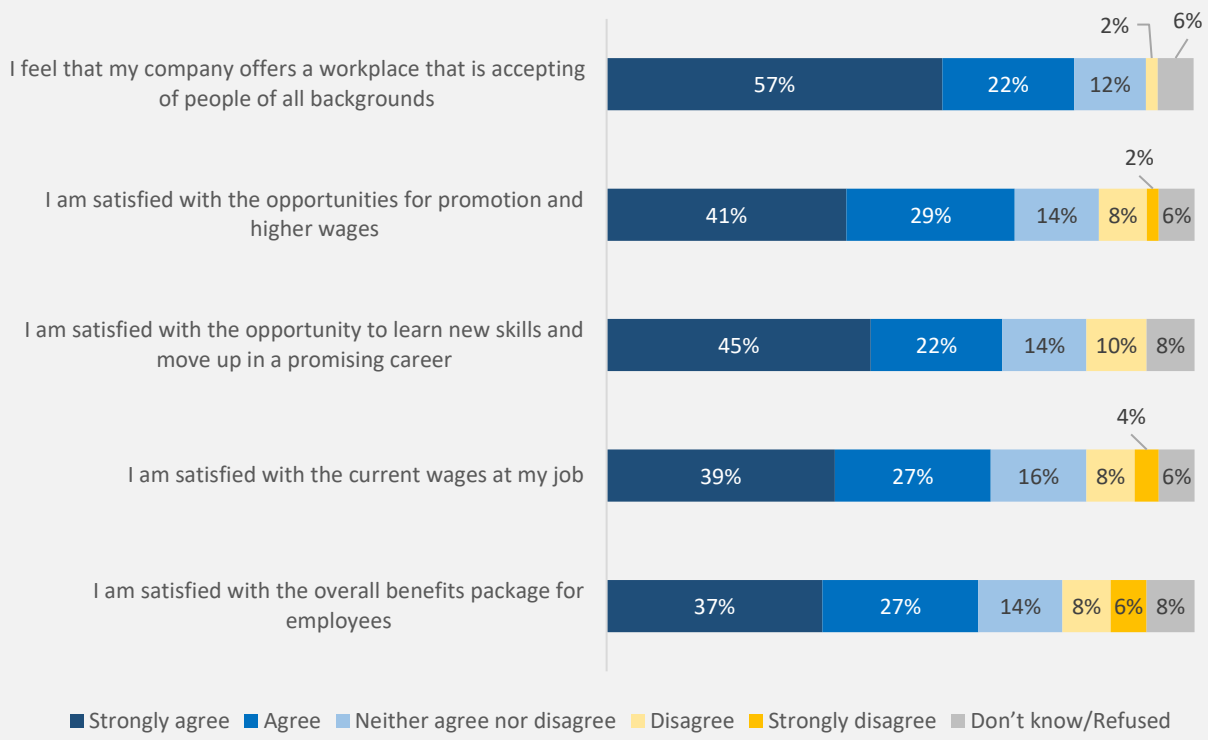
FIGURE 19. CAREER SATISFACTION



In general, most surveyed workers were satisfied (very and somewhat) with all the aspects tested in Figure 20. Workers indicated the highest rates of satisfaction with their sense of acceptance and belonging in the workplace for individuals of all backgrounds (79.5 percent very and somewhat satisfied) and their opportunities for promotion and higher wages (69.4 percent).

At least six in ten respondents were also very or somewhat satisfied with their opportunity to learn new skills and move up a promising career ladder (67.3 percent), their current wages (65.3 percent), and the overall benefits packages their receive from their firms (63.2 percent).

FIGURE 20. SATISFACTION WITH SPECIFIC CAREER ASPECTS



Respondents are confident about their opportunities for advance in the clean energy industry. Just over half of surveyed clean energy workers (52.1 percent) reported that they expect to advance within their current company, and 6.3 percent expect to advance at another company in the same industry. About a third of respondents did not project any career advancement (31.3 percent).

Of those expecting to advance, 45.0 percent expect to move into leadership roles, such as directors, executives, or managers.

FIGURE 21. CAREER ADVANCEMENT

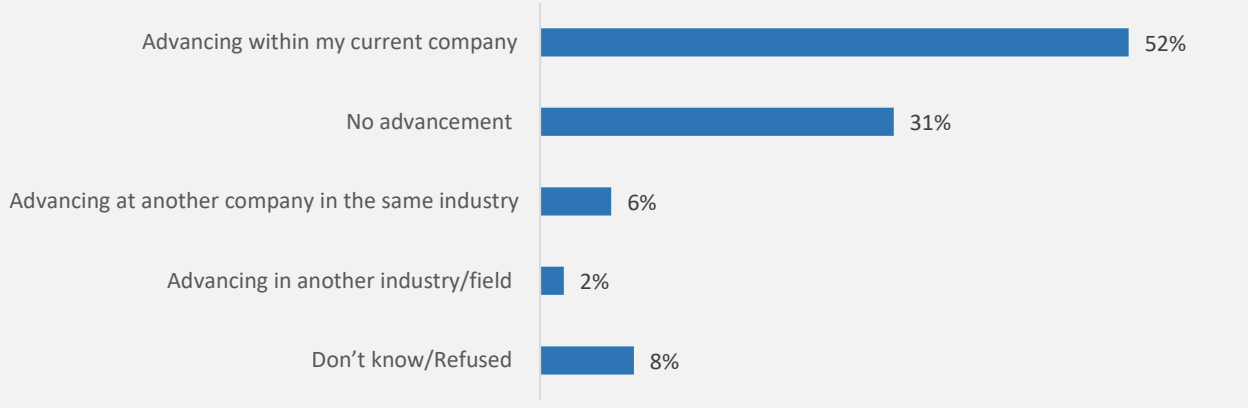


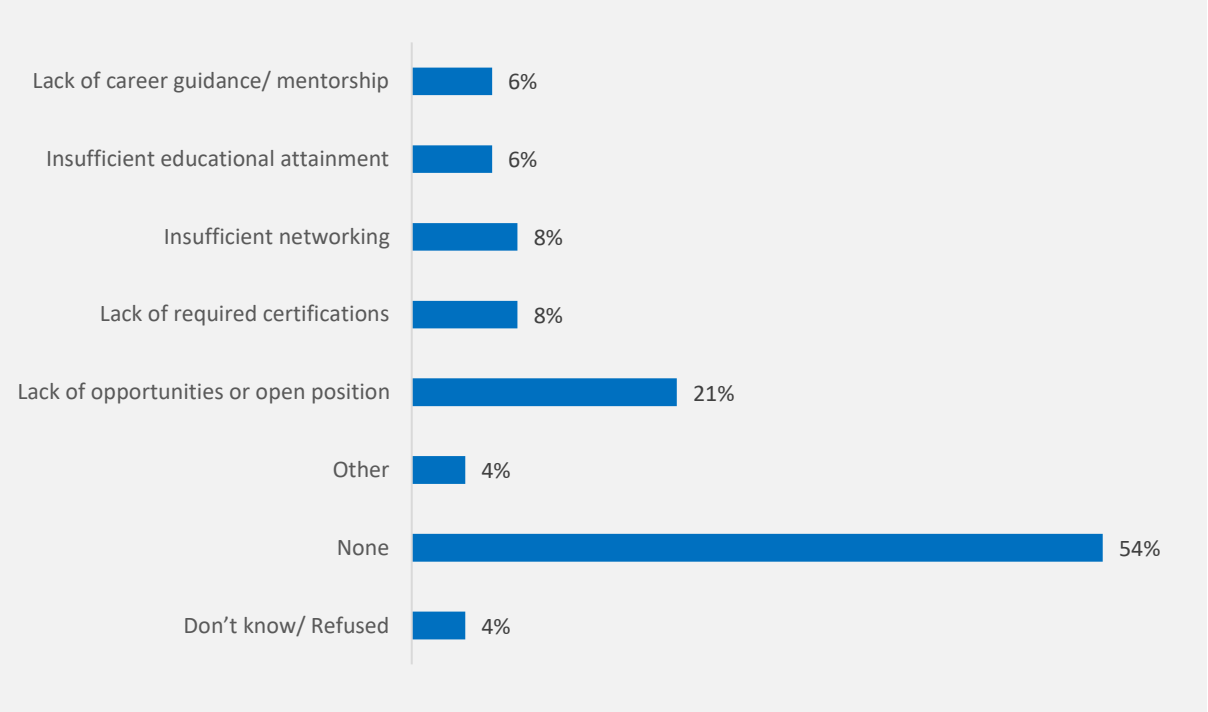
TABLE 7. PROMOTION TITLE

Expected Promotion Title	Percent
Director/ Executive leadership	24.0%
Manager	20.0%
Foreman	12.0%
Engineer	8.0%
Weatherization/ Installer	8.0%
Architect/ Contractor	8.0%
Welder	4.0%
Deck captain	4.0%
Other	12.0%

More than half of workers that expect to advance in their careers indicated that they do not foresee any obstacles to their promotion (54.2 percent). About two in ten respondents reported that lack of opportunities or open positions may be a hindrance to their career advancement (20.8 percent).

Under 10 percent of respondents also reported lack of career guidance or mentorship, insufficient educational attainment, insufficient networking opportunities, or a lack of required certifications may present obstacles to their career advancement.

FIGURE 22. PROMOTION OBSTACLES



STAKEHOLDER OUTREACH: CLEAN ENERGY EMPLOYMENT BENEFIT HIGHLIGHTS

BW Research conducted a series of interviews with clean energy stakeholders across the State of Maine. Interviewees included employers and businessowners, labor representatives, business associations, and utilities. The research team spoke with a total of 23 stakeholders to gather qualitative data on the perceptions of workforce needs and challenges for the clean energy industry in Maine. In addition to workforce needs and challenges, stakeholders provided some feedback on the benefits of clean energy careers. The key themes and findings from these interviews are summarized here.

The clean energy industry can provide a source of job fulfillment and good wages while Maine boasts high quality of life. The inherent value- and mission-driven nature of clean energy work is a unique selling point, particularly for young adults and other jobseekers who are interested in environmentally-focused careers. At the same time, clean energy jobs support sustainable wages and benefits.

"We have a unique opportunity [in the clean energy industry] because there is mission and value."

"A lot of people would rather work for a clean energy company than other industries… we can connect with them on mission."

"There is a lot to be offered here. [We need] good marketing. We got it nailed in those areas of quality of life and work-life balance, we just do a horrible job of advertising it."

"…really reinforcing that the trades are a viable career opportunity for many people. A lot of people don't understand the pay and benefits that come along with working in trades. Someone graduating from an apprenticeship program after four years is going to be making about $60,000 a year, as a base journeyman, foreman, or general foreman, and they can go up from there."

"Kids apply [to the heat pump sector] because they see the money, we're a top paying industry. Most of my [employees] are earning $35 to $50 an hour."

"I have a single mother who was working three jobs. She's a union ironworker now and she's only working one job. I have another friend who has the same story."

Apprenticeships and on-the-job learning models are a sustainable pathway to well-paying careers without taking out significant student loans or educational debt. Union-sponsored apprenticeships and government-supported trainings are not only offered at no cost, but workers have the opportunity to learn and earn, securing hands-on, industry-specific knowledge, skills, and experience, which oftentimes lead to immediate job outcomes.

"[Our apprenticeships] are funded by members, we have a working dues deduction that goes right back into the union to train with… we're a nonprofit."

"We have registered apprenticeship programs and other training programs that don't cost anything and pay really well, including benefits. It is a self-sustaining model."

"We gotta make [the trades] cool again. What they don't understand is that my guys are making as much money as doctors. Without any expense. We pay you to learn."

"We take anyone, someone with little to no experience. We teach them from the ground up, fundamentals for mechanical and electrical programs as well as civil development, carpentry, or concrete work… we pay these folks as they learn..."

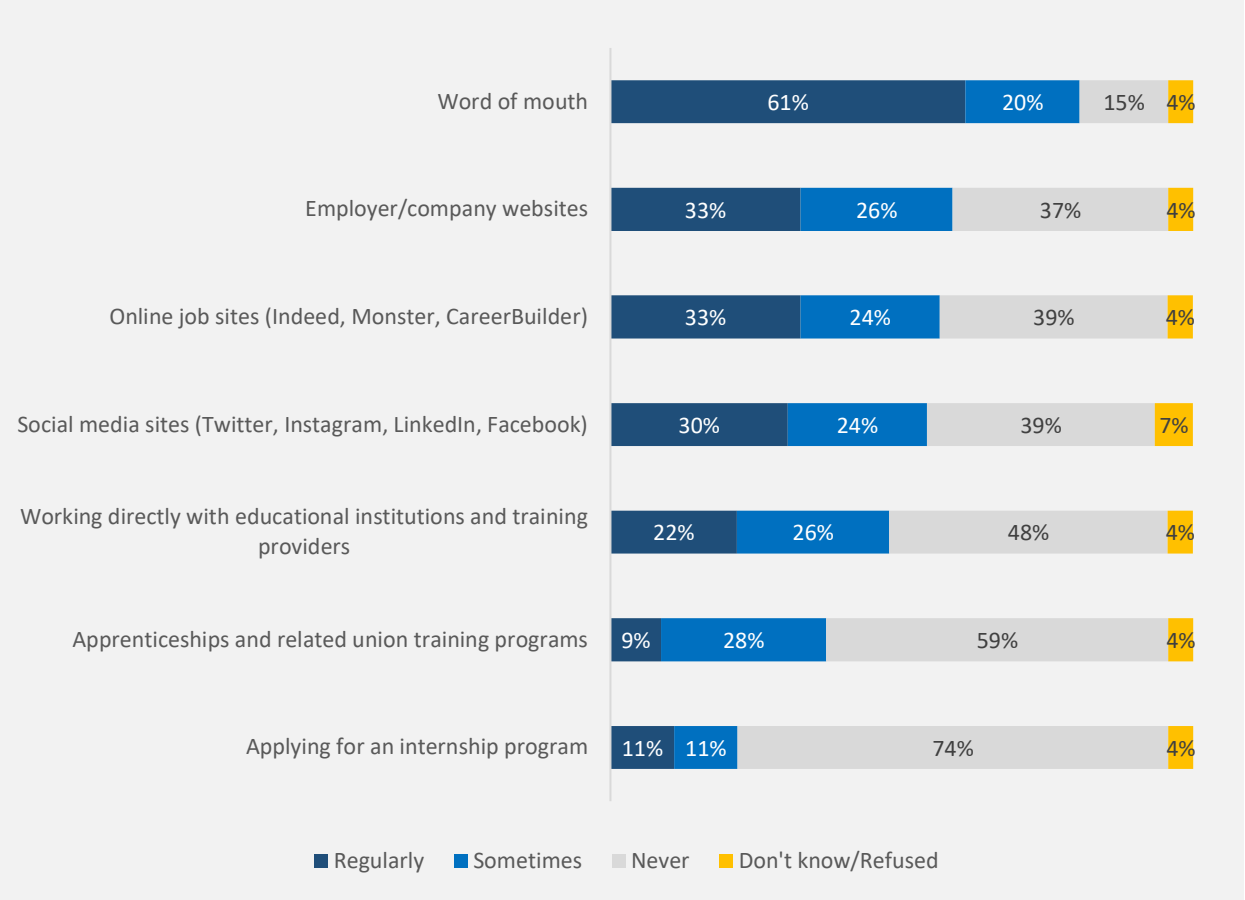
"…organized labor does this every day, they provide great pay, pension plans, etc. for their members and they have apprenticeship programs that teach at no cost. We charge nothing."

CAREER NAVIGATION & CHALLENGES

When searching for a new job, survey respondents indicated that they most often find out about new job opportunities via word of mouth; eight in ten (80.5 percent) clean energy workers indicated they rely on word of mouth regularly or sometimes. About six in ten respondents reported regularly or sometimes using employer or company websites (58.7 percent) or online job sites (56.5 percent).

Just over half of individuals regularly or sometimes use social media sites (54.3 percent). Apprenticeships and internships were lowest on the list of job search resources, used regularly by fewer than 11 percent of respondents each.

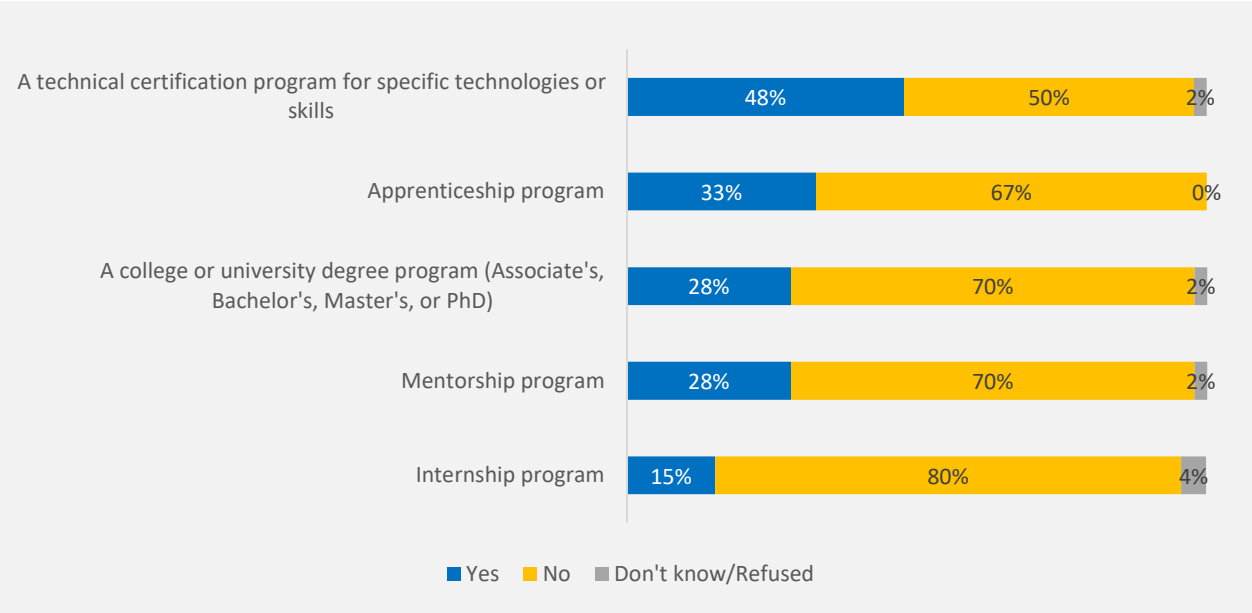
FIGURE 23. JOB SEARCH RESOURCES



Surveyed clean energy workers were not likely to indicate having participated in some type of on-the-job training program, such as an apprenticeship or internship. About a third of surveyed clean energy workers (32.6 percent) reported that they had participated in an apprenticeship program specific to their current position and only 15 percent indicated they had participated in an internship program.

The most common program type was a technical certification program for specific skills or technologies; just under half of surveyed clean energy workers had attended one of these programs (47.8 percent). About three in ten each reported attending a degree program (28.2 percent) or a mentorship program (28.3 percent) related to their current position.

