



# HAWAI'I SKILLED TRADES WORKFORCE ANALYSIS

MAY 2023



HAROLD K.L. CASTLE  
FOUNDATION



The Harry and Jeanette  
Weinberg Foundation



Chamber of Commerce  
HAWAII





## A LETTER FROM THE FUNDERS

To our readers,

We are pleased to present to you the Hawai'i Skilled Trades Workforce Analysis. This report considers the current and future job opportunities within the skilled trades sector in the State of Hawai'i. This work is the result of our shared commitment to understanding the needs of our community and economy, and we believe it holds significant implications for our collective future.

As you may be aware, Hawai'i's economy has its own set of advantages and challenges. Being a small and isolated state, we can control our own future and make rapid changes that can have a significant impact on the quality of life for our residents. However, we also face limitations such as a smaller pool of workers and potentially limited access to the specialized and diverse training opportunities found on the mainland. We see great potential in the skilled trades sector and the growing field of clean energy. A majority of these jobs meet or exceed what is considered a living wage in Hawai'i and offer on-the-job training opportunities that provide upward mobility for those interested in starting work straightaway post-high school or those looking to make a career change later in life while supporting a family.

This report is informed by dozens of stakeholder interviews and labor market data and outlines the current and future demand for workers in these fields and the training and education pathways available to support them. We also provide a list of recommendations for industry and policymakers that may help to close the supply and demand gap seen in the sector. By investing in a skilled trades workforce, we can both support our economy and local workforce and contribute to the broader goal of a more sustainable future for our state.

We hope that this report will inspire action and collaboration among our community leaders and stakeholders. Mahalo to the Chamber of Commerce HI for launching a conversation on the next steps. By working together, we can create meaningful opportunities and a self-sustaining workforce for Hawai'i's future.

Thank you for your continued support and partnership in this important work.

Sincerely,

Harold K. L. Castle Foundation



HAROLD K.L. CASTLE  
FOUNDATION

The Harry and Jeanette Weinberg  
Foundation



The Harry and Jeanette  
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# CONTENTS

**INTRODUCTION** ..... 1

**PROJECT TEAM** ..... 1

**SKILLED TRADES IN HAWAI'I**..... 4

**OVERVIEW**..... 4

**OCCUPATIONS**..... 4

**LICENSING REQUIREMENTS** ..... 8

**TRAINING AND EDUCATION LANDSCAPE** ..... 10

**INDUSTRY CREDENTIALS** ..... 16

**TRANSFERRABLE SKILLS**..... 17

**CLEAN ENERGY TRADES** ..... 19

**OVERVIEW**..... 19

**OCCUPATIONS IN CLEAN ENERGY**..... 19

**SECTORS AND GROWTH**..... 21

**CLEAN ENERGY SPECIFIC CREDENTIALS** ..... 23

**STAKEHOLDER FEEDBACK** ..... 24

**RECOMMENDATIONS** ..... 28

**APPENDIX A: TABLES** ..... 29

**APPENDIX B: METHODOLOGY** ..... 50

**APPENDIX C: OUTREACH GUIDES** ..... 51

**APPENDIX D: PRIMARY DATA SOURCES**..... 53



## INTRODUCTION

In Hawai'i and across the nation, there is a growing concern about the shortage of skilled tradespeople in various industries. From carpenters and masons to electricians and plumbers, the demand for skilled trades workers is on the rise. This report aims to examine the current state of the skilled trades workforce in Hawai'i and the factors driving the demand for skilled workers into the future. Additionally, the report explores the challenges and opportunities that exist for individuals interested in pursuing a career in the skilled trades in Hawai'i.

As Hawai'i navigates an increasingly competitive global economy and continues to work towards its clean energy goals, the support of existing and new local skilled trades workers is critical to maintaining a strong and resilient local economy into the future. Understanding the trends and dynamics of this sector in Hawai'i is key to ensuring that the supply of skilled trades workers meets the demand and supports the state's economic objectives.

This report aims to provide insights into the skilled trades workforce demand in Hawai'i, with a focus on community needs, opportunities, and challenges. Stakeholder outreach was conducted to gather information on the needs and perspectives of the local community, while publicly available data on industry trends, workforce demand, and training and education landscape were analyzed to provide a comprehensive picture of the skilled trades workforce in Hawai'i.

“Skilled trades” refer to occupations that require specialized training and technical expertise in areas such as construction, electrical, plumbing, HVAC, and welding. Skilled trades play a critical role in Hawai'i's economy and are essential for the state's infrastructure development, maintenance, and repair.

The report summarizes available data and explores key trends and perspectives from industry stakeholders on the strengths and demands of the sector. Insights that emerged from the analysis are provided in the recommendations section of the report.

## PROJECT TEAM

The project team for the Hawai'i Skilled Trades Workforce Analysis included strategic leadership and financial backing from The Harry and Jeanette Weinberg Foundation, Harold K.L. Castle Foundation, and Chamber of Commerce Hawaii. The project team was supported by Hawai'i-based SMS Research as consulting partners.