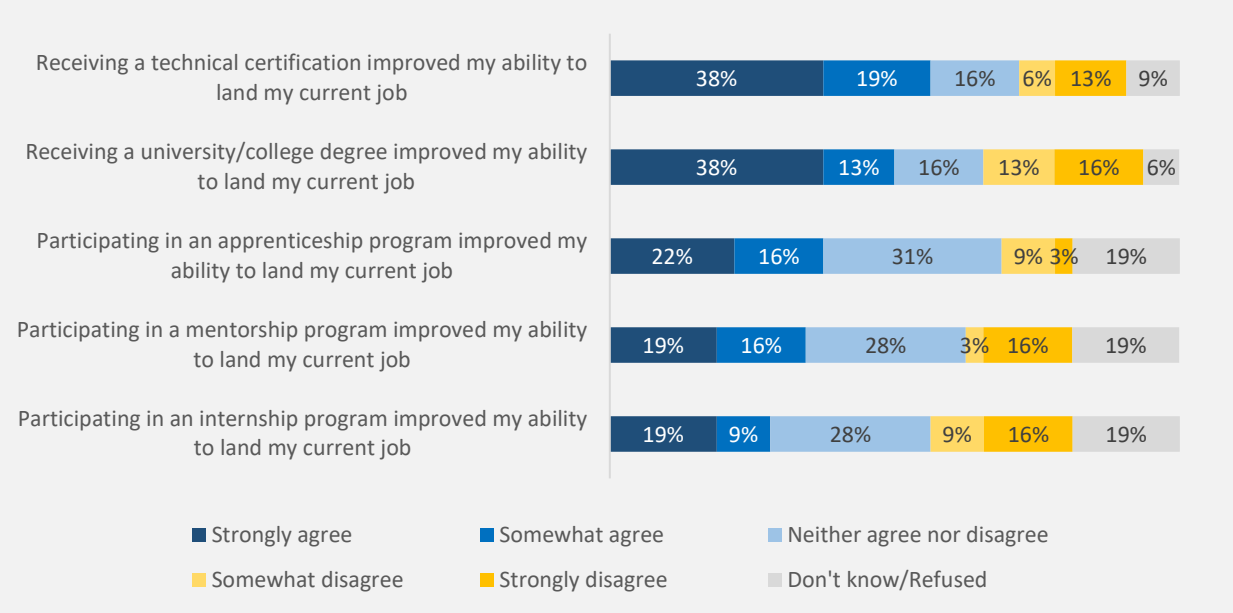
FIGURE 24. PROGRAM PARTICIPATION



Of individuals who had participated in any one of these programs, at least three in ten agreed (strongly or somewhat) that they improved their ability to land a job. Participation in a technical certification or degree program topped the list, with 56.3 percent and 50.0 percent, respectively, indicating agreement with these statements.

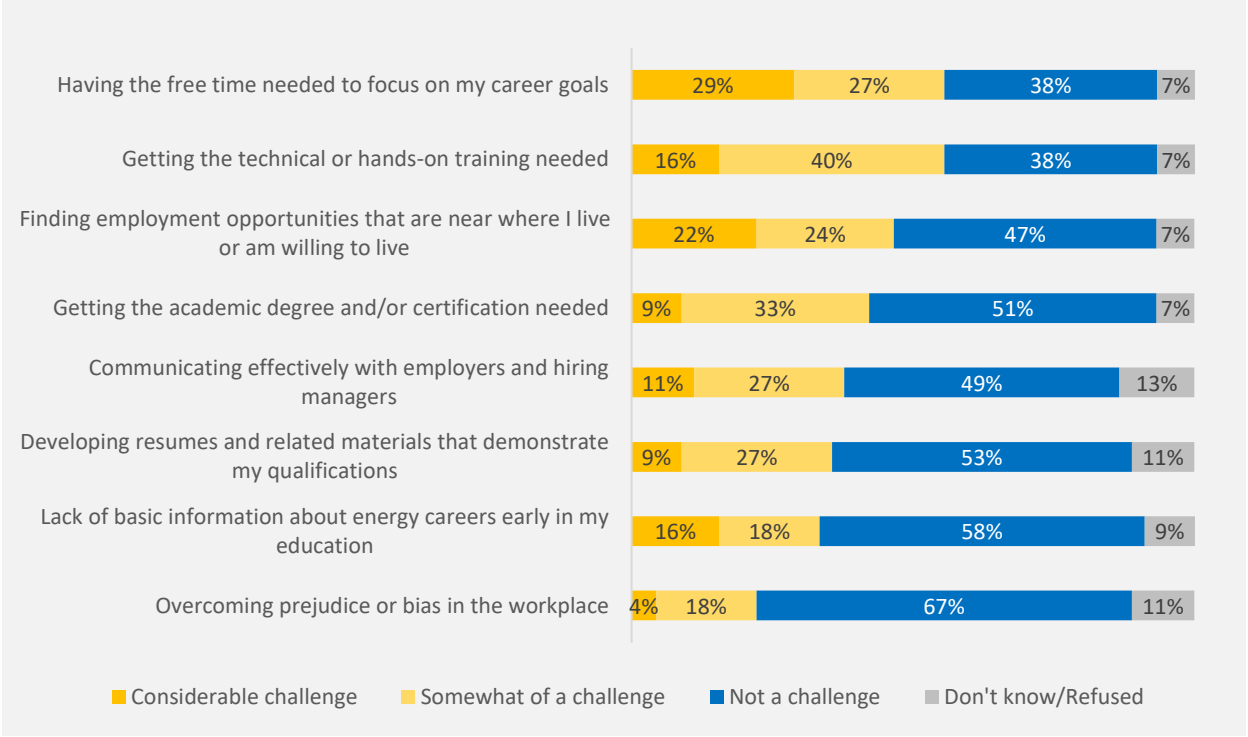
About four in ten individuals who had participated in an apprenticeship program agreed that it was beneficial to landing a job (37.5 percent), followed by participation in a mentorship program (34.4 percent), and an internship program (28.2 percent).

FIGURE 25. PROGRAM PARTICIPATION BENEFITS



The top three most significant obstacles to finding employment in the clean energy industry include: having the free time needed to focus on career goals (55.6 percent considerable or somewhat or a challenge), getting the technical or hands-on training needed (55.6 percent), and finding employment opportunities that are geographically desirable (46.6 percent).

FIGURE 26. CLEAN ENERGY CAREER ADVANCEMENT OBSTACLES



Workforce Needs & Challenges

The Workforce Needs & Challenges section profiles survey respondents from clean energy businesses across Maine. This section provides details on the overall profile of clean energy firms, including years in business and primary technology and supply chain focus. Additionally, data on the employment and hiring profile, including projected growth and skill and education requirements are provided in this section. Lastly, the section provides some insight into the energy efficiency sector, profiling firms' awareness of, interest in, and barriers to working with these technologies.

This section is broken out into the follow sub-sections:

1. Overall Firm Profile
2. Employment & Hiring Profile
3. Skill & Education Requirements
4. Advanced Energy Efficiency Technologies: Awareness & Interest

It is important to note that this survey only profiles clean energy businesses with at least one location in Maine. In total, there were 164 responses to the survey, including partials, and 43 employers that made it all the way through the survey, answering all questions.

Overall Firm Profile

By far the areas most serviced by clean energy firms in Maine include Cumberland (33.3 percent), Penobscot (23.8 percent), and York (21.4 percent) counties. About two in ten surveyed clean energy companies (19.2 percent) reported that they provide services to all counties across the state.

FIGURE 27. COUNTIES SERVED

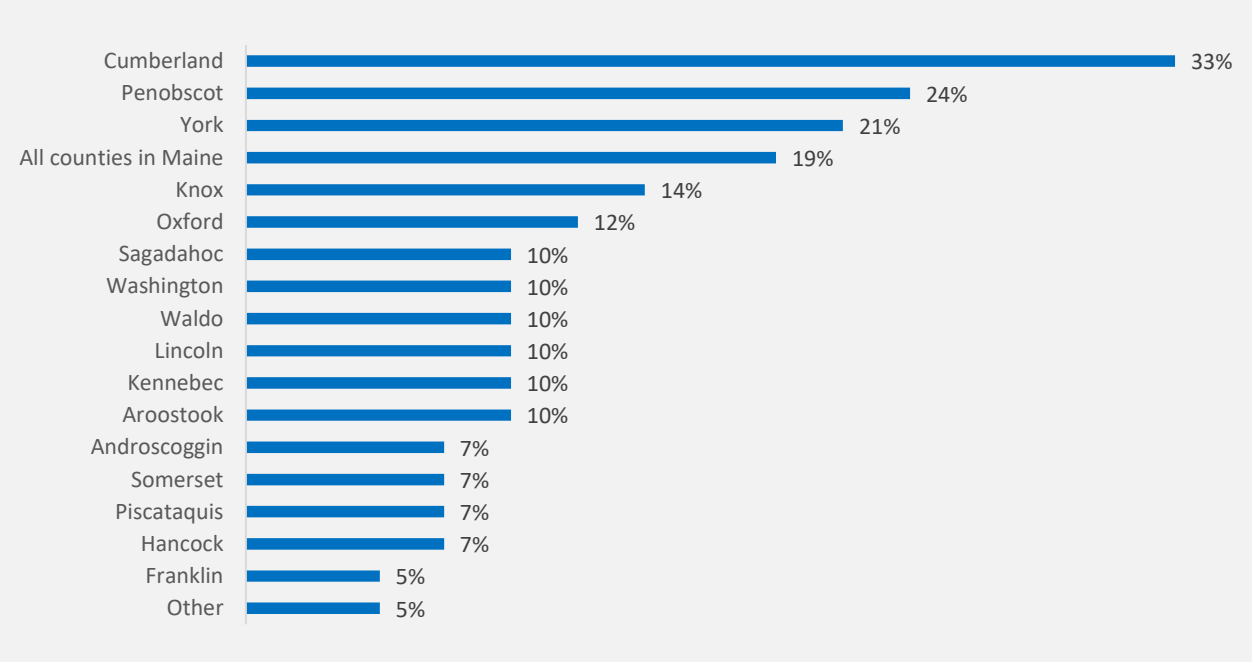
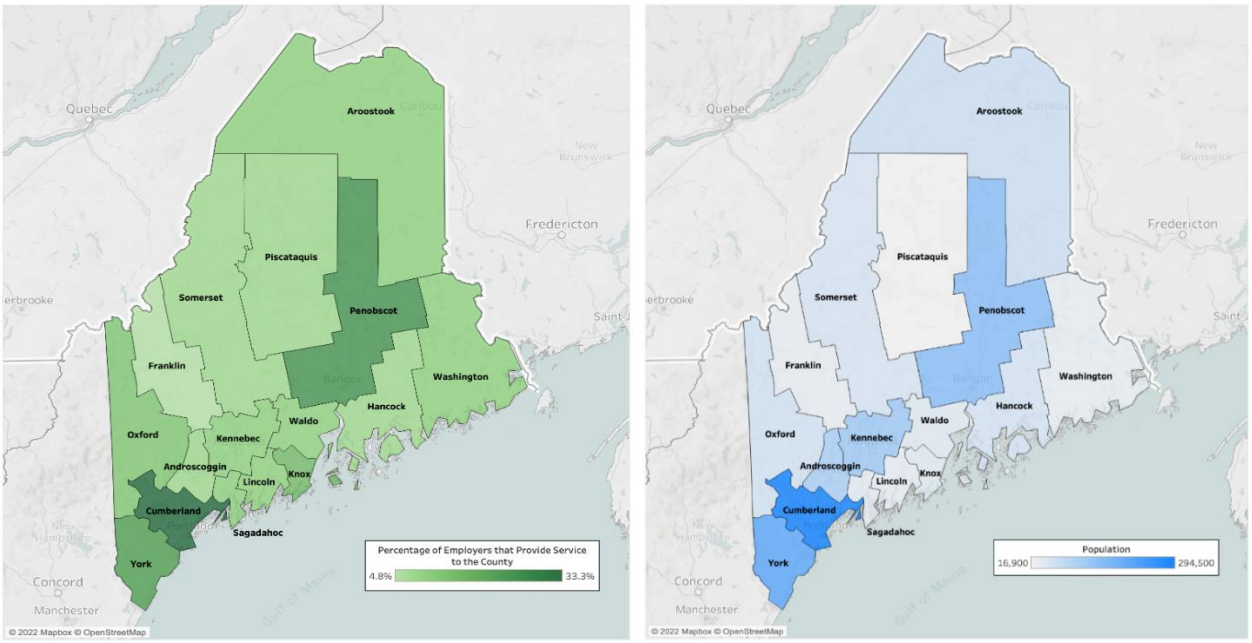


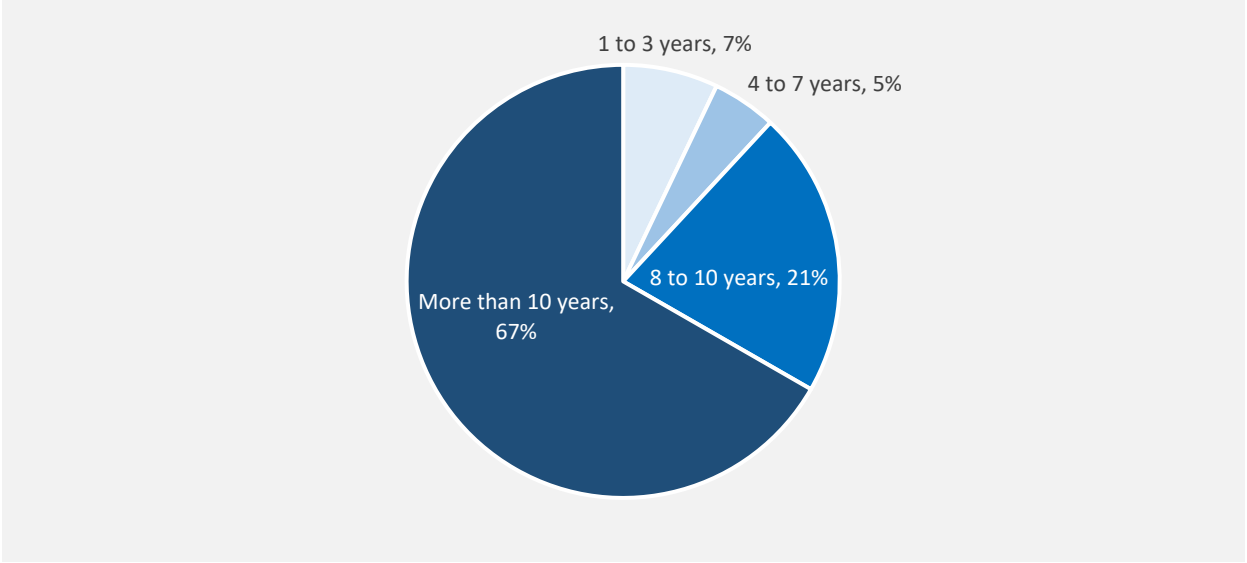
FIGURE 28. COUNTIES SERVED & POPULATION BY COUNTY[21]



Most surveyed clean energy firms are not new businesses. Two-thirds of firms surveyed (66.7 percent) have been in business for more than 10 years, and 21.4 percent have been in business for eight to ten years.

The majority of clean energy firms in Maine are focused on clean energy generation (38.1 percent) and energy efficiency (35.7 percent) technologies, including solar PV, heat pumps, battery storage and generators, and insulation.

FIGURE 29. YEARS IN BUSINESS



[21] American Community Survey 2020

FIGURE 30. PRIMARY TECHNOLOGY FOCUS

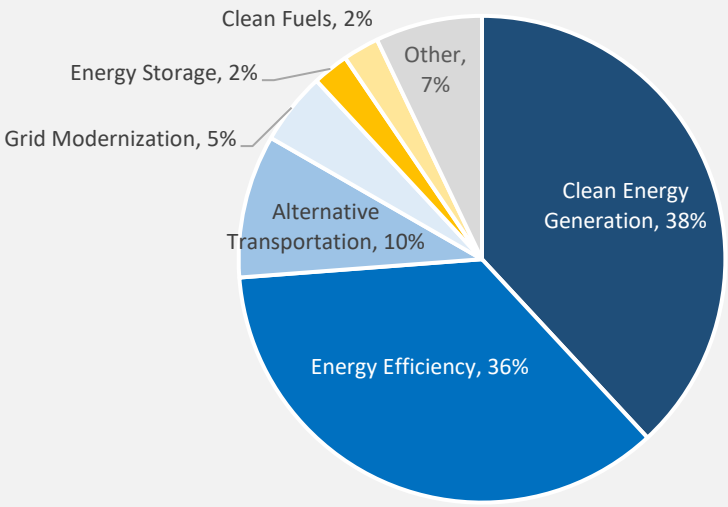
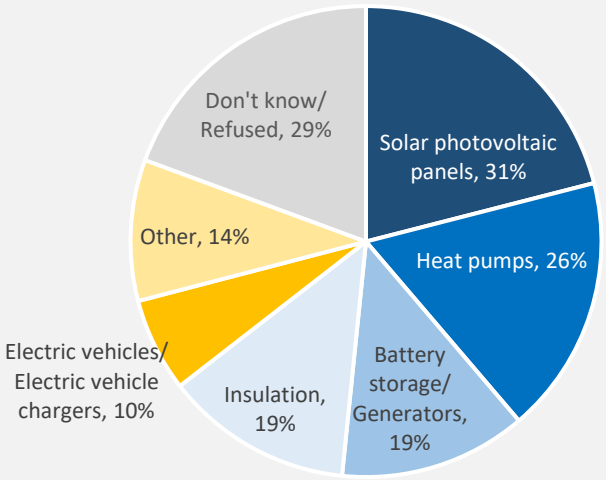
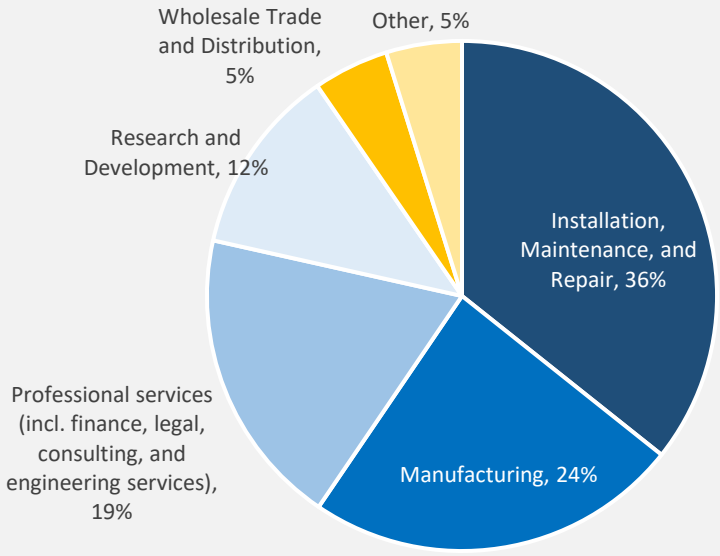


FIGURE 31. PRIMARY SUB-TECHNOLOGIES



Installation, maintenance, and repair firms accounted for just over a third of survey respondents (35.7 percent), followed by manufacturing (23.8 percent) and professional services (19.0 percent).

FIGURE 32. PRIMARY VALUE CHAIN FOCUS



Employment & Hiring Profile

Most surveyed clean energy firms are medium-sized businesses with 25 or more full-time employees (54.8 percent) and one to four part-time employees (54.8 percent).

FIGURE 33. FULL-TIME EMPLOYEES

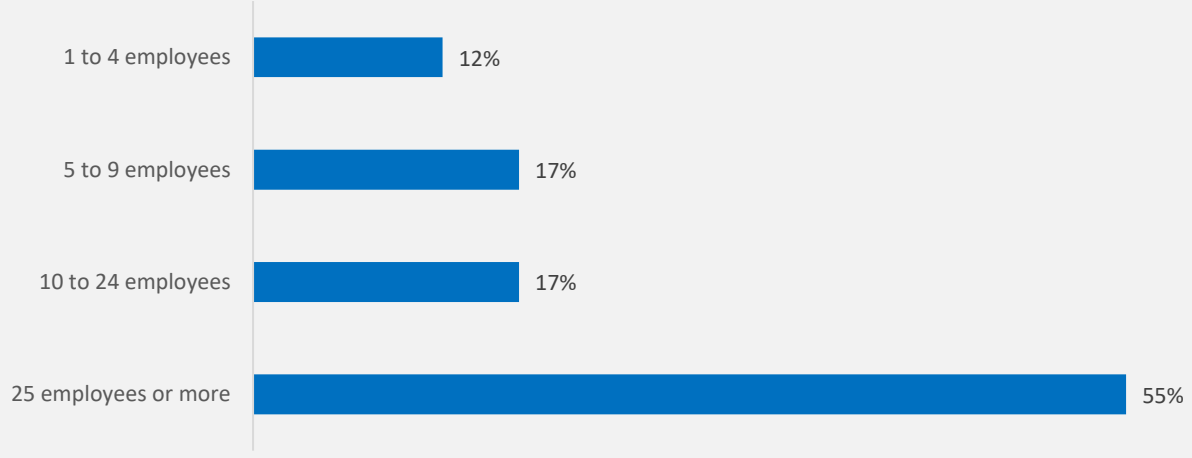
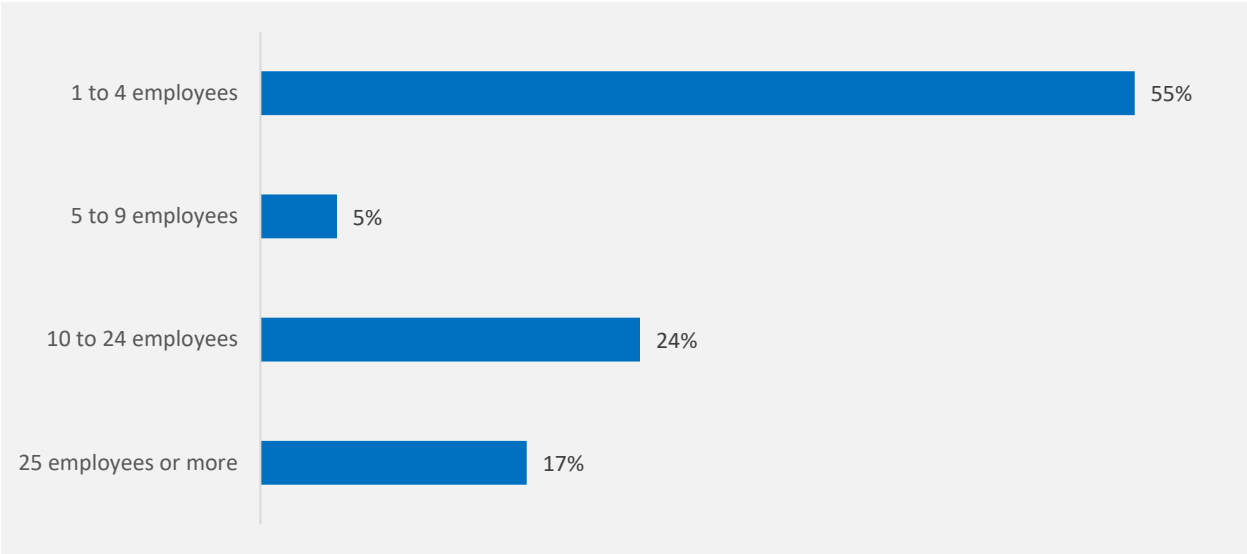


FIGURE 34. PART-TIME EMPLOYEES



Many clean energy employers in Maine are projecting to add more full-time employees to their workforce over the next 12 months (45.2 percent), and 16.7 percent expect to add more part-time employees as well. None of the surveyed clean energy workers expected to see fewer full-time workers over the next 12 months.

FIGURE 35. PROJECTED GROWTH, 12 MONTHS (FULL-TIME EMPLOYEES)

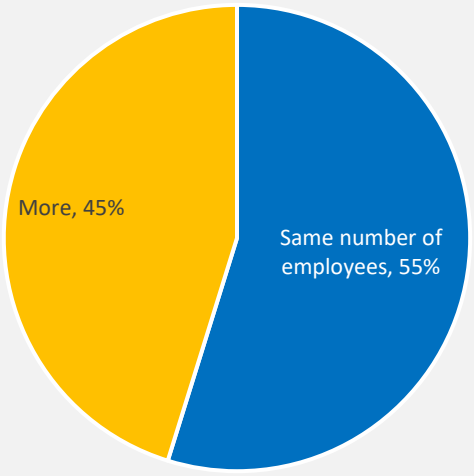
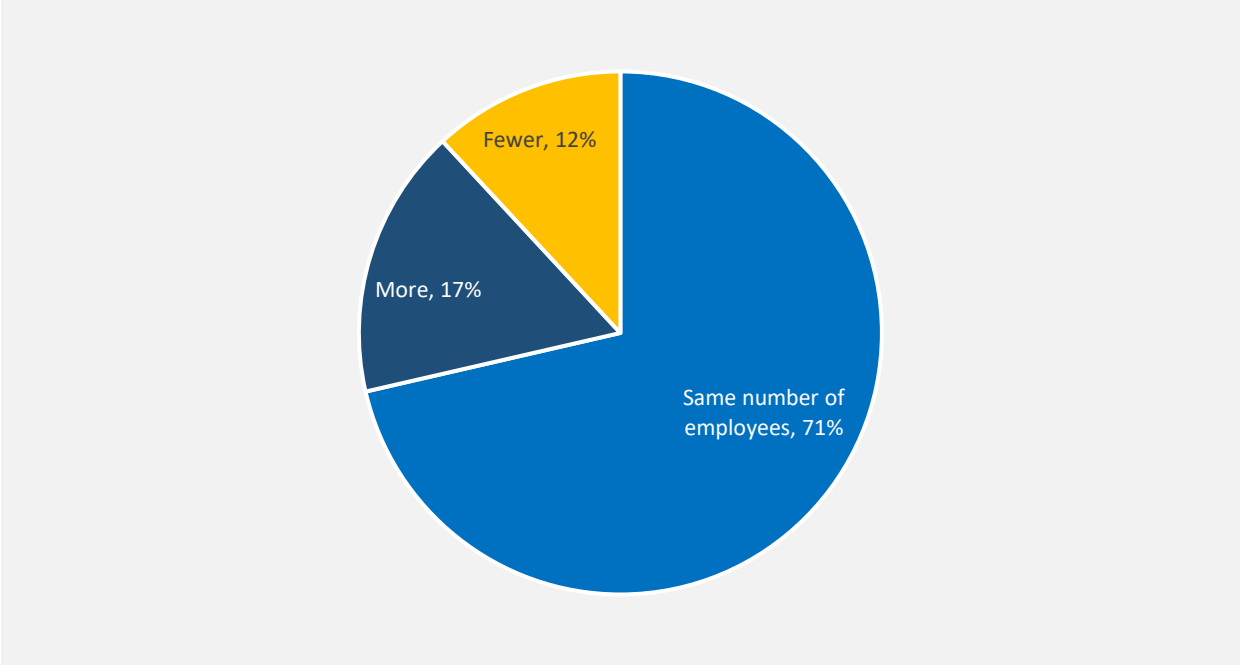


FIGURE 36. PROJECTED GROWTH, 12 MONTHS (PART-TIME EMPLOYEES)



Most clean energy employers indicated hiring difficulty trying to fill open positions over the last 12 months; nine in ten surveyed employers reported that hiring was either very or somewhat difficult (90.5 percent), with almost half indicating it had been very difficult.

Of employers that indicated they had hiring difficulty, just over a quarter reported that the most difficult positions to fill included managers or supervisors, followed by HVAC or field/repair technicians (18.4 percent), installation workers (13.2 percent), and engineers (13.2 percent).

FIGURE 37. LEVEL OF HIRING DIFFICULTY

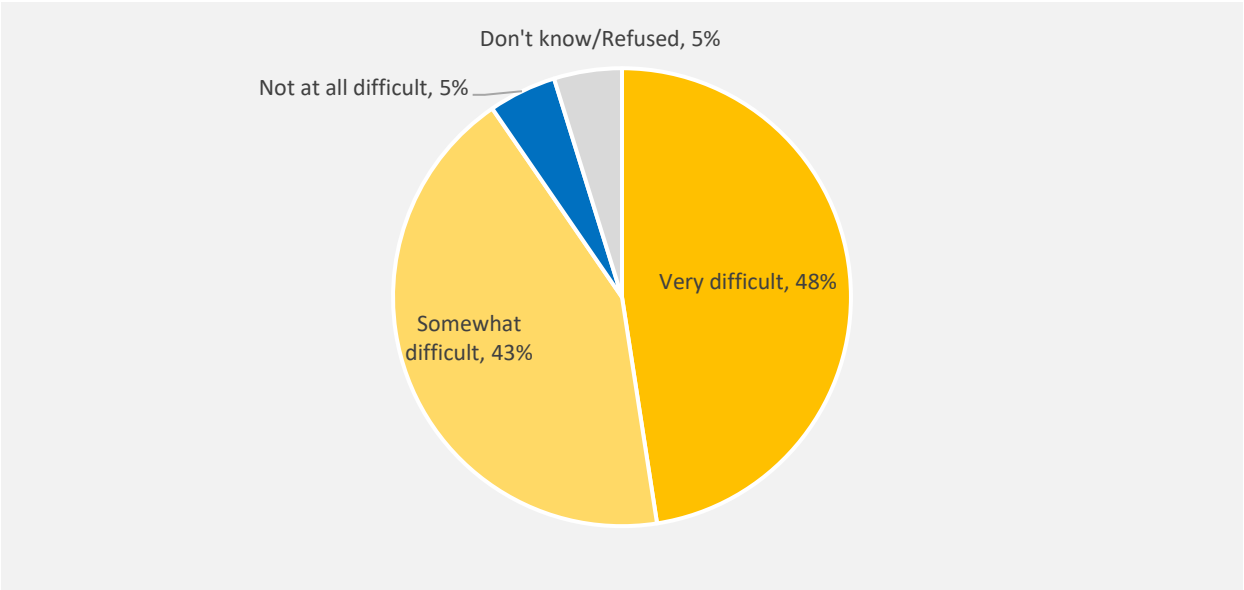
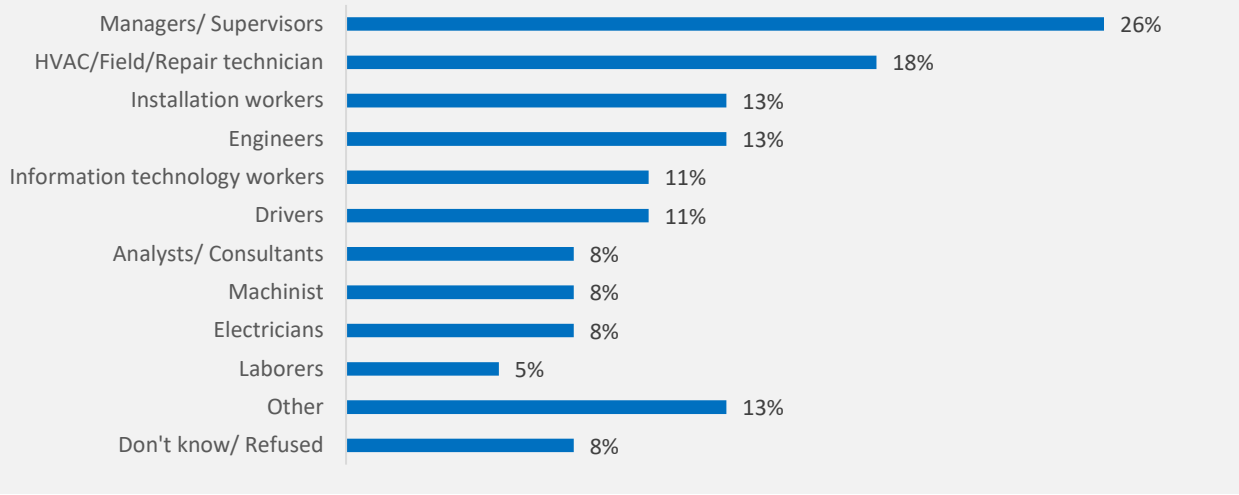


FIGURE 38. DIFFICULT POSITIONS TO FILL



A small applicant pool was the top hiring challenge for Maine's clean energy employers. Six in ten clean energy employers agreed, either strongly or somewhat, that there were not enough applicants to fill open positions. In an open-ended question, more than half indicated a small applicant pool to be one of the top two reasons for hiring difficulty (52.6 percent)

FIGURE 39. GENERAL HIRING CHALLENGES

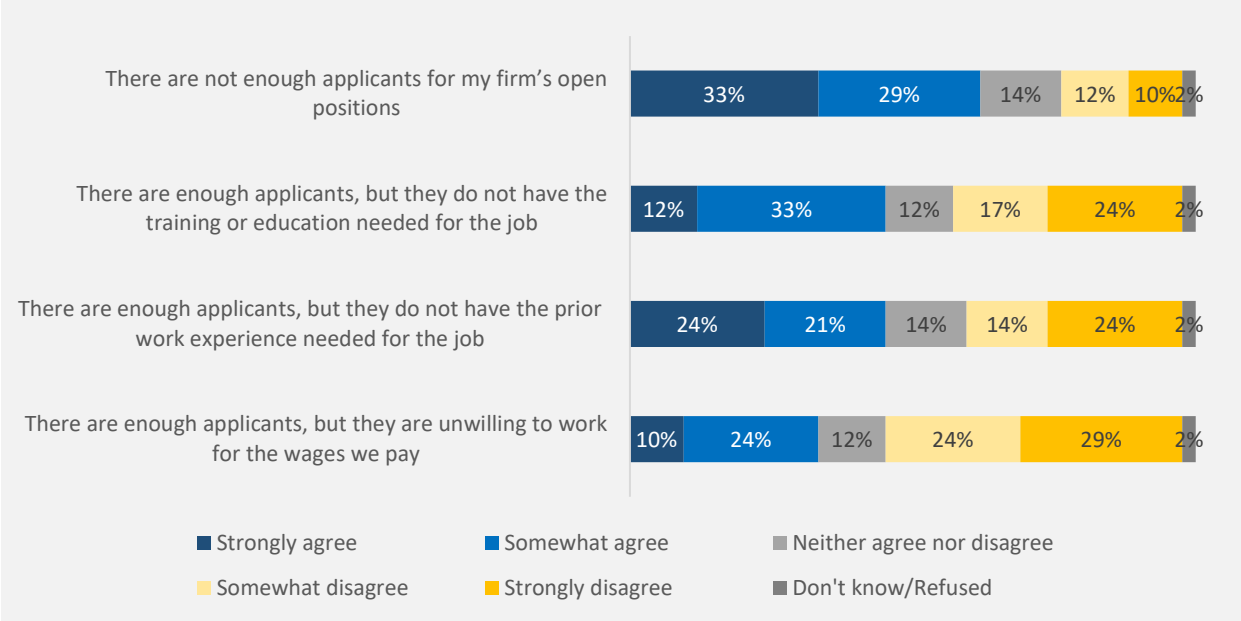
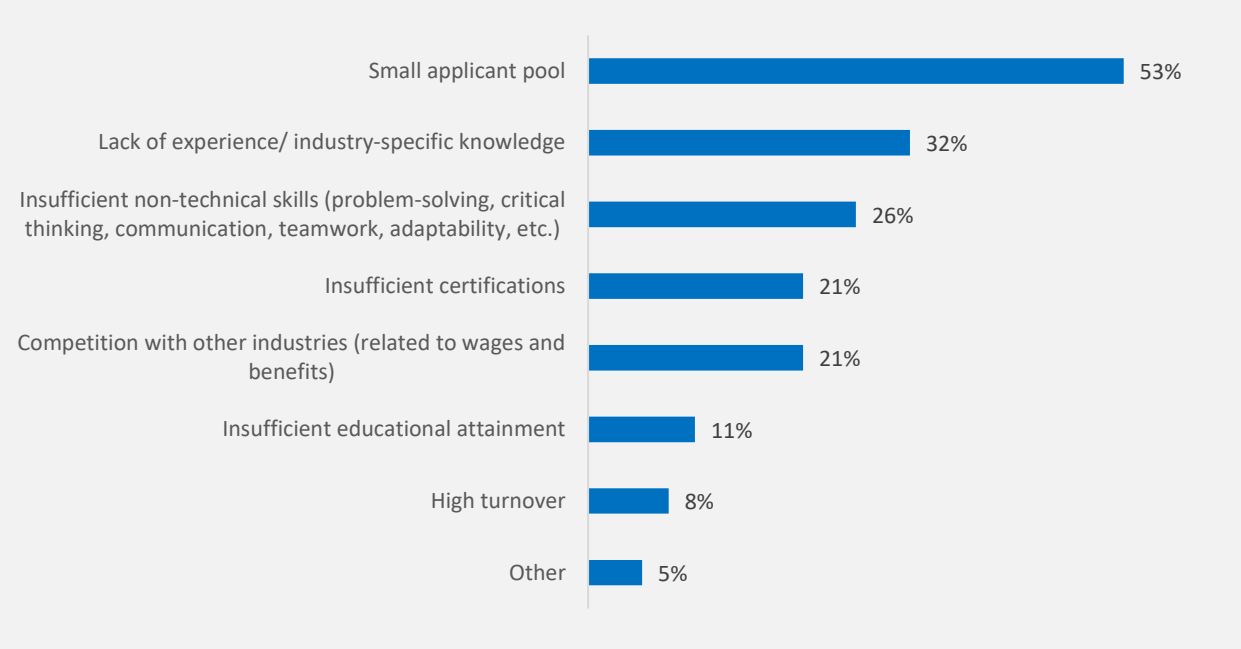


FIGURE 40. REASONS FOR HIRING DIFFICULTY



Skill & Education Requirements

The employer survey included some questions covering educational, experience, and certification requirements for (a) entry-level assembly/production workers and (b) entry-level installation/repair technicians. These questions were only asked of employers who indicated that their primary industry focus was either installation, maintenance, and repair or manufacturing. The sample size for this group of questions was 15 or fewer, and as such, this section will be reported anecdotally or qualitatively.

Entry-Level Assembly/Production Worker

Most surveyed manufacturers indicated that they require their entry-level assembly or production workers to have a high school diploma or a vocational certification; a few employers indicated that they require an Associate's or Bachelor's degree. The typical starting or entry-level salary according to most employers is at least $15 per hour, with many indicating that their entry-level production workers earn $25 an hour or more.

Most employers do not require specific licenses or certifications; however, entry-level assembly/production workers are largely expected to have some type of prior work experience. Nearly all employers reported this, with the majority indicating that they require a year or less of related work experience in a comparable position. Some employers also indicated requiring one to three years and even more than three years of related work experience for their entry-level assembly or production workers.

Entry-Level Installation/Repair Technicians

Similarly, entry-level installation and repair technicians are mostly required to have a high school diploma or less or some type of vocational training or certification, though a few employers noted that they require an Associate's or Bachelor's degree. Most employers indicated that their entry-level installation and repair technicians earn between $15 and $25 per hour, while a few indicated that their entry-level wages are above $25 an hour.

Most surveyed employers do not require any specific licenses or certifications, though a handful did indicate that they require these qualifications. Compared to assembly and production workers, many employers indicated that they do not require work experience in a comparable position, though most did indicate requiring several months or up to three years of related work experience.

Advanced Energy Efficiency Technologies: Awareness & Interest

Given that most questions in this section were only asked of employers who indicated that they do work with advanced technologies and sample sizes are low, the survey responses will be reported as anecdotal or qualitative information. For the purposes of this report, advanced technologies include all high efficiency and ENERGY STAR-rated HVAC technologies, such as hybrid heat split systems and heat pumps, duct-free or ductless air conditioning and heating systems as well as weatherization, building insulation, and efficient lighting.

Of surveyed clean energy employers, about six in ten reported that they work with advanced energy efficiency technologies. Of these, all firms indicated working with these technologies at least once or a few times a month or once a week, with most indicating that they conduct work regularly (at least once a week); no employers indicated that they work with these technologies less than once a month.

When asked why firms work with advanced technologies, employers offered the following reasons:

1. They are better for the environment
2. Customers request these technologies
3. Rebates and incentives allow firms to sell more advanced technologies

A few firms indicated that there are barriers to offering or working with advanced technologies, though the majority reported that they do not encounter any barriers. Of firms that reported barriers to advanced technologies, employers offered the following reasons:

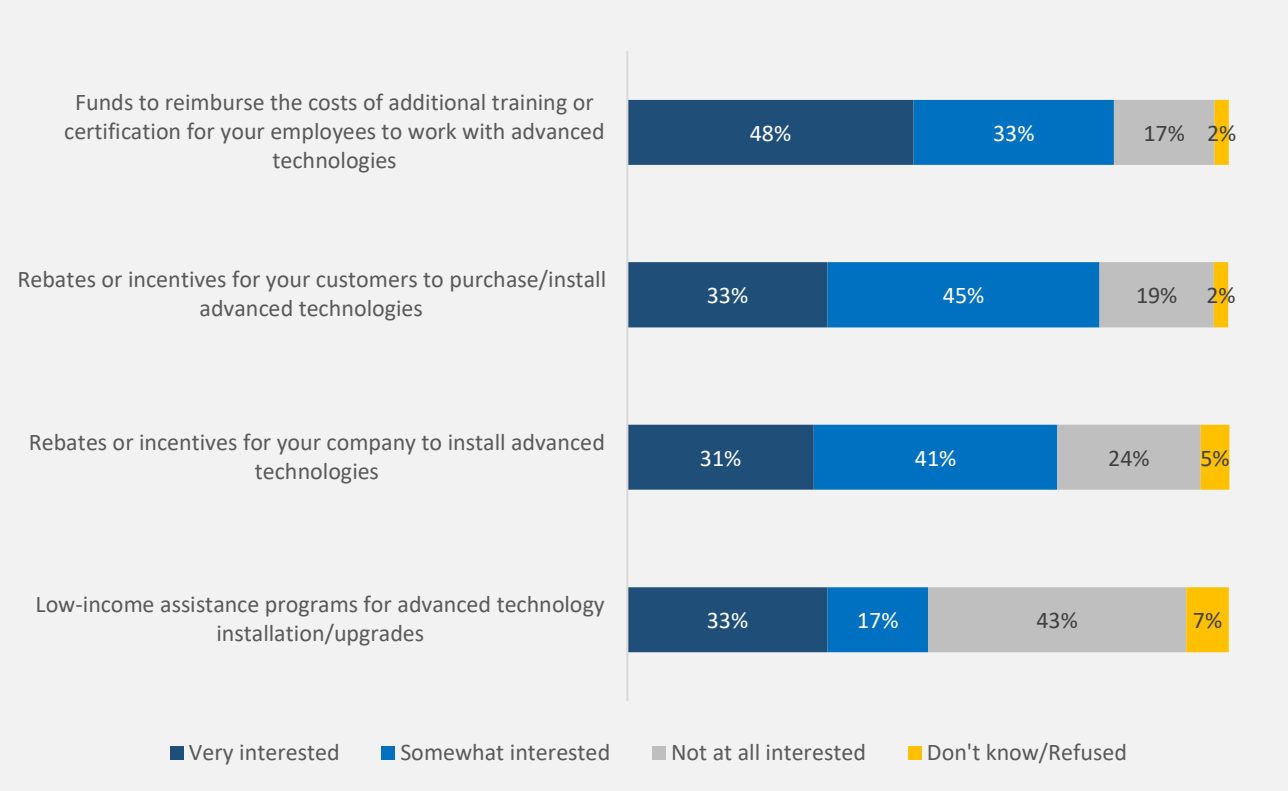
1. They are too expensive
2. Employees do not have the proper training or certifications to work with advanced technologies
3. Rebates and incentives take too long to process
4. There is no demand
5. The cost savings are not sufficient

Roughly four in ten firms indicated they do not work with advanced technologies (42.9 percent); these firms provided the following reasons for not offering or working with advanced technologies:

1. Professional and consulting firms do not work directly with advanced technologies
2. Employees do not have the proper training or certifications to work with advanced technologies
3. There is no demand
4. They are too expensive
5. The cost savings are not sufficient

For firms not currently working with advanced technologies, the majority reported some level of interest in the programs and incentives listed in Figure 41 below. Eight in ten firms indicated that they would be very or somewhat interested in funds to reimburse the costs of additional training or certification for their employees to work with advanced technologies (80.9 percent), followed by rebates or incentives for customers (78.5 percent), rebates or incentives for their company (71.5 percent), and low-income assistance programs for advanced technology installations and upgrades (50.0 percent).

FIGURE 41. PROGRAM INTEREST



Stakeholder Outreach Findings: Workforce Challenges & Industry Needs

BW Research conducted a series of interviews with clean energy stakeholders across the State of Maine. Interviewees included employers and businessowners, labor representatives, business associations, and utilities. The research team spoke with a total of 23 stakeholders to gather qualitative data on the perceptions of workforce needs and challenges for the clean energy industry in Maine. The key themes and findings from these interviews are summarized here.

WORKFORCE CHALLENGES

Workforce recruitment is a challenge for clean energy firms in Maine, particularly for trade positions in the home performance sector for weatherization and heat pump installations. In general, interviewees noted a tight labor market across the state, with many industries having difficulty filling open positions. For the clean energy industry in particular, however, firms noted difficulty finding workers to install heat pumps and weatherize homes. Employers are largely concerned with the sheer volume of demand given Maine's housing stock and the low availability of workers. Additional concerns raised include the difficult nature of work and long hours as well as the lack of available in-state BPI testing centers.

"What's holding back the industry is the workforce development challenge… recruitment is a big challenge. All companies are facing this, not just the clean tech industry."

"We paid $10,000 to do recruitment videos for our website… but we have someone designated in HR, most companies don't have this. The industry as a whole needs that."

"…even just people to do weatherization, that's a big one, there's no question that that's a significant need."

"…with the amount of homes that we have in Maine versus the available workforce, you need more companies to do the amount of work that's called for in the Climate Plan."

"There are some real specialized things about housing sciences, thermal barriers, insulation, spray foam, etc. that are not all on the current curriculum at vocational schools."

"The biggest challenges [with regards to weatherization] is that we do not have enough workers; there aren't enough people to do the amount of work that needs to be done."

"Retention is a problem… once apprentices get up to speed, they seek employment elsewhere, and contractors can't bill against them because they aren't licensed yet so it is a cost for employers."

"You can't get the [BPI] certification in Maine. You have to go do the testing in Massachusetts… could use more geographically accessible weatherization training, and having a training space or facilities with mock walls to show people how to do the insulation."

"The market [for heat pumps] is not even close to saturated… there are 1.3 million people in Maine. It is the future, but [the workforce shortage] is a bottleneck… I could be a $75 million company if I could fill my demand for labor… we need more heat pump training in community colleges."

"It takes a special person to do this kind of work [with heat pumps] every day, it's a 12-hour day, we start at 5:30 am. It takes a certain person to be able to do that for years."

Referencing insulation, air sealing, etc.: "Frankly, in this marketplace there aren't many people who are willing to do this…"

"There are barriers to entry for the employee; who wants to crawl around underneath a mobile home or in attics and small spaces in the middle of winter or summer, when you could be on a job site swinging a hammer or welding, etc."

"Finding skilled weatherization technicians is very challenging. It is very physically demanding. And finding folks in this employment economy is difficult. Every company in the state is begging for employees."

Geography and the rise of remote work capabilities also create workforce competition, recruitment, and retention challenges, especially for the utility industry and professional positions such as engineering and information technology. This is particularly true for the more rural portions of Maine, where recruiting young professionals for clean energy positions can be difficult without major urban centers. Additionally, with the rise in remote work access, many young professionals that live in Maine are employed by out-of-state or international firms.

"…we have a hard time tracking people in Central Northern Maine. A lot of younger folks want to be in more urban areas."

"The pandemic has opened up remote work for anybody anywhere… that's a benefit and a problem for companies based in Maine. People used to choose to work in Portland and Maine for quality-of-life reasons, but now they can live here and work for a firm in New York or Boston or Australia. We have lost some staff to firms that are based elsewhere."

"…it's a very competitive market right now because employees are given a lot more flexibility on where they're located and where they want to work. A lot of folks are moving into Maine, but still working in New York or Boston. We are not getting the benefit of people moving here and working for Maine companies."

"We have to compete with employers across the country… someone left us for a job in Houston but didn't have to leave Maine."

"There are fewer people moving into engineering because it's 'hard'. That's exactly what we need, those technical people to think about some of the hard things."

"There are new jobs to be done that the utility has never had to integrate into our operation, it's not that we need more people, just a lot of new types of jobs."

"We hear from members that they are looking for civil or environmental engineers…"

"Probably the hardest [position to fill] is information technology or data services, [someone] that deals with database and data visualization activities."

"We don't have trouble having high numbers of resumes, we have trouble competing with wage levels of other areas."

Meeting job quality standards is equally as important as achieving environmental goals. Clean energy workforce development, particularly for some trades such as weatherization, requires special focus on job quality, ensuring that there is a career pathway with upward wage mobility for workers.

"…we should be meeting workforce development goals… making sure these jobs are sustainable and will lead to careers. There is a huge concern in Maine that these jobs are demonstrably not the case. So from a regulatory standpoint, we are putting benchmarks in place to force contractors to meet certain standards…"

INDUSTRY NEEDS

Clean energy firms indicated the value of workforce subsidies to support the cost of onboarding, recruitment, and training. State agencies, such as MassCEC and NYSERDA partner with clean energy firms on internship and wage reimbursement programs that streamline the clean energy talent pipeline from graduation to the workplace. While internships and on-the-job training opportunities are important, recruitment is also important, since awareness of clean energy job opportunities is low. Employers suggested rethinking avenues for marketing clean energy job listings and outreach to potential jobseekers.

"NYSERDA has a 50-75% subsidy on wages for priority populations. [This] would be helpful in Maine to take on new workers at a net negative… a way of covering on-the-job training, recruitment, and other costs…"

Regarding the weatherization sector: "Could we develop some kind of paid internship where we could get some young high school students who might want a summer job… training funding could be used for this, on-the-job training, and wages could be paid out of the program. Internships usually work themselves into a job."

"The college paid BPI to train people. They had funds and they used them and offered to pay for people who want to get certified in [the weatherization] field. Without that, my guys could not have gotten certified."

"I think what we have to do is really look at how we are engaging folks… what is the dialogue… normal paths of putting an application up on Indeed… that won't work, especially from rural parts. You have to think about how we're approaching folks – social media marketing, local newspaper, etc."

Employers also noted the benefits of programs that incentivize both keeping workers local and attracting new workers, such as loan forgiveness programs. It is important to create a competitive edge for Maine, not only for professional positions that are able to work remotely, but also for trade positions, highlighting what makes Maine an attractive place to live and work compared to other cities. In addition to financial incentives, employers noted the importance of highlighting key benefits to living in Maine, such as the nature and scenery, quality of life, environmental legislation, and work-life balance.

"Maine has a student debt program where for in exchange for staying in Maine and working in Maine, there's a student loan forgiveness, and a lot of people have pointed to that as part of their decision to work for a Maine firm."

"…how do we make it a little better to stay in Maine and work for a Maine company… loan forgiveness is a great way to get there, but there could be another similar incentive that helps Maine competes compete with New York, San Diego, etc."

"[We can] learn from models used nationally. Vermont was offering $10,000 for folks to move into the state."

"Fundamentally, Maine should continue to be proactive at positioning itself as a place to work, particularly for young families."

"We need not just a clean energy program, we need things that make the state a desirable place to live; this is as important as clean energy training elements. Something that highlights are pristine beaches, strong environmental laws, beautiful mountains, etc. We need Maine, and specifically the Portland area, to be an attractive area for our employees, including affordable housing, the ability to commute efficiently, fiber optic work-from-home options, great restaurants, vibrant downtown, family-friendly, etc."

The sector could benefit from a central organizing body to manage workforce development needs across the clean energy industry and ensure training programs are meeting skill and education requirements. Enlisting or creating a central organization to manage the various facets of clean energy workforce development would ensure greater efficiency and streamlined program development. The main gap mentioned by interviewees is between industry needs and training services (i.e. ensuring that educational programs are supplying the skills and knowledge appropriate for the workplace). This is particularly important for the wind industry, to ensure that Maine gets ahead of development and really captures in-state benefits. The Maine Community College System acts as a convener between industry and college partners to ensure that colleges are meeting the needs of businesses. Expanding on or supporting this model of connectivity would ensure effective resource use and knowledge-sharing.

"The real gap is [a group] to organize the industry's needs and develop the workforce."

"A [central organizing body] could facilitate the workforce development money that is already out there."

"I think our workforce and training system is fairly siloed; unions do good work over here with their registered apprenticeship programs, community colleges do some pieces over here. There's a number of other efforts, but it hasn't felt like there's a strong vision or coherent plan for how all these pieces fit together globally."

"I think the gaps in the clean energy sector are understanding where the folks are needed and when they are needed. So as we look at additional licensure or credentials of value, understanding from industry the when and the where. How many folks do you need and where do you need them and when?"

"…We can scale up and down programs easily… our colleges are very responsive to the needs of our industry partners, [it] needs to be put on their radar though."

"We have a partnership with community colleges, and it's based on what the needs are with companies. We don't create training and then ask who wants it, we ask companies what training they need and then create it."

"Every year we have a manufacturing summit, year-after-year there's a total disconnect between what our needs are and what workforce and education system provide…"

"I would recommend a clean energy SWAT team, let's figure out what these developers need… we have a three-year runway for this 1.2 GW wind project, we should be positioning the state to capture opportunities."

Raising awareness and introducing technical trades through hands-on instruction and experimentation at an early age would be beneficial to Maine's clean energy economy in the long run. Exposure at career fairs is helpful but integrating technical concepts back into the curriculum and improving partnerships with programs that offer hands-on "trade-related" courses would be beneficial for the clean energy talent pipeline. This is especially true for middle and high schools, where exposure to clean energy careers can take a more hands-on approach.

"We can't have enough STEM in our school systems, and we wildly support a more robust inclusion of more technical colleges in secondary education, so people don't need to feel like they have to go to a four-year college. Technical crafts are extremely valuable."

"We've been involved in [partnerships with] middle and high schools…[we] try to make sure they understand the fruitful careers that exist in construction and the ability to learn and get a paycheck while they're doing so."

"It's so important that these students understand these multiple pathways out there for them… we bring them in and explain 'this is why math is important to pipefitting', etc."

"…businesses can get in front of students and have these conversations about job opportunities."

"K-12 education is important too… show young people that they can really do well in Maine professionally."

"The elimination of industrial arts in school… [you] could identify basic tools and have comfort with equipment. Now, no one is comfortable with tools."

"Even a semester of learning how to build or work with tools or repairing; they just need an introduction, getting them around tools so they have an understanding before they go to a career fair."

"For CTE, there's a resistance from kids that don't want to leave their peers and go to another school center and become disconnected... especially in the City, they don't want to go to a vocational school and be outside their peers."

"We've done a lot of career fairs, here's the problem with it, even if I bring pieces of equipment, they see shiny things that are cool to look at but don't give them that practical application for what they need to learn to get into that type of training."

"It doesn't have to be that complicated, just how to build a little more hand-working with tools into a math class where you're doing something with angles. Solar is a perfect example… there's no reason why we can't have a small solar assembly in a math or science class where students are actually putting it together."

"Maine is taking some good steps. There is a renewed emphasis on and funding on CTE and more resources on the table to strengthen and expand apprenticeship programs, but there really has not been a very systematic statewide effort to meaningfully incorporate those career options into our public education system. We need to put other options on the table other than a four-year degree."

"…short courses with certifications for employed young people to get some hands-on focused stuff related to renewables. The State of Maine can help engage with community colleges to provide that type of mechanism… this is a great model."

Maine has an opportunity to connect to and engage many populations, including new residents and immigrants, transitioning workers, and those recovering or re-entering the workforce. These populations represent an untapped resource of potential clean energy workers. Interviewees noted the importance of outreach and support for these communities.

"[We] can also connect to immigrant communities. We have a huge resource of "New Mainers" that we need to plug into."

"There's an opportunity for New Americans (Ukrainians), to re-train these folks and re-settle. We also need to focus on our folks in recovery and those departing corrections, giving them a pathway so they can be supported in the training. I think the clean energy sector has huge opportunities for these populations… electricians, heat pump training, weatherization, etc."

"[We offer] incentives to bring people from jobs that don't pay a decent wage, get them into training, credentialed, and then connect them to an employer. We've been using training stipends and paying participants to get involved in training so they can escape a minimum wage job."

"Flexibility is paramount… [we partner with] organizations that do wraparound services, but there needs to be more flexible dollars so an individual can get a training stipend and use it however they want, like for childcare… a lot of those programs have very specific boxes that have to be checked for someone to receive those services."

"The training programs are there to staff up as needed… we can recruit within the community, particularly from underrepresented populations."

Program continuity is key to signaling to clean energy businesses that public support is long-term and reliable. This is particularly true for incentives and rebates, but similarly for workforce programs.

"Programs come and go in Maine, it would be nice to have a program in Maine that is more predictable and had the same characteristics of the funding coming with them… [like] consistency in funding of workforce training programs."

"Companies need to feel comfortable taking on the risk to grow… that the rebates aren't going to change with administrations."

Licensing requirements for solar installs are hindering project development. Several interviewees noted that a change in licensing requirements for solar projects could increase their firm's abilities to complete more projects.

"There are not enough electricians in our state to begin with… [the difficulty is] driven primarily through requirements from the state to use licensed electricians for repair and upkeep of facilities."

"There's not enough licensed electricians to do the work as per state law. We've had to ship in from other states."

"In Maine, modules need to be installed by a licensed electricians and apprentices within the proper ratio... New York allows modules to be installed by non-licensed electricians… It's this requirement that's hindering the amount of jobs that can be completed in Maine… The amount of people you need to provide a module crew significantly increases…"

"There's definitely a bottleneck for us, and it's mostly related to the available electricians to complete the work… partially related to licensing requirements, if they were opened up a bit, [it] would afford us more flexibility in getting people."

"They don't need to do away with the whole requirement, just change the ratio."

"One thing that could be done is have the state adjust the ratio requirements, so one journeyman could oversee four apprentices instead of one or two."

Clean Energy Talent Pipeline

The Clean Energy Talent Pipeline section highlights the findings from a quantitative survey of potential clean energy workers in Maine. Individuals who participated in the survey live in Maine and are (a) currently working in an industry not related to clean energy, (b) not currently working but looking for work, or (c) currently working but looking for other job opportunities. This section is broken out into the following sub-sections:

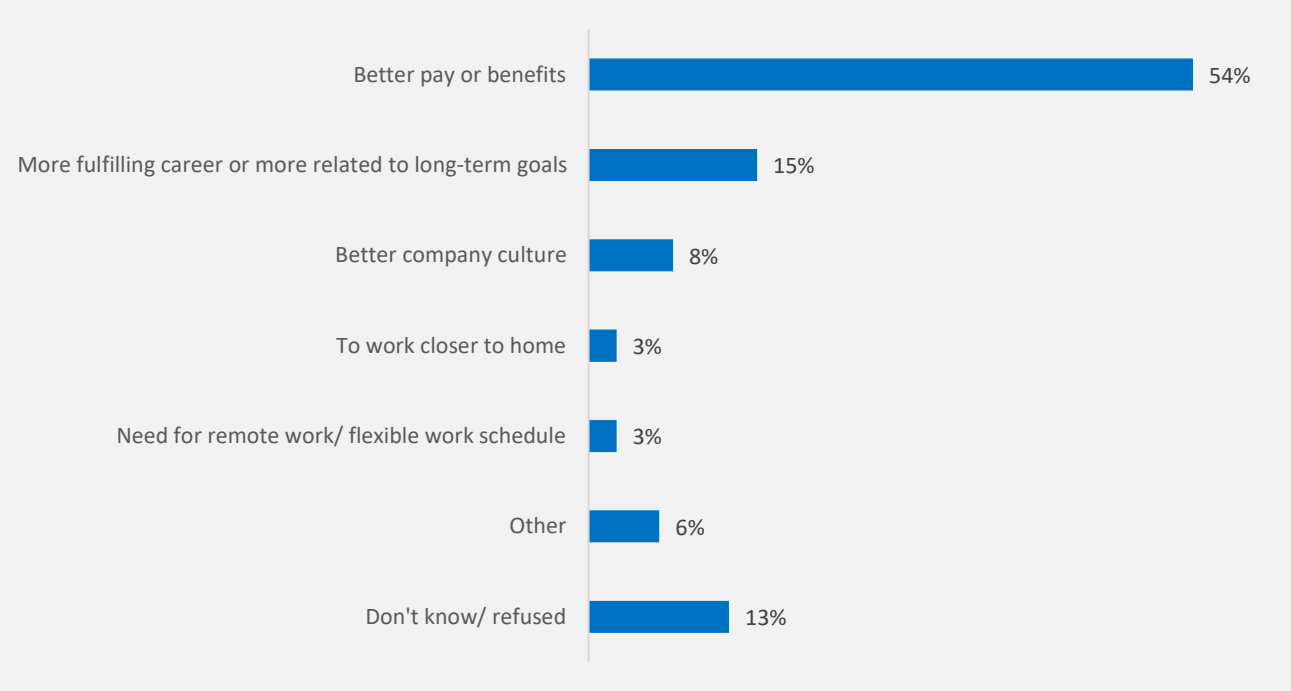
1. Employment Priorities & Preferences
2. Industry Perceptions, Awareness, & Interest
3. Career Navigation & Barriers

It is important to note that this survey profiles only adults over the age of 18 who live in Maine. In total, there were 505 responses to the survey, including partials, and 189 individuals that made it all the way through the survey, answering all questions.

Overall Employment Priorities & Preferences

The majority of surveyed potential workers that indicated they were searching for a new job are doing so in order to secure better pay or benefits (53.8 percent). One in seven survey respondents reported searching for a new job in order to find either a more fulfilling career or one that related more to long-term goals (15.0 percent).

FIGURE 42. CAREER CHANGE REASONS

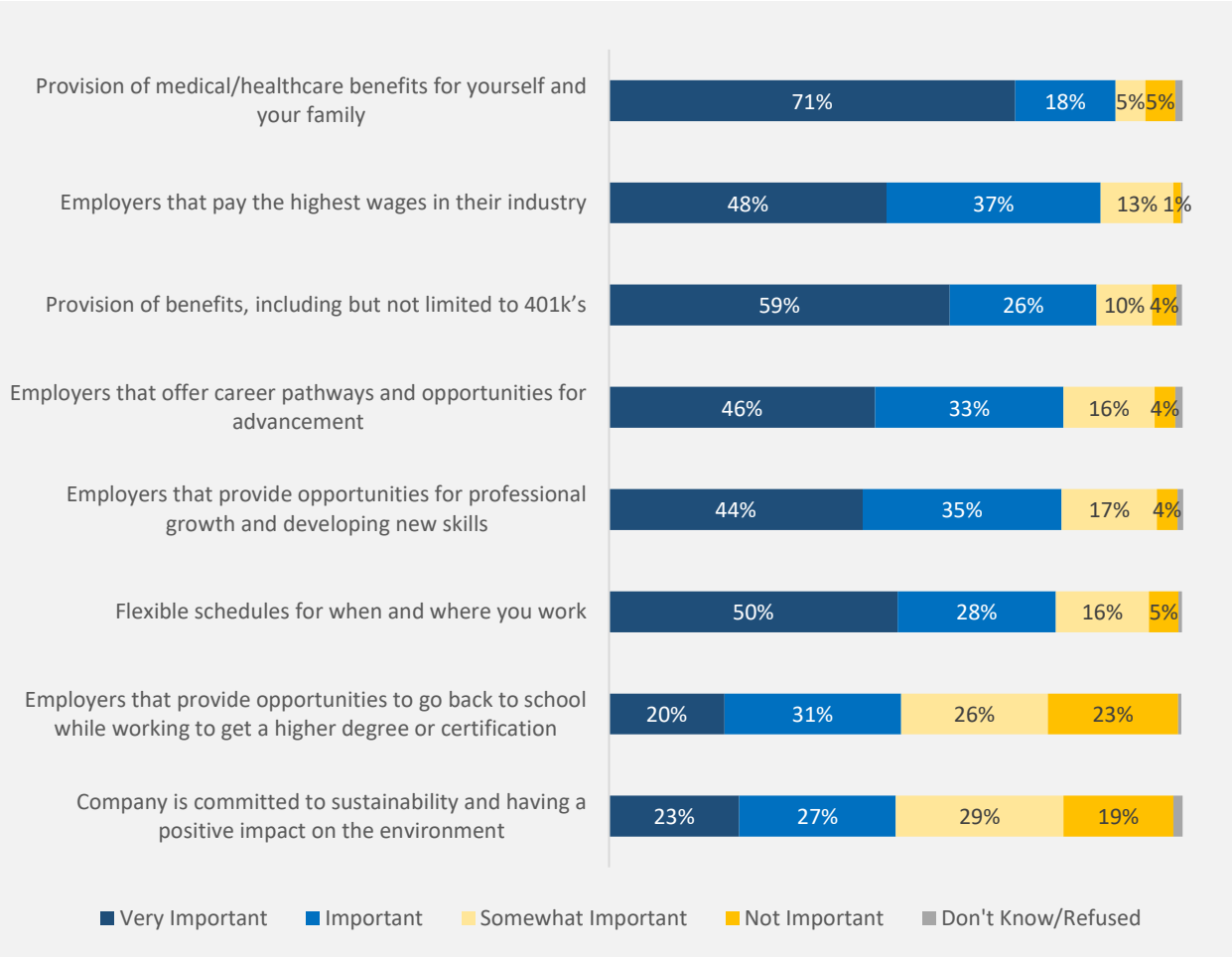


At least half of all survey respondents agreed with each of the employment characteristics tested in Figure 43 below, but healthcare tops the list of important characteristics for surveyed potential clean energy workers; eight in ten individuals indicated that this benefit was either very or somewhat important (88.3 percent), followed by high wages (85.7 percent) and retirement benefits (85.0 percent).

Additional benefits that were considered very important or important by at least three-quarters of potential workers include career pathways and opportunities for advancement (79.2 percent), opportunities for professional growth and skill development (78.9 percent), and flexible work schedules (77.9 percent).

About half of surveyed potential workers also indicated that the opportunity to go back school while working to get a higher degree is important (50.9 percent) and working for a company that is committed to sustainability and having a positive environmental impact is important (50.0 percent).

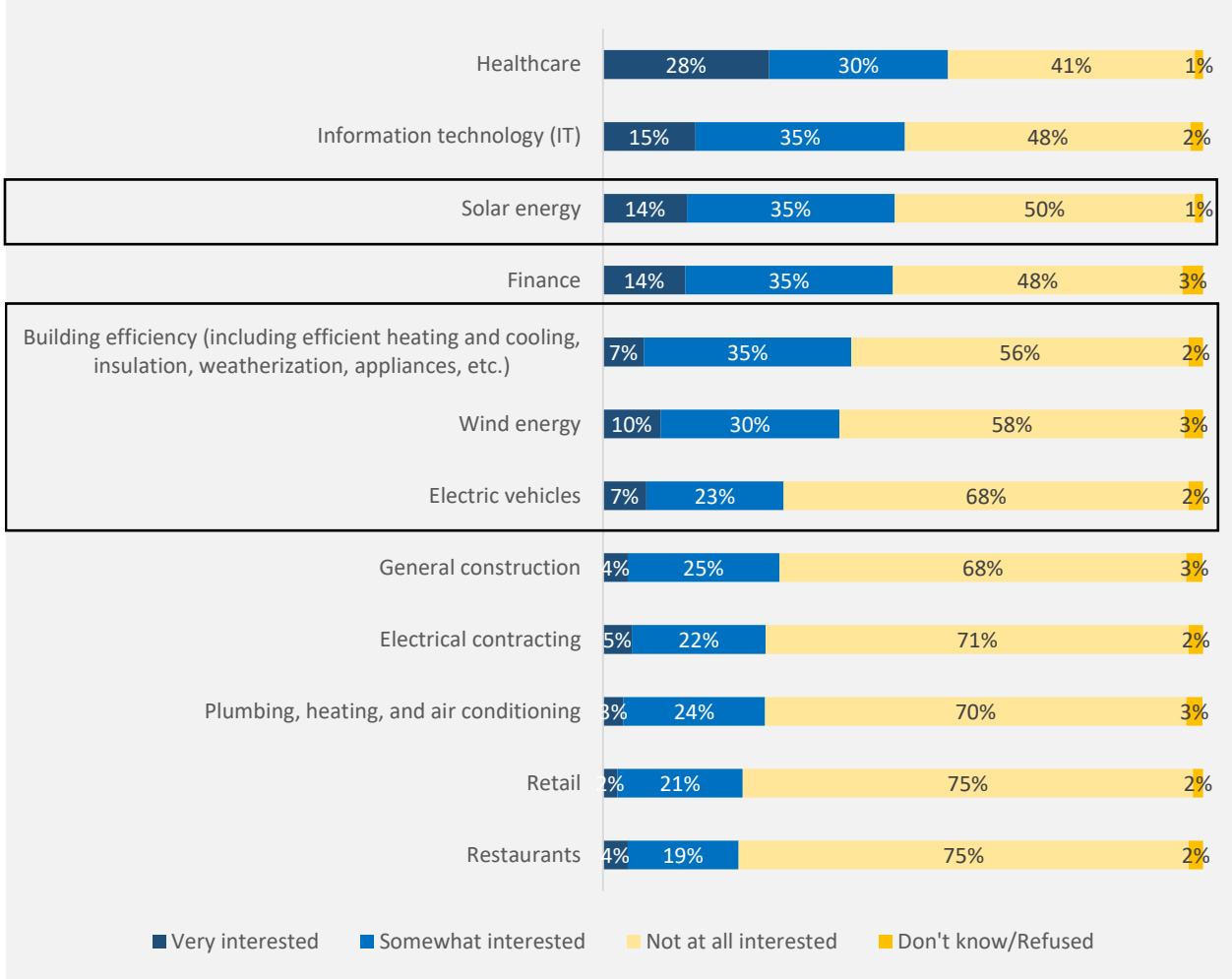
FIGURE 43. IMPORTANCE OF VARIOUS EMPLOYMENT CHARACTERISTICS



With regards to building careers in specific industries, healthcare and information technology topped the list of tested items, with at least half of survey respondents indicating that they are either very or somewhat interested in building a career in these industries.

About half of survey respondents also indicated some level of interest in building a career in the solar industry (48.3 percent), while four in ten respondents indicated interest in building efficiency (41.1 percent), followed by wind energy (39.4 percent), and electric vehicles (30.1 percent).

FIGURE 44. CAREER INTEREST BY INDUSTRY

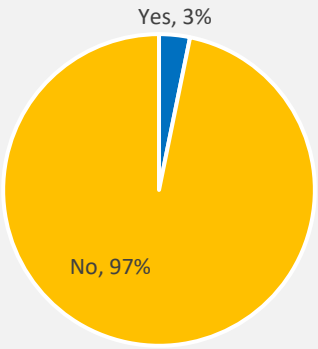


Clean Energy Perceptions, Awareness, & Interest

There is very low awareness with regards to the types of clean energy jobs or positions that exist or are available. When asked about their awareness of any clean energy jobs or positions, nearly 97 percent of survey respondents indicated that they could not specify any job titles or occupations.

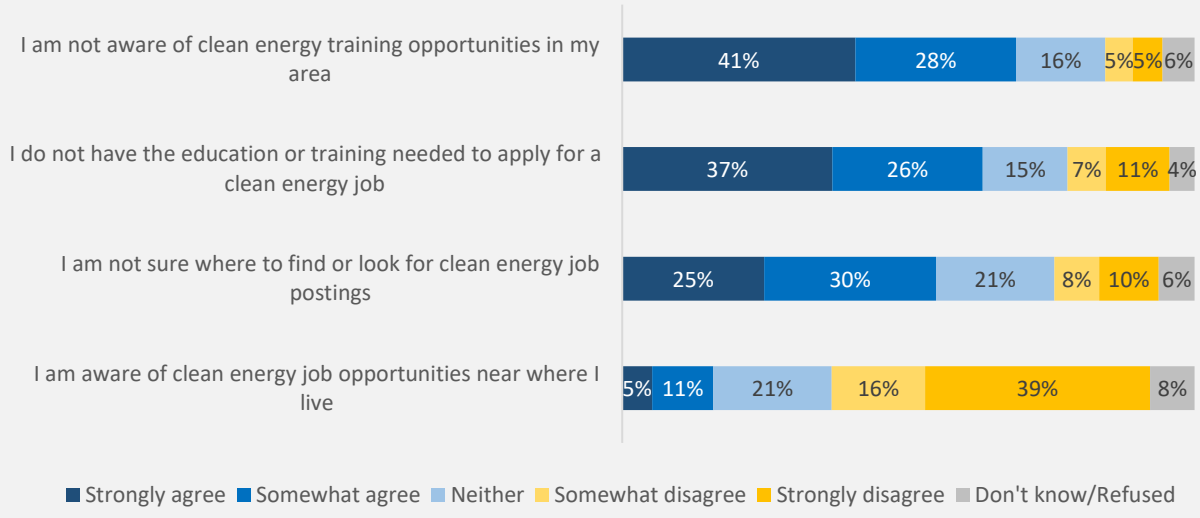
Of the 3.2 percent of respondents that are aware of clean energy jobs, individuals reported awareness of solar, wind, biomass, and hydropower-related positions.

FIGURE 45. CLEAN ENERGY JOB AWARENESS



Awareness of clean energy training opportunities is also low amongst potential workers. About seven in ten survey respondents strongly or somewhat agreed that they are not aware of clean energy training opportunities in their area (68.8 percent). Just over half of survey respondents also agreed that they are not sure where to look for or find clean energy job postings (54.8 percent), and 63.0 percent agreed that they do not have the education or training needed to apply for a clean energy job.

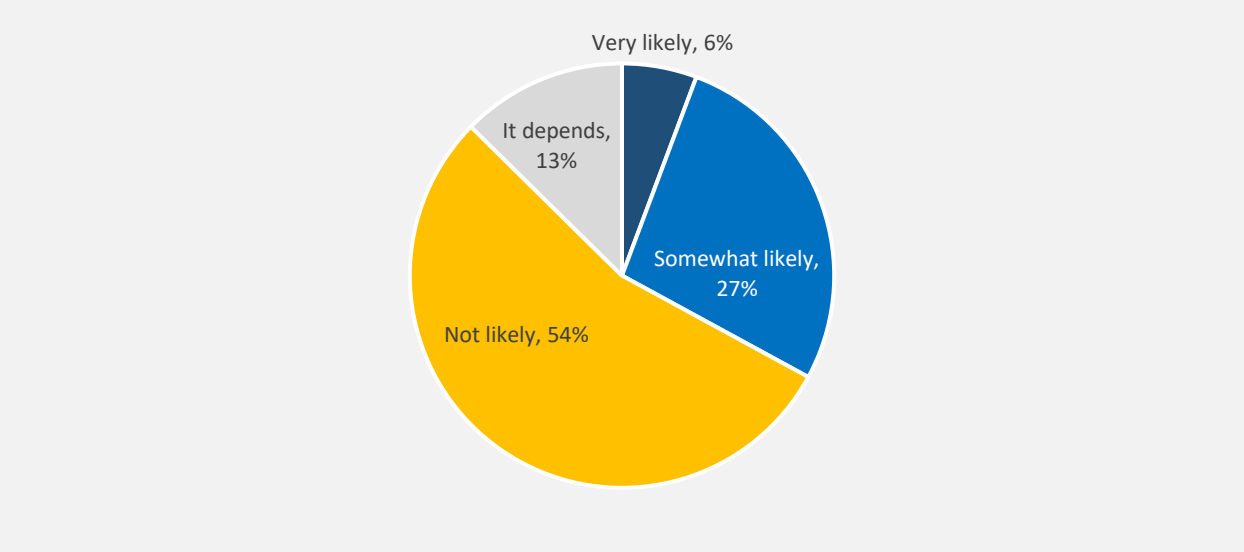
FIGURE 46. AWARENESS OF CLEAN ENERGY EMPLOYMENT & TRAINING OPPORTUNITIES



Few individuals indicated that they would apply for a position in the clean energy industry if they were looking for new employment opportunities. The majority of respondents reported that were not likely to apply for a clean energy position (54.4 percent), and 12.6 percent indicated "it depends". About a third of respondents reported they were very or somewhat likely to apply to a clean energy job listing (32.9 percent).

Individuals that indicated "it depends" cited the following reasons: job requirements must fit with current skills, level of pay and benefits offered, alignment with current industry and skills, location and remote work availability, and alignment with current values or environmental goals.

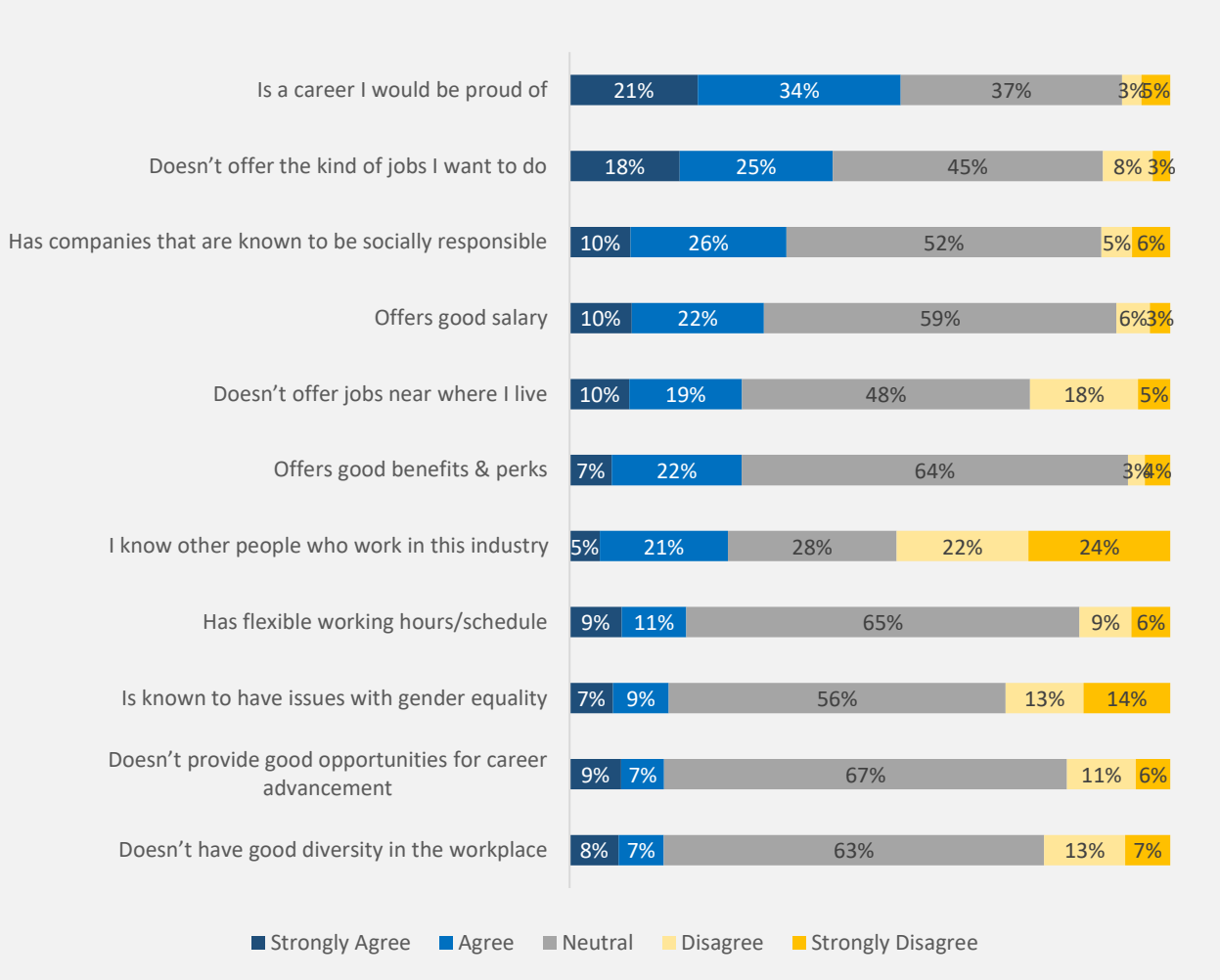
FIGURE 47. LIKELIHOOD OF APPLYING TO CLEAN ENERGY POSITION



Maine's general population is largely unaware of the attributes and characteristics of clean energy careers. The majority of respondents either strongly agreed or agreed that a clean energy career is something they would be proud of, but about four in ten agreed that the industry does not offer the kinds of jobs they would want to do (43.8 percent).

For the most part, at least half to just over two-thirds of respondents indicated that they neither agreed nor disagreed regarding clean energy firms' salary and benefit offerings, work schedules, geographic desirability, equitable and diverse workplace environments, and opportunities for career advancement. Furthermore, few surveyed potential workers know people who work in the clean energy industry; 45.5 percent of survey respondents disagreed with this statement.

FIGURE 48. CLEAN ENERGY INDUSTRY PERCEPTIONS[22]



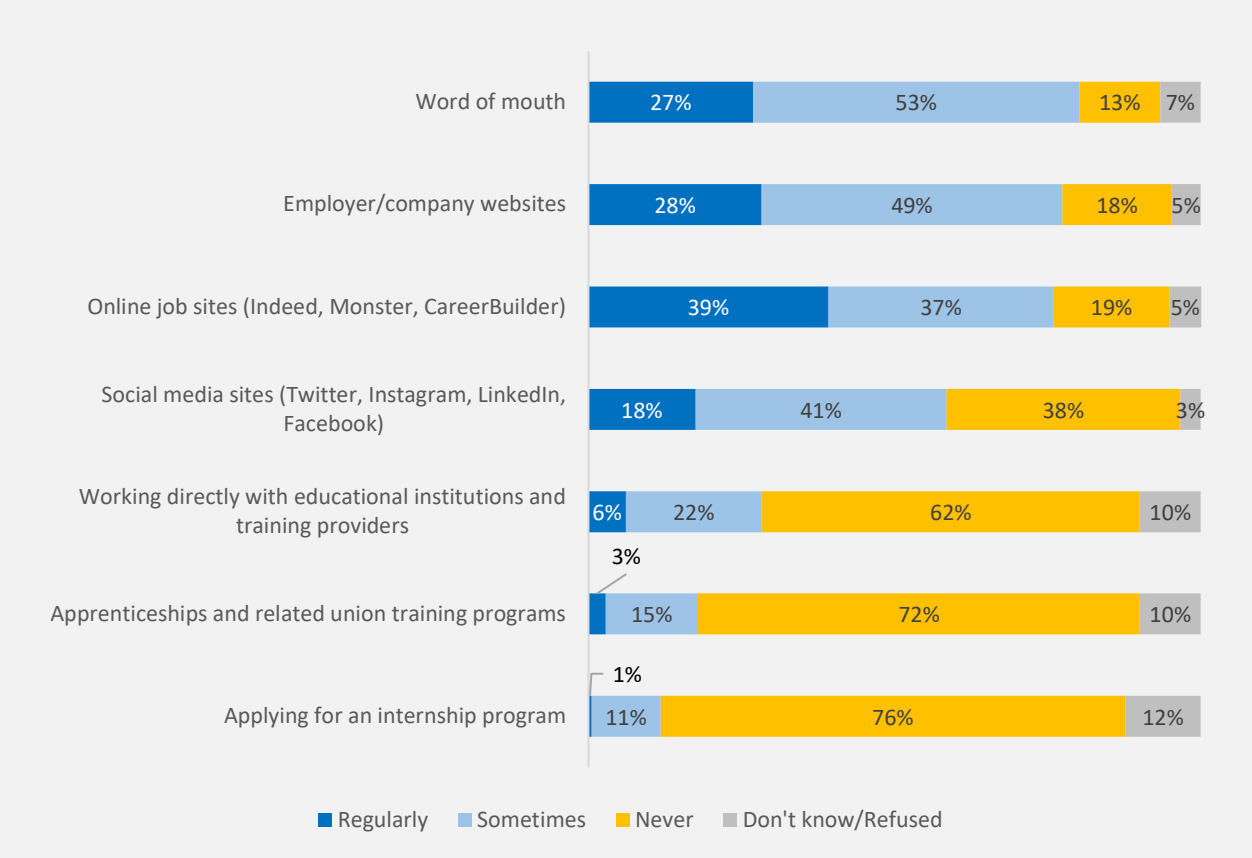
[22] "Don't know/ Refused" responses have been factored out of this analysis.

General Career Navigation & Barriers

The top job search resources for potential clean energy workers include word of mouth, which is used regularly or sometimes by eight in ten respondents (80.2 percent), followed by employer or company websites (77.4 percent), and online job sites (76.0 percent).

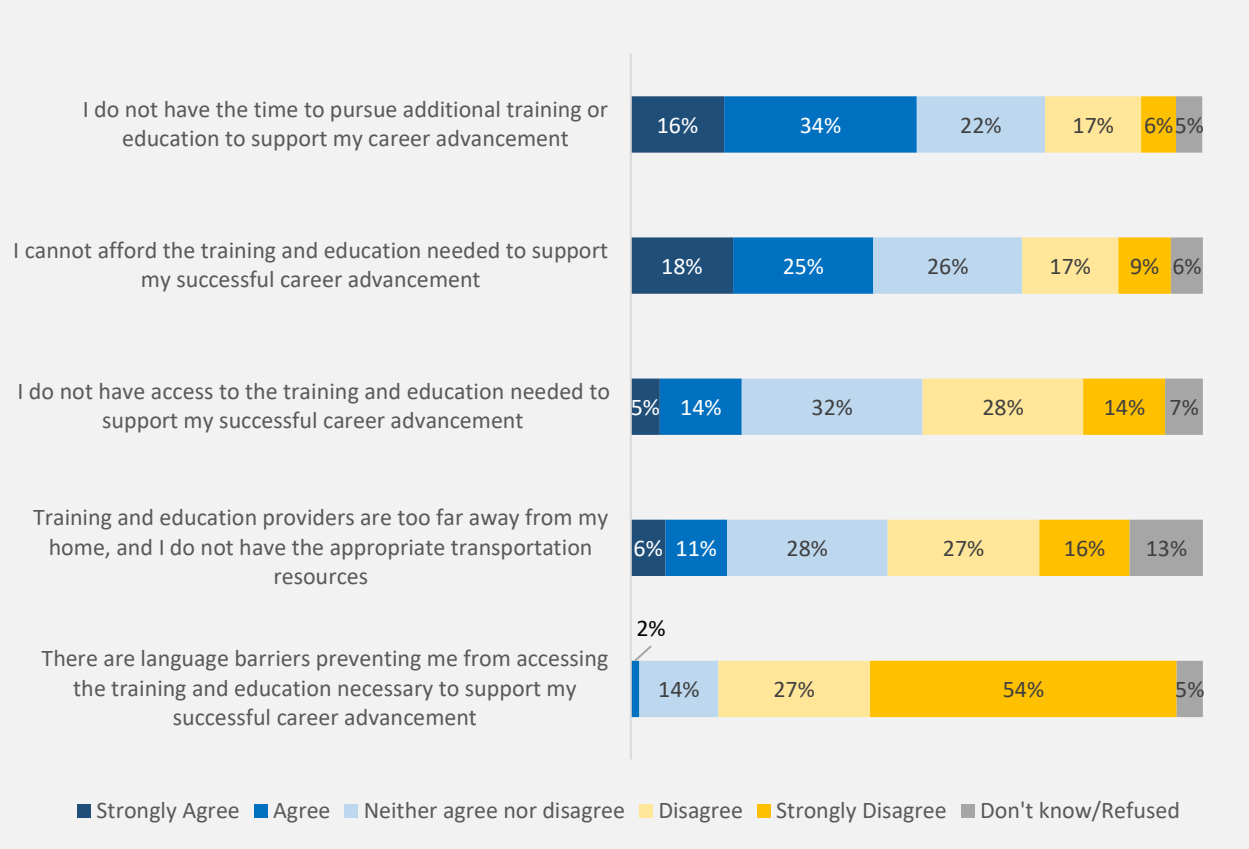
Survey respondents also use social media sites (58.5 percent) or work directly with educational institutions and training providers (28.3 percent). Fewer than 20 percent of respondents find jobs through apprenticeships and related union training programs (17.9 percent) or internship programs (11.8 percent).

FIGURE 49. JOB SEARCH RESOURCES



The largest barrier to career advancement for surveyed potential workers is finding the time to pursue additional training or education; 50.0 percent of survey respondents strongly agreed or agreed with this statement. About four in ten respondents agreed that they cannot afford the training and education needed to support career advancement (42.4 percent). Training and education access is a challenge for 19.4 percent of respondents, followed by distance to training providers (16.8 percent), and language barriers (1.5 percent).

FIGURE 50. CAREER ADVANCEMENT CHALLENGES



Clean Energy Training Landscape

This Clean Energy Training Analysis seeks to provide stakeholders with a greater understanding of where gaps exist in labor market demand and workforce supply, particularly related to skill needs and talent availabilities. Clean energy is a relatively new but resilient industry, and it has the ability to provide high quality opportunities for Maine workers. Governor Janet Mills has also prioritized reducing Mainers' reliance on fossil fuels and the state continues to embrace the transition towards clean energy sources. In support of Maine's progress towards embracing clean energy, Governor Mills unveiled a Clean Energy Partnership to provide career training opportunities to equip Maine residents with skills to find jobs in the growing clean energy sector.[23] Thus, it is imperative for the state to understand strengths and weaknesses that exist in training potential workers for jobs in the clean energy sector. The purpose of this section is to identify Maine's positionality in the state's ability to attract and retain workers who are interested in training for clean energy jobs.

To conduct a robust analysis, the team developed a training inventory of clean energy-related workforce development and training programs in Maine. This inventory also included training programs for occupations that can be applied to offshore wind, particularly welding programs, as initially developed in the Maine Offshore Wind Talent Analysis.[24] Publicly available listings on school, apprenticeship and union websites, and feedback from stakeholders was instrumental in developing the inventory which contains 151 programs. The inventory provides a basic understanding of the geographic and occupational distribution of existing training programs.

Clean Energy Training Programs

This section highlights the current training programs around the state of Maine that are presently or could be involved in developing the state's clean energy workforce.

Of the 151 identified training programs, construction emerged as the top occupational focus with 45 programs (29.8 percent); 37 of these programs are apprenticeships. General Dynamics Bath Iron Works and Portsmouth Naval Shipyard excelled in their apprenticeship offerings, offering 27 construction programs between the two institutions. representing Just over 20 percent are aimed at HVAC workers (22.5 percent), followed by electricians (17.9 percent).[25] Precision technology programs training machinists made up 13.2 percent of the total number of programs. Welding and general clean energy programs, each representing 8.6 percent and 7.3 percent respectively, offer broad training that could be applied to the clean energy industry.[26] Construction, electrician, HVAC, and general clean energy programs include workplace safety training, such as state-specific OSHA 10- and 30-Hour certification courses.

[23] Office of Governor Janet Mills
[24] BW Research Partnership
[25] Electrician programs were mostly made up of a combination of apprenticeships offered by trade associations and fundamentals courses offered at community colleges.
[26] The 'General Clean Energy' Occupational Focus category is composed of trainings for multiple clean energy technologies that are not specifically focused on one technology as well as introductory or general courses that explore renewable energies and alternative fuels in relation to climate change and the environment. Solar includes installation and service technicians.

Table 8 provides the number of programs offered in Maine by occupational focus.

TABLE 8. MAINE CLEAN ENERGY TRAINING PROGRAMS BY OCCUPATIONAL FOCUS

Occupational Focus	Number of Programs*	Percent of Programs
Construction	45	29.8%
HVAC	34	22.5%
Electrician	27	17.9%
Machinist	20	13.2%
Welding	13	8.6%
General Clean Energy	11	7.3%
Solar Installer	10	6.6%
Quality Assurance	9	6.0%
Carpenter	5	3.3%
Wind Technician	5	3.3%
Research	4	2.6%
Management & Consulting	4	2.6%
Engineering	4	2.6%
Weatherization Technician	4	2.6%
Automotive Technicians	3	2.0%

* **Some programs applied to multiple occupational specifications. These programs are counted for each sector they represent. Note that the sum will be above 151 and 100%.**

Apprenticeships and offerings at community colleges represent over three quarters of identified training programs; 39.1 percent of programs are apprenticeships and 36.4 percent are hosted by community colleges. Four-year colleges or universities represented 7.9 percent of total programs followed by trade associations and private firms, each representing 6.6 percent of total programs. Table 9 provides the number of programs offered in Maine by program type.

As noted above, the majority of apprenticeships— thirty-three in total— are offered by General Dynamics Bath Iron Works and Portsmouth Naval Shipyard; twenty-seven of these thirty-three programs are construction programs. Kennebec Valley Community College (KVCC), Southern Maine Community College (SMCC) and Northern Maine Community College (NMCC) hosted a total of forty-two programs. KVCC emerged the clear leader in clean energy and clean energy adjacent programs, offering a total of

nineteen programs, a majority of which trained people for electrician occupations. Only four of the nineteen KVCC programs led to no determinable outcome while the rest led to a certificate (42.1 percent of KVCC programs), an associate degree (10.5 percent of KVCC programs) or helped individuals prepare for certification exams (26.3 percent). Individuals are well likely to take advantage of community college offerings. The volume of offerings also aligns with Governor Mills' plan to provide free college for some Maine residents by covering costs at community college for two years and Maine residents are well-positioned to take advantage of this training opportunity.

TABLE 9. MAINE CLEAN ENERGY TRAINING PROGRAMS BY PROGRAM TYPE

Program Type	Number of Programs	Percent of Programs
Apprenticeship*	59	39.1%
Community College	55	36.4%
4-Year College/University	12	7.9%
Trade Association*	10	6.6%
Private	10	6.6%
Technical-Vocational School*	6	4.0%
High School*	4	2.6%
Community Based Organization*	3	2.0%
Non-Profit Organization	2	1.3%
Government	1	0.7%
Quasi-State Agency	1	0.7%

*** Some programs applied to multiple program types. These programs are counted for each sector they represent. Note that the sum will be above 151 and 100%.**

Cumberland, Somerset, and Sagadahoc counties each offer twenty or more training programs, 16.6 percent, 15.2 percent, and 13.2 percent of the inventory, respectively. York (10.6 percent), Penobscot (9.9 percent), Aroostook (7.9 percent), Androscoggin (7.9 percent), and Kennebec (7.3 percent) counties each offer between 11 and 16 programs. Three programs (2.0 percent) were determined to be exclusively online while 1.3 percent were based in Massachusetts but served the greater New England area.

Table 10 provides a breakdown of the training programs by county and Figure 51 shows the breakdown of programs at the zip code level. Kennebec Valley Community College represented 19 of the 20 programs offered in the respective zip code level and Southern Maine Community College made up 13 of the 16 programs in the second highest zip code.

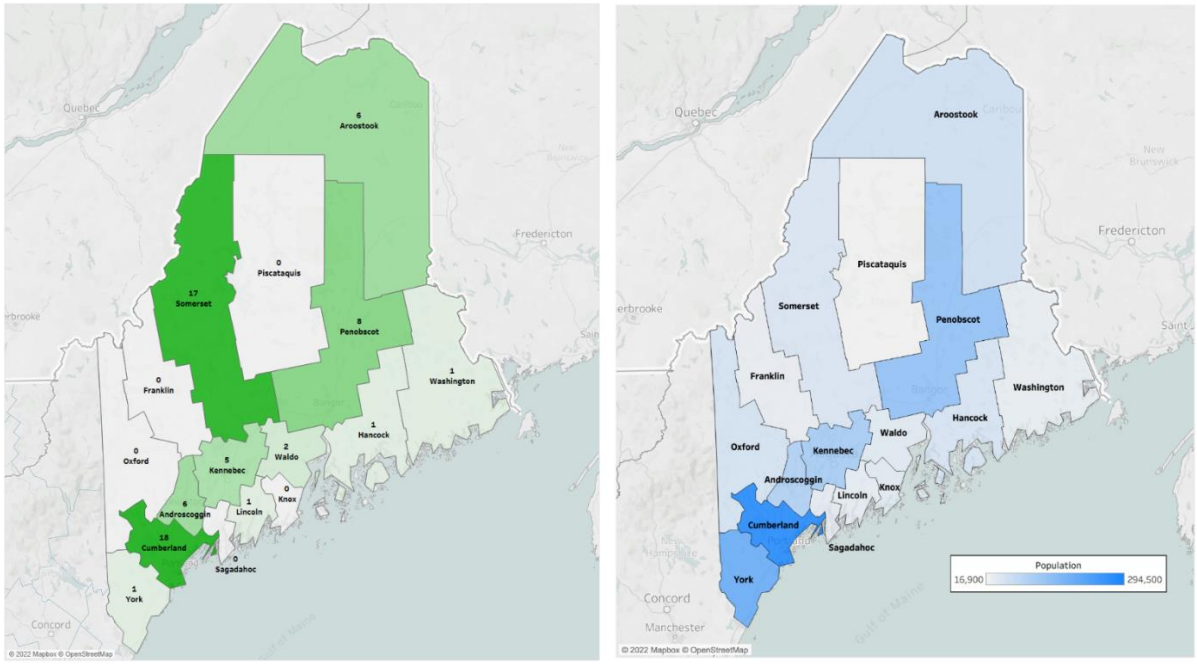
TABLE 10. MAINE CLEAN ENERGY TRAINING PROGRAMS BY COUNTY

County	Number of Programs	Percent of Programs
Cumberland	25	16.6%
Somerset	23	15.2%
Sagadahoc	20	13.2%
York	16	10.6%
Penobscot	15	9.9%
Aroostook	12	7.9%
Androscoggin	12	7.9%
Kennebec	11	7.3%
Hancock	3	2.0%
Waldo	3	2.0%
Online	3	2.0%
Franklin	2	1.3%
Knox	2	1.3%
Massachusetts State[27]	2	1.3%
Washington	1	0.7%
Lincoln	1	0.7%

Technological advances fueled by the global pandemic may be expected to accelerate the adoption of virtual programs. Such changes would increase the geographic accessibility and cost-effectiveness of workforce development opportunities although gaps in equitable access to technology and internet connectivity should be at the forefront of such planning.

[27] These are union trainings that are based in Massachusetts but serve the greater New England area, including Maine residents.

FIGURE 51. CLEAN ENERGY TRAINING PROGRAMS & POPULATION BY COUNTY[28]



Trainings for the clean energy workforce in Maine cover an array of industry sectors. Most trainings (63.6 percent)—which are mainly hosted by community colleges, trade associations and offered as apprenticeships—address renewable electric power generation. Programs related to energy efficiency improvements to new and existing structures and electrical systems made up 31.8 percent of identified programs. Alternate transport programs (2.0 percent) largely focus on understanding electric or hybrid electric vehicle infrastructure and technology. Grid Modernization and Storage either focused on installation or general clean energy related to wind or solar. Table 11 shows a breakdown of training programs by technology focus.

TABLE 11. MAINE CLEAN ENERGY TRAINING PROGRAMS BY TECHNOLOGY SECTOR

Tech Sector	Number of Programs	Percent of Programs
Renewable Electric Power Generation	96	63.6%
Energy Efficiency	48	31.8%
Alternate Transportation	3	2.0%
Grid Modernization & Storage	3	2.0%
Renewable Fuels	1	0.7%

Certificates, offered by 38.4 percent of identified in-state training programs, enhance an individual's credibility and knowledge of their field as well as improve their job prospects and portability since many certificates are standardized and recognized by companies throughout the United States and globally.

[28] American Community Survey 2020

While a total of 25.8 percent of identified programs had no discernible outcomes, 17.2 percent of programs indicated training meant to help individuals strengthen their skills and increase their employability. Just over seven percent of programs help with exam preparation for modules related to renewable electric power generation. Table 12 breaks down training programs by outcomes and a complete list of programs can be found in Appendix B.

TABLE 12. MAINE CLEAN ENERGY TRAINING PROGRAMS BY DEGREE OR OUTCOME

Degree Outcome	Number of Programs	Percent of Programs
Certificate*	58	38.4%
Increased Employability	26	17.2%
College Credit*	23	15.2%
Associate*	18	11.9%
None	13	8.6%
Exam Preparation	11	7.3%
Bachelor's*	5	3.3%
License*	3	2.0%
Master's	1	0.7%
Diploma	1	0.7%
Internship Credit	1	0.7%

*** Some programs have multiple outcomes. These programs are counted for each sector they represent. Note that the sum will be above 151 and 100%.**

Business Assets & Resources

The purpose of this section is to provide an overview of 13 workforce and education programs offered by five agencies in Maine, including the Maine Department of Labor, the Department of Health and Human Services, the Maine Community College System, the Department of Economic and Community Development, and the Department of Education. Highlighted programs provide funding for Maine businesses to upskill their employees to help with retention or make improvements to their physical locations. Some programs for individuals provide funding for furthering education and provide wraparound services to ensure success for the participants. Other programs provide skill development opportunities from as early as high school to provide clear career pathways for the Maine workforce.

It should be noted that these are the available programs at the time of this report's publication. For more information, please visit the respect department websites for each of the following:

1. Department of Labor: https://www.maine.gov/labor/
2. Department of Health & Human Services: https://www.maine.gov/dhhs/
3. Maine Community College System: https://www.mccs.me.edu/
4. Department of Economic & Community Development: https://www.maine.gov/decd/
5. Department of Education: https://www.maine.gov/doe/home

MAINE DEPARTMENT OF LABOR

Maine CareerCenters

Maine CareerCenters is an arm of the Maine Department of Labor (DOL) that provides employment and free training services for workers and businesses. CareerCenters partners with multiple organizations to train and educate job seekers, provide them with labor law information and career planning services, as well as equip youth, veterans, and disabled job seekers with free tools and resources. Maine CareerCenters also provides business owners and employers with resources for growing and sustaining a successful business in Maine. Almost each of the nineteen local career centers hosts monthly virtual and in-person hiring events and training workshops at no cost to workers or businesses.

Maine Apprenticeship Program

The Maine Apprenticeship Program combines on-the-job learning with technical and theoretical classroom instruction to provide comprehensive and structured training for jobs meant to meet the specific needs of employers in Maine. The Maine DOL works with labor groups, employers, and employer associations to hire and train apprentices in a working environment. Training ranges from trade roles in construction to management roles in healthcare and education, providing expansive experiences for apprentices who are at least 16 years old.

Competitive Skills Scholarship Program (CSSP)

The CSSP is a grant which provides high school graduates who are at least 18 years old with funding of up to $6,000 per year for a full-time student— $3,000 for a part-time student— and support services for eligible Maine residents to pursue two- and four-year degree programs or credentials recognized by employers. The scholarship can be used to supplement scholarships from other sources to cover tuition and fees. Support services include childcare, transportation, books, supplies, equipment, and training to fulfill prerequisites or to satisfy remedial requirements. In addition to the education and age requirements to be eligible for the scholarship, applicants must not have any other marketable post-secondary degree and have a household income of less than 200% of the federal poverty level.

Workforce Innovation and Opportunity Act (WIOA)

"The WIOA-- signed by President Obama in 2014 with goals to develop and deliver integrated training, job seeking, educational, and support services for workforce development-- authorized state departments of labor to implement provisions made for core programs related to titles I-IV of WOIA. Core programs consist of:

1. adult, dislocated worker, and youth formula programs under title I
2. the Adult Education and Family Literacy program under title II
3. the Wagner-Peyser Act employment services (ES) program under title III
4. vocational rehabilitation programs under title I and amended by title IV

The WOIA aligns federal investments to support job seekers and employers, streamlines agencies that establish workforce investment priorities, implements a common accountability system, encourages regional specific economic development and planning, improves services to individuals with disabilities, invests in disconnected youth, and more. Maine JobLink maintains a list of training providers approved to provide training to individuals who are eligible for federal funds through WOIA provisions."

Division of Vocational Rehabilitation (VR)

VR provides free diagnostics services, vocational evaluation, counseling, or job placement assistance for individuals with documented physical, mental, or emotional disabilities that prevent them from getting or keeping a job. VR plans are tailored to each individual and range from career planning, placement in or development of training programs with accommodations, purchasing job-related supplies, and provision of a job coach for support. VR also provides services for students through the DVR Youth and Transition Services. In addition to the services listed above, VR also offers Progressive Employment services (refer below).

Work Opportunity Tax Credit (WOTC)

The WOTC is a federal tax credit meant to incentivize employers to hire job seekers who belong to groups, termed "target groups", that consistently face barriers to employment. These groups include qualified veterans, VR referrals, Supplemental Nutrition Assistance Program (SNAP) recipients, Supplemental Security Income (SSI) recipients, summer youth employees, ex-felons, and other groups. There is no limit to the number of qualified employees an employer can claim for the tax credit and employers may reduce income liability by up to $9,600 per target employee.

Transition Work-Based Learning Model Demonstration

Between 2016 and 2021, Maine's DVR was awarded a $9 million grant to study work-based learning interventions i.e., Progressive Employment (refer to VR section) and 'Enhanced Jobs for Maine's Grads (e-JMG). Over 350 high school students participated in the grant. Through Progressive Employment, program participants engage in hands-on work-based activities which include job tours, interview practice, job shadowing, summer work experiences, and on-the-job experiences. e-JMG is a college/career readiness program that partners with public schools to offer for-credit courses to improve high school graduation. Progressive Employment and e-JMG combined expanded workforce opportunities for students with disabilities to improve post-secondary outcomes.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Temporary Assistance for Needy Families (TANF)

The HOPE program covers costs related to education and training— e.g., tuition, fees, books, supplies, childcare, transportation, car insurance, technology, etc.— for Maine parents who qualify. HOPE also provides a mentor, called a Student Navigator, to help HOPE recipients with other wraparound services to help parents stay and thrive in school. Maine residents between the age of 16 and 64 who are parents or caretaker relatives of a minor who lives with them are eligible to apply. Additionally, applicants must have been accepted or enrolled into a qualifying training or education program and must not already have a marketable bachelor's degree. HOPE prioritizes cost-effective options that result in tangible outcomes, like a degree or certificate, and lead to a job with an average job outlook.

Higher Opportunity for Pathways to Employment (HOPE)

TANF provides cash assistance to eligible families with dependent children living in their homes or pregnant women while they work towards self-sufficiency. Once enrolled, some individuals may also be eligible for job training and education aid. TANF has six related programs, including the HOPE program, that provide housing, education, and work-related assistance. The ASPIRE program helps TANF recipients with job training, employment, and education support and services. Parents as Scholars (PaS) is a monthly benefit through TANF that helps parents working through a two- or four-year education program. Alternative Aid Assistance assists TANF-eligible parents who need short-term help to find or maintain employment. Emergency Assistance provides voucher payments for children in families facing the risk of homelessness. TANF Transitional Benefits help former TANF recipients pay for work-related childcare and transportation expenses.

MAINE COMMUNITY COLLEGE SYSTEM

Harold Alfond Center for the Advancement of Maine's Workforce

The Harold Alfond Center, launched in 2021, coordinates all workforce training programs for Maine's Community Colleges (MCCs) and works closely with business leaders and workforce specialists throughout Maine to provide a variety of training models for trainees. The center offers free short-term training programs including professional development courses, commercial driver's license training, land

surveying, medical assisting, and more. Businesses and individuals can also receive scholarships from the Harold Alfond Center. Individuals can receive funding to take for-credit courses during the semester. Businesses can use scholarship funding for employees to take for-credit courses; the goal of this investment is to help businesses retain their employees and increase company productivity. Businesses can also apply for training funds which make it easy for them to set up workforce training initiatives to address their unique needs. Funding for businesses can come from the following programs: Put ME to Work; Maine Workforce Development Compact; and Maine Quality Center.

Maine Quality Centers

The Maine Quality Centers program offers workforce training grants to Maine employers who are interested in providing training for new and current employees. Since it was created by the state legislature in 1984, the Maine Quality Centers program has helped over 289 businesses expand and strengthen their workforce. Employers work with the program to design and implement tailored programs that address employers' unique needs and provide workers with the skills they need. Past programs have been as straightforward as a few weeks of basic safety training or as elaborate as teaching employees how to operate heavy machinery.

DEPARTMENT OF ECONOMIC & COMMUNITY DEVELOPMENT

Micro-Enterprise Grant Program

Maine received a total of $11 million from the federal CARES Act for its Community Development Block Grant (CDGB). The Maine Department of Economic and Community Development (DECD), in partnership with the Maine Small Business Development Centers (SBDC), made approximately $2 million available for the Micro-Enterprise Grant. Maine for-profit businesses with five or fewer employees and low to moderate ranges of income are eligible for grants of up to $5,000. Businesses can use grant funding for working capital, interior renovations, exterior improvements, purchase of inventory, and eligible planning activities to complete the Project Development Phase

DEPARTMENT OF EDUCATION

Maine Administrators of Career and Technical Education (MACTE)

Through MACTE, a network of 27 career and technical high schools prepare students for post-secondary academic success and career placement. Maine CTE schools receive funding from federal education grants, state education funding, and tuition reimbursement from sending schools to offer hands-on, technical education and career-focused programs. Among the programs included at CTE schools are those focused on healthcare, technology, automotive, construction, and public service.

Appendix A: Maine Clean Energy Training Inventory

Organization	*Name of Program*	*Program Type*	*Degree/Outcome*	*General Technology Sector*	*Occupational Focus*	*County*
Aero Heating & Ventilating, Inc	Duct Installation Technician Apprenticeship	Apprenticeship	Increased Employability	Energy Efficiency	HVAC	Cumberland
Anthony Mancini, Inc. DBA Mancini Electric	Electrician Training	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Electrician	Cumberland
Associated Builders & Contractors of Maine, Inc.	Apprenticeship Program	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Construction	Kennebec
Associated General Contractors of Maine, Inc.	Apprenticeship Program	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Carpenter, Construction	Kennebec
Associated General Contractors of Maine, Inc.	Apprenticeship Program	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Construction	Kennebec
Associated General Contractors of Maine, Inc.	Apprenticeship Program	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Construction	Kennebec
Associated General Contractors of Maine, Inc.	Apprenticeship Program	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Electrician, Construction	Kennebec
Augusta Electrical JATC	Photovoltaic Power Systems - Design, Installation, & Maintenance	Private	Exam Prep	Renewable Electric Power Generation	Solar Installer	Somerset
Beal College	Welding Technology Program	4-Year College/University	Associate, Diploma	Renewable Electric Power Generation	Welding	Penobscot
Brackley Electric, Inc.	Apprenticeship Program	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Electrician	Sagadahoc
Central Maine Community College	HVAC&R	Community College	Associate, Certificate	Energy Efficiency	HVAC	Androscoggin
Central Maine Community College	PMT Academy	Community College	None	Renewable Electric Power Generation		Androscoggin
Central Maine Community College	Plumbing and Heating Program	Community College	Associate, Certificate	Energy Efficiency	HVAC	Androscoggin
Central Maine Community College	Biofuel Production Operations Online Training	Community College	None	Renewable Fuels	Quality Assurance	Androscoggin

Cianbro	The Cianbro Institute: Apprenticeship (NCEER Curriculum)	Private	Certificate	Energy Efficiency	General Clean Energy, Construction	Somerset
Coastal Winair Company	Contractor Training	Private	Increased Employability	Energy Efficiency	HVAC	York
Community Energy Center	Summer Energy Fellowship	Non-Profit Organization	Internship Credit	Renewable Electric Power Generation	Research	Hancock
Dog House Heating, Air, & Plumbing	HVAC Technician Apprenticeship	Apprenticeship	Increased Employability	Energy Efficiency	HVAC	Cumberland
Eastern Maine Community College	Solar Photovoltaic 40hr Entry Level	Community College	Exam Prep	Renewable Electric Power Generation	Solar Installer	Penobscot
Eastern Maine Community College	Building Construction Technology: Carpenter Training Program	Community College	None	Energy Efficiency	Carpenter, Construction	Penobscot
Eastern Maine Community College	Computer Integrated Machining Training Program	Community College	Associate	Renewable Electric Power Generation	Machinist	Penobscot
Eastern Maine Community College	AAS HVAC Program	Community College	Associate	Energy Efficiency	HVAC	Penobscot
Eastern Maine Community College	Welder/Welding Technologist Program	Community College	Certificate	Renewable Electric Power Generation	Welding	Penobscot
Efficiency Maine	Solar Photovoltaic Design and Installation	Private	Certificate	Renewable Electric Power Generation	Solar Installer	online
Efficiency Maine	Heat Pump Training	Private	Certificate	Energy Efficiency	HVAC	online
Efficiency Maine, Maine Indoor Air Quality Council	Building Energy Code Workshops	Quasi-State Agency	Increased Employability	Energy Efficiency	General Clean Energy	online
General Dynamics Bath Iron Works	Advanced Apprenticeship Program: Surveyor	Apprenticeship	Associate, College Credit	Renewable Electric Power Generation	Quality Assurance	Sagadahoc
General Dynamics Bath Iron Works	Advanced Apprenticeship Program: Marine Design	Apprenticeship	Associate, College Credit	Renewable Electric Power Generation	Construction, Machinist	Sagadahoc
General Dynamics Bath Iron Works	Advanced Apprenticeship Program: Marine Engineer	Apprenticeship	Bachelor's, Master's	Renewable Electric Power Generation	Engineering	Sagadahoc
General Dynamics Bath Iron Works	Advanced Apprenticeship Program: Planning Tech	Apprenticeship	Associate, College Credit	Renewable Electric Power Generation	Quality Assurance	Sagadahoc

General Dynamics Bath Iron Works	Advanced Apprenticeship Program: Supply Chain Management	Apprenticeship	Associate, College Credit	Renewable Electric Power Generation	Quality Assurance	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Carpenter	Apprenticeship	College Credit	Renewable Electric Power Generation	Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Insulator	Apprenticeship	College Credit	Energy Efficiency	HVAC, Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Machinist	Apprenticeship	College Credit	Renewable Electric Power Generation	Machinist	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Maintenance Electric & HVAC	Apprenticeship	College Credit	Energy Efficiency	HVAC, Electrician, Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Maintenance Mechanic	Apprenticeship	College Credit	Renewable Electric Power Generation	Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Marine Electrician	Apprenticeship	College Credit	Renewable Electric Power Generation	Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Outside Machinist	Apprenticeship	College Credit	Renewable Electric Power Generation	Machinist	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Pipefitter	Apprenticeship	College Credit	Renewable Electric Power Generation	HVAC, Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Painter	Apprenticeship	College Credit	Renewable Electric Power Generation	Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Stage Builder	Apprenticeship	College Credit	Renewable Electric Power Generation	Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Structural Fitter	Apprenticeship	College Credit	Renewable Electric Power Generation	Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Tinsmith	Apprenticeship	College Credit	Renewable Electric Power Generation	Construction	Sagadahoc
General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Welder	Apprenticeship	College Credit	Renewable Electric Power Generation	Welding, Construction	Sagadahoc

General Dynamics Bath Iron Works	Basic Apprenticeship Programs: Yard Rigger	Apprenticeship	College Credit	Renewable Electric Power Generation	Construction	Sagadahoc
Heat & Frost Insulators, LU 6/Axion	Mechanical Insulation Apprenticeship	Apprenticeship, Trade Association	Increased Employability	Energy Efficiency	HVAC, Construction	Massachusetts
IBEW 1253	Augusta Electrical JATC - Inside Wireman	Apprenticeship, Trade Association	Increased Employability	Energy Efficiency	Electrician	Somerset
IBEW 567	IBEW 567/PJATC Apprenticeship	Apprenticeship, Trade Association	Increased Employability	Energy Efficiency	Electrician	Androscoggin
Ironworkers Local 7 JATC, Portland Electrical JATC	Ironworkers Local 7 Apprenticeship Program	Apprenticeship, Trade Association	Certificate	Renewable Electric Power Generation	Construction	Kennebec
Kennebec Valley Community College	Geothermal Accredited Installer	Community College	Certificate	Renewable Electric Power Generation	HVAC, Construction	Somerset
Kennebec Valley Community College	BPI Building Analyst - I	Community College	Certificate	Energy Efficiency	Quality Assurance	Somerset
Kennebec Valley Community College	Residential Energy Auditor Training Program	Community College	Certificate	Energy Efficiency	Quality Assurance	Somerset
Kennebec Valley Community College	Precision Machining Technology Training Program	Community College	Certificate	Renewable Electric Power Generation	Machinist	Somerset
Kennebec Valley Community College	Maine Solid Fuel Examination Preparation Course	Community College	Exam Prep	Energy Efficiency	HVAC	Somerset
Kennebec Valley Community College	Solar Thermal	Community College	Certificate	Energy Efficiency	HVAC	Somerset
Kennebec Valley Community College	Introduction to Photovoltaics	Community College	Exam Prep	Renewable Electric Power Generation	Electrician	Somerset
Kennebec Valley Community College	Solar Heating Design and Installation	Community College	None	Renewable Electric Power Generation	Electrician	Somerset
Kennebec Valley Community College	Solar Heating for the Entry Level Candidate	Community College	Exam Prep	Renewable Electric Power Generation	Electrician	Somerset
Kennebec Valley Community College	Solar Photovoltaic Design and Installation	Community College	None	Renewable Electric Power Generation	Electrician	Somerset

Kennebec Valley Community College	Solar Photovoltaics for the Entry Level Candidate	Community College	Exam Prep	Renewable Electric Power Generation	Electrician, Solar Installation	Somerset
Kennebec Valley Community College	Mini-Split Heat Pump Training	Community College	Certificate	Energy Efficiency	Electrician	Somerset
Kennebec Valley Community College	Heat Pump Installer	Community College	None	Energy Efficiency	HVAC	Somerset
Kennebec Valley Community College	Energy Services and Technology (EST) Program	Community College	Associate	Energy Efficiency	Electrician	Somerset
Kennebec Valley Community College	Renewable Energy Computer Software Applications	Community College	None	Renewable Electric Power Generation	General Clean Energy	Somerset
Kennebec Valley Community College	Solar PV for the Entry Level Candidate	Community College	Exam Prep	Renewable Electric Power Generation	Solar Installer	Somerset
Kennebec Valley Community College	Electrical Technology	Community College	Associate	Renewable Electric Power Generation	Electrician, Construction	Somerset
Kennebec Valley Community College	Welder/Welding Technologist Program	Community College	Certificate	Renewable Electric Power Generation	Welding	Somerset
Kennebec Valley Community College	Weatherization Technician Program	Community College	Certificate	Energy Efficiency	Weatherization Technician	Somerset
Kenneth Foster Regional Vocational Center	Metal Fabrication Program	Technical-Vocational School	Certificate	Renewable Electric Power Generation	Welding	Franklin
Kenneth Foster Regional Vocational Center	Carpenter Training Program	Technical-Vocational School	None	Renewable Electric Power Generation	Carpenter, Construction	Franklin
Lensa	Solar Service Technician - Electrical Apprenticeship	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Solar Installer, Electrician	Cumberland
Louth Callan Renewables, LLC	Electricina Apprenticeship	Apprenticeship, Trade Association	Increased Employability	Renewable Electric Power Generation	Electrician, Solar	Waldo
Maine Energy Marketers Association	MTEC Air Conditioning and Refrigeration Program	Apprenticeship	Increased Employability	Energy Efficiency	HVAC	Cumberland
Maine Indoor Air Quality Council	Build a Better House	Private	Certificate	Energy Efficiency	HVAC	Kennebec

Maine Maritime Academy	Elective Course in DC Electrical Systems.	4-Year College/University	College Credit	Grid Modernization & Storage	Engineering, Electrician	Hancock
Maine Public Utilities Commission	Grid Modernization Lab Consortium	Government	None	Grid Modernization & Storage	General Clean Energy	Kennebec
Maine School Administrative District No. 24	Welding Training Program	Community Based Organization, Technical-Vocational School	None	Renewable Electric Power Generation	Welding	Aroostook
Massachusetts and Northern New England Laborers	LIUNA Construction Craft Laborer Apprenticeship	Apprenticeship, Trade Association	Certificate	Energy Efficiency	General Clean Energy, Construction	Massachusetts
MEMA Technical Education Center	HVAC-R Professional Certification	Private	Certificate	Energy Efficiency	HVAC	Cumberland
Mid-Coast Energy Systems	HVAC Apprentice Program	Apprenticeship	Increased Employability	Energy Efficiency	HVAC	Lincoln
Midstate Machine	Apprenticeship Program	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Machinist	Kennebec
Modula	Project Manager/Installation Training	Apprenticeship	Increased Employability	Grid Modernization & Storage	Management & Consulting	Androscoggin
Northeast Technical Institute	HVAC Programs	Private	Certificate	Energy Efficiency	HVAC	Cumberland
Northern Maine Community College	Plumbing and Heating Program	Community College	License	Energy Efficiency	HVAC	Aroostook
Northern Maine Community College	Residential Construction: Carpenter Training Program	Community College	Associate	Energy Efficiency	Weatherization Technician, Carpenter, Construction	Aroostook
Northern Maine Community College	Precision Machining Technology Training Program	Community College	Certificate	Energy Efficiency	Weatherization Technician, Machinist	Aroostook
Northern Maine Community College	Precision Machining Manufacturing Training Program	Community College	Associate	Renewable Electric Power Generation	Machinist	Aroostook
Northern Maine Community College	Automotive Technology Program	Community College	Certificate	Alternate Transportation	Automotive Technicians	Aroostook
Northern Maine Community College	Photovoltaic Systems	Community College	Exam Prep	Renewable Electric Power Generation	Solar Installer, Electrician	Aroostook
Northern Maine	Heating	Community College	Certificate	Energy Efficiency	HVAC	Aroostook

Community College						
Northern Maine Community College	Wind Power Technology	Community College	Certificate	Renewable Electric Power Generation	Wind Technician	Aroostook
Northern Maine Community College	Structural Welding Program	Community College	Certificate	Renewable Electric Power Generation	Welding	Aroostook
Pine State Services	HVAC Technician Apprenticeship	Apprenticeship	Increased Employability	Energy Efficiency	HVAC	Cumberland
Plumbers and Pipefitters UA Local 716	Plumbers, Pipefitters and HVACR Apprenticeship	Apprenticeship, Trade Association	Certificate, License	Energy Efficiency	HVAC, Construction	Kennebec
Portland Arts and Technology High School	Plumbing and HVAC	High School	Certificate	Energy Efficiency	HVAC	Cumberland
Portland Electrical JATC	Electrical Vehicle Intratructure Training Program	Apprenticeship, Trade Association	Certificate	Alternate Transportation	Electrician, Automotive Technician	Androscoggin
Portsmouth Naval Shipyard	Apprenticeship Program: Electronic Industrial Control Mechanic	Apprenticeship	Certificate	Renewable Electric Power Generation	Machinist, Construction	York
Portsmouth Naval Shipyard	Worker Skills Progression Program (WSPP): Electronic Industrial Control Mechanic	Apprenticeship	Certificate	Renewable Electric Power Generation	Machinist, Construction	York
Portsmouth Naval Shipyard	Apprenticeship Program: Machinist	Apprenticeship	Certificate	Renewable Electric Power Generation	Machinist, Construction	York
Portsmouth Naval Shipyard	Worker Skills Progression Program (WSPP): Machinist	Apprenticeship	Certificate	Renewable Electric Power Generation	Machinist, Construction	York
Portsmouth Naval Shipyard	Apprenticeship Program: Marine Electrician	Apprenticeship	Certificate	Renewable Electric Power Generation	Electrician, Construction	York
Portsmouth Naval Shipyard	Worker Skills Progression Program (WSPP): Marine Electrician	Apprenticeship	Certificate	Renewable Electric Power Generation	Electrician, Construction	York
Portsmouth Naval Shipyard	Apprenticeship Program: Nondestructive Tester	Apprenticeship	Certificate	Renewable Electric Power Generation	Quality Assurance, Construction	York

Portsmouth Naval Shipyard	Worker Skills Progression Program (WSPP): Nondestructive Tester	Apprenticeship	Certificate	Renewable Electric Power Generation	Quality Assurance, Construction	York
Portsmouth Naval Shipyard	Apprenticeship Program: Pipe Fitter (Construction)	Apprenticeship	Certificate	Renewable Electric Power Generation	Construction	York
Portsmouth Naval Shipyard	Worker Skills Progression Program (WSPP): Pipe Fitter (Construction)	Apprenticeship	Certificate	Renewable Electric Power Generation	Construction	York
Portsmouth Naval Shipyard	Apprenticeship Program: Sheet Metal Mechanic	Apprenticeship	Certificate	Renewable Electric Power Generation	HVAC, Construction	York
Portsmouth Naval Shipyard	Worker Skills Progression Program (WSPP): Sheet Metal Mechanic	Apprenticeship	Certificate	Renewable Electric Power Generation	HVAC, Construction	York
Portsmouth Naval Shipyard	Apprenticeship Program: Welder	Apprenticeship	Certificate	Renewable Electric Power Generation	Welding, Construction	York
Portsmouth Naval Shipyard	Worker Skills Progression Program (WSPP): Welder	Apprenticeship	Certificate	Renewable Electric Power Generation	Welding, Construction	York
ReVision Energy	Solar Installer - Electrical Apprenticeship	Apprenticeship	Increased Employability	Renewable Electric Power Generation	Solar Installer, Electrician	Cumberland
ReVision Energy	ReVision Energy Electrical Apprenticeship Program (REEAP)	Private	License	Energy Efficiency	Electrician	Cumberland
Sheet Metal Workers Local 17	Training and Apprenticeship Programs	Apprenticeship, Trade Association	Increased Employability	Energy Efficiency	General Clean Energy, Construction	Androscoggin
Sky Climber Renewables	Tech One Program (TOP)	Private	Increased Employability	Renewable Electric Power Generation	Wind Technician	Somerset
Southern Maine Community College	Associate Degree in Heating, Air Conditioning, Refrigeration & Plumbing	Community College	Associate	Energy Efficiency	HVAC	Cumberland
Southern Maine Community College	Introduction to Manufacturing and Machining	Community College	College Credit	Renewable Electric Power Generation	Machinist	Cumberland
Southern Maine	CNC Machine Operator	Community College	Certificate	Renewable Electric Power Generation	Machinist	Cumberland

Community College	Training Program					
Southern Maine Community College	Precision Machining & Manufacturing Program	Community College	Associate	Renewable Electric Power Generation	Machinist	Cumberland
Southern Maine Community College	Heating, Air Conditioning & Refrigeration	Community College	Associate	Energy Efficiency	HVAC	Cumberland
Southern Maine Community College	Air Conditioning & Refrigeration	Community College	Certificate	Energy Efficiency	HVAC	Cumberland
Southern Maine Community College	Certificate in Heating	Community College	Certificate	Energy Efficiency	HVAC	Cumberland
Southern Maine Community College	Certificate in Refrigeration and Air Conditioning	Community College	Certificate	Energy Efficiency	HVAC	Cumberland
Southern Maine Community College	Associate Degree in Electrical Engineering Technologies	Community College	Associate	Renewable Electric Power Generation	Electrician	Cumberland
Southern Maine Community College	Certificate in Electrician Technology	Community College	Certificate	Renewable Electric Power Generation	Electrician	Cumberland
Southern Maine Community College	Automotive Technology Center	Community College	Certificate	Alternate Transportation	Automotive Technicians	Cumberland
Southern Maine Community College	Solar PV Installation	Community College	Exam Prep	Renewable Electric Power Generation	Solar Installer, Electrician	Cumberland
Southern Maine Community College	Welder/Welding Technologist Program	Community College	Certificate	Renewable Electric Power Generation	Welding	Cumberland
Southern Maine Community College	Weatherization Technician/Retrofit Installer Program	Community College	Exam Prep	Energy Efficiency	Weatherization Technician	Cumberland
UA Local 716 Maine Plumbers and Pipefitters	HVAC Technician Apprenticeship	Apprenticeship, Trade Association	Increased Employability	Energy Efficiency	HVAC	Kennebec
Unity College	B.S. in Renewable Energy Management	4-Year College/University	Bachelor's	Renewable Electric Power Generation	General Clean Energy, Management & Consulting	Waldo
University of Maine	Forest Operations, Bioproducts & Bioenergy	4-Year College/University	Bachelor's	Renewable Electric Power Generation	Management & Consulting	Penobscot
University of Maine	Renewable Energy Concentration	4-Year College/University	Bachelor's	Renewable Electric Power Generation	General Clean Energy	Penobscot

University of Maine	SELF Institute	High School	None	Renewable Electric Power Generation	Research	Penobscot
University of Maine	4-H Power of Wind Program	4-Year College/University	None	Renewable Electric Power Generation	General Clean Energy, Wind	Penobscot
University of Maine	Minor: Renewable Energy Engineering	4-Year College/University	College Credit	Renewable Electric Power Generation	Wind Technician	Penobscot
University of Maine	Composite Materials and Structures Certificate	4-Year College/University	Certificate	Renewable Electric Power Generation	Wind Technician	Penobscot
University of Maine	Energy Development and Policy	4-Year College/University	Certificate	Renewable Electric Power Generation	Research	Aroostook
University of Maine	Minor in Renewable Energy Engineering	4-Year College/University	College Credit	Renewable Electric Power Generation	Engineering, Electrician	Penobscot
University of Maine	Advanced Structures and Composites Center - Offshore Wind Laboratory.	4-Year College/University	College Credit	Renewable Electric Power Generation	General Clean Energy, Engineering, Research	Penobscot
University of Maine Presque Isle	Bachelor Degree in Environmental Science and Sustainability: Energy Focus	4-Year College/University	Bachelor's	Renewable Electric Power Generation	General Clean Energy, Management & Consulting	Aroostook
Waldo County Technical Center Adult Education	Welding Technology Program	Technical-Vocational School	Certificate	Renewable Electric Power Generation	Welding	Waldo
Washington County Community College	Heating Program	Community College	Certificate	Energy Efficiency	HVAC	Washington
RSU 24 Adult Education	Residential Construction: Carpenter Training Program	Community Based Organization	Certificate	Energy Efficiency	Carpenter, Construction	Hancock
New England School of Metalwork	Advanced Blacksmithing Training Program	Non-Profit Organization	Increased Employability	Renewable Electric Power Generation	Welding	Androscoggin
Central Maine Community College	Precision Machining Technology Program	Community College	Associate	Renewable Electric Power Generation	Machinist	Androscoggin
Central Maine Community College	Precision Machining Technology Program	Community College	Certificate	Renewable Electric Power Generation	Machinist	Androscoggin
York County Community College	Precision Machining Technology Program	Community College	Certificate	Renewable Electric Power Generation	Machinist	York
Mid-Coast School of Technology	CNC Machining	Technical-Vocational School	Certificate	Renewable Electric Power Generation	Machinist	Knox

	Training Program					
Mid-Coast School of Technology	Machining Training Program II	Technical-Vocational School	Certificate	Renewable Electric Power Generation	Machinist	Knox
Lewiston Adult Education	Machine Tool: Advanced Program	High School	None	Renewable Electric Power Generation	Welding	Androscoggin
Bangor Adult & Community Education	LEED Green Associate Exam Preparation	High School, Community Based Organization	Exam Prep	Energy Efficiency	Quality Assurance, Construction	Penobscot

Appendix B: Full Design Session Recommendations

Expand access to apprenticeship and earn-and-learn models

1. Increasing access/removing barriers (especially for underserved populations)
    a. *More supports or stipends for underserved populations*
    b. *Remove barriers within the apprenticeship program*
    c. *Expand access to points of entry for the program*
    d. *Program funds for staffing to work with groups that are underserved*
    e. *Partner with CBOs to increase representation with under-represented communities*
2. Early education awareness
    a. *Embed more pre-apprenticeship offerings in K-12, CTE, MCCS settings (3 votes)*
    b. *Raise awareness about apprenticeship as post-grad pathway with schools and students*
    c. *Pre-apprenticeship with supports as supported pathway to apprenticeship (5 votes)*
3. Increased funding
    a. *More funding for free training*
    b. *Funding for training equipment*
4. Provision of stipends and wraparound services
    a. *Provide stipends*
    b. *Support services such as ride share, childcare, financial support for materials and PPE required*
    c. *Including housing and other wraparounds*
5. Engage employers in OJT
    a. *Make it easy for employers to offer apprenticeship*
    b. *More employers engaged in offering work-based learning*
6. Engage/capitalize on current partnerships
    a. *Partnership with pathways to apprenticeship*
    b. *We also need to be cognizant of overcomplicating and recreating the wheel when it comes to job training and registered apprenticeship in the construction field. We know that the system works in Maine and across the country. The more we can work together to utilize the structure already in place and support it, the more efficient we'll be*

Increase exposure to hands-on trade skills, courses, and modules in early education

1. Engaging teachers and counselors
    a. *Meetings with guidance counselors*
    b. *Dedicated staff in school systems who can do the 1 on 1 outreach with youth, connecting them to existing programs. Need to be clear of the kinds of wages, benefits, etc. for each industry and also outline the earn-as-you-learn model. I don't think enough youth see or understand that aspect of apprenticeship*
    c. *More teachers exposed to opportunities*

   d. *Educating teachers/counselors about career paths in trades/clean energy (4 votes)*
2. Partnerships
   a. *More coordinated partnerships between industry associations and unions – and schools for programs like Maine Career Exploration with job shadowing and short-term paid work experience (4 votes)*
3. Raising awareness
   a. *It's critical that we lift up the pathways to high road careers with real benefits (health, retirement, etc.) and meet our students and parents where they are. Care and feeding of these populations from childhood to working age should be consistent and authentic, so as to build trust. That also goes for the career opportunities at the end.*
4. Hands-on experience opportunities
   a. *Create hands-on opportunities*
   b. *Pre-apprenticeship starting in high school*
   c. *Expand CTE opportunities at a younger age*
   d. *We must be sure that we are opening up a pipeline to established, proven registered apprenticeship programs that yield real results. We are seeing a number of new programs that do not meet that threshold.*
5. Extracurriculars
   a. *Summer paid internships (high school)*
   b. *Maximize downtime at schools, such as vacations and summer months for focused camps*
   c. *Summer camps related to trades*
   d. *Class credit for construction-related classes*
6. Field trips/site visits
   a. *Job shadowing for jobs of the future*
   b. *Job site trips for exposure to different types of work/jobs/projects*
7. Provide scholarships
   a. *Scholarships issued to students participating in summer internships*
8. Random
   a. *More is not better! Quality over quantity!*

<u>Create a clean energy clearinghouse for coordinating resources, funds, stakeholders, etc.</u>

1. Full-time staffing and resources
   a. *Collaboration requires staffing resources – not solely volunteers/committees*
   b. *Potentially employ navigators to help jobseekers/employers "navigate" this new resource (3 votes)*
2. Strengthening and capitalizing on current partnerships
   a. *This is an excellent idea. Trust and effectiveness will be key for it to be a useful tool. Connections to partners with clear pathways to success will prove useful and sustain the popularity and usefulness of the effort.*

   b. *Labor Unions must be included here. Recreating the wheel when we have joint labor-management partnerships that work together to bolster our workforce is a waste of time and resources*
   c. *Need to include advertising on existing resources (i.e. Maine Joblink at MDOL). Some folks may not even realize the opportunities for family sustaining wages when only looking at the huge database offered. Should have a clear link, from Maine Joblink, to the clearinghouse*
   d. *Employer led vs. government led (coordinate with State Workforce Board portal effort?)*
   e. *We must be sure that we lift up programming and partners that coincide with key policy decisions at the state-level (i.e. labor standards, Project Labor Agreements, Registered Apprenticeships, etc.). To be consistent and to avoid the brain dumb that will surely lead to confusion will be critical. Lawmakers set policy for a reason and any decisions we make must track with it*
3. Identify successful models and emulate
   a. *A model similar to the MJRP Healthcare Coordinating Team (3 votes)*
4. Random
   a. *Will current RFP fund a "backbone" industry partner?*
   b. *Ability to auto-populate new offerings, changes in courses, new funding opportunities vs. manual entry*
   c. *Need to include: clear pathways, including benchmarks, for prospective clean energy workers. Start at training, with timelines, and move to employment. Just as in education (think college vs. immediate employment), there need to be multiple tracks (3 votes)*

<u>Support business' onboarding, recruitment, and training costs</u>

1. Raise awareness of existing resources
   a. *Utilizing and leveraging existing OJT opportunities*
   b. *Education on available programs*
   c. *Educate/raise awareness of existing programs that provide OJT wage subsidies*
2. Wage reimbursement
   a. *Partial wage reimbursement for OJT*
   b. *The Maine Building Trades spearheaded and succeeded in exponentially growing the money available for registered apprenticeship reimbursement for program sponsors (JATCs, etc.). We must be sure this program funds good, high-road programming that will build trust and yield results*
   c. *Flexible funding to support learners (4 votes)*
3. Project labor agreements
   a. *Through consistent labor agreements and PLAs, we can build in the community benefits necessary to build our workforce while at the same time reach out to traditionally underrepresented populations and ensure our workforce looks like the communities in which they work. Pre-job agreements and goals are the easy button to accomplish this.*
4. Navigation and onboarding services
   a. *Streamlined onboarding plan to plug and play*

   b. *Career navigation services (4 votes)*

Provide pathways to independence and entrepreneurship for clean energy workers

1. Mentorship programs
   a. *Business mentorship program*
   b. *Leveraging mentorship opportunities*
   c. *Direct connection with SBDC advisors*
   d. *We must lift up success stories and share case studies from those who have worked their way up from journey worker to foreman to owner. These stories are many in Maine and across the country and learning their pathways will help others as well (4 votes)*
2. Business education resources
   a. *Basic Business Management courses embedded in CE training*
   b. *Education on entrepreneurship, financial management, and networking*
   c. *Providing educational opportunities in financial and business management*
3. Access to capital
   a. Incentivize business ownership to current workers through access to preferred capital (4 votes)
4. New models or ownership
   a. *How could encouraging co-op or employee ownership model promote this?*
5. Ensuring high job quality
   a. *Build career ladder in weatherization to include "practice management" certifications and skills*
   b. *We know that the best entrepreneurs and businessowners are the ones who work the trade they are promoting. Pathways to ownership and successful portfolio building are learned when front-line workers have the runway to earn a family-sustaining wage. It is then when their skills can successfully pivot from employee to owner.*
   c. *Educate employers on creating high quality jobs and advancement ladders*
   d. *Support for high road jobs will lead to the ability to move towards ownership*