## EXECUTIVE SUMMARY

The skilled trades sector in Hawai'i provides a diverse range of lucrative job opportunities for our local workforce. These occupations not only offer competitive pay but also present affordable training options that enable individuals to earn while they learn and progress in the industry. Currently, there are 85 different skilled trades occupations accounting for 58,470 skilled trades jobs in the state, and this workforce is growing. More than half of these occupations are projected to experience statewide growth from 2018 to 2028.

**85**SKILLED TRADE  
OCCUPATIONS**58,470 EMPLOYED  
STATEWIDE 2021** **57% OF  
SKILLED TRADES  
ARE GROWING  
STATEWIDE  
2018-28****\$67,106 AVERAGE ANNUAL WAGE**COMPARED TO 2020 ALICE AVERAGE INDIVIDUAL  
SURVIVAL BUDGET: \$31,056

In terms of employment volume, the top skilled trades occupations in the state include Maintenance and Repair Workers, General (6,440), Carpenters (5,670), Construction Laborers (3,950), Heavy and Tractor-Trailer Truck Drivers (3,510), Electricians (3,040), Automotive Service Technicians and Mechanics (2,650), Plumbers, Pipefitters, and Steamfitters (2,330), and Painters, Construction, and Maintenance (2,010). These occupations are prominent employment opportunities in all counties throughout the state.

As Hawai'i continues to work towards its 2045 clean energy goals, skilled trades workers are essential to the expansion of renewable energy development, battery storage, and grid maintenance and improvements, resulting in new employment opportunities. While many of the skilled trades occupations specific to clean energy are still evolving and lack historical data, national trends and local insights indicate a significant future demand and need for additional training in this area, including upskilling Hawai'i's current skilled trades workforce.

Candidates can pursue many skilled trades through on-the-job training, short-term certification programs, and/or one of more than 50 registered apprenticeship programs in the state. Through these programs, candidates are able to enter the workforce quickly and avoid the traditional challenges of tuition costs and postsecondary loans as they advance from apprentice to journeyman over the course of 3 to 5 years on the job. With additional years of experience, trades workers can progress in their careers and increase their earning potential in supervisory roles or by becoming licensed contractors.



To support and expand our local skilled trades workforce development efforts in Hawai'i, collective and collaborative action across the industry and increased industry-education partnership are needed. Shared priorities include improving students' early career awareness and exposure to the skilled trades, ensuring candidates are prepared with the skillsets necessary to succeed in the field, such as basic math and various professional skills, and addressing barriers to apprenticeship access and completion, including financial literacy, transportation, and childcare demands.



## SKILLED TRADES IN HAWAII

### OVERVIEW

Skilled trades occupations are often jobs that require specialized training and technical expertise within the construction, electrical, plumbing, HVAC, and welding industries. Skilled trades play a critical role in the state's infrastructure development and energy generation, maintenance, and repair and are often occupations in very high demand across the country. Included in this section is a detailed outline of the occupations considered skilled trades within the state and the supporting data collected regarding those occupations such as volume, growth projections, wages, and employment requirements.

### OCCUPATIONS

This analysis identified 85 occupations in Hawaii that are considered skilled trades occupations<sup>1</sup>. As of 2021, these occupations accounted for 58,470 jobs statewide, representing approximately 8% of Hawaii's total workforce, with an average annual wage of \$67,106. By 2028, they are projected to account for 75,410 jobs statewide. Occupations are predominantly classified into the following major SOC groups: Construction and Extraction (31); Installation, Maintenance, and Repair (27); Production (23); and Transportation and Material Moving (4).

Table 1 shows the 25 skilled trades occupations with the highest employment volume in Hawaii as of 2021 and their associated annual wages. Of the high-volume occupations in Table 1, those with the highest average annual wages are First-Line Supervisors of Construction Trades and Extraction Workers (\$89,720), First-Line Supervisors of Mechanics, Installers, and Repairers (\$86,130), Mobile Heavy Equipment Mechanics (\$80,650), Drywall and Ceiling Tile Installers (\$80,590), and Electricians (\$79,290).

**Table 1: Skilled Trades Occupations with Highest Employment Volume Statewide**

Occupation	SOC	Statewide Employment (2021)	Average Annual Openings	Mean Annual Wage
Maintenance and Repair Workers, General	49-9071	6,440	760	\$51,710
Carpenters	47-2031	5,670	840	\$79,200
Construction Laborers	47-2061	3,950	850	\$59,210
Heavy and Tractor-Trailer Truck Drivers	53-3032	3,510	470	\$54,190
Electricians	47-2111	3,040	510	\$79,290
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	2,930	370	\$89,720

<sup>1</sup> The complete list of occupations included in the analysis, associated statewide labor market data, and links to additional resources can be found in Appendix A, Table 15.



First-Line Supervisors of Mechanics, Installers, and Repairers	49-1011	2,730	280	\$86,130
Automotive Service Technicians and Mechanics	49-3023	2,650	280	\$52,410
Plumbers, Pipefitters, and Steamfitters	47-2152	2,330	280	\$72,830
Painters, Construction and Maintenance	47-2141	2,010	330	\$59,070
Operating Engineers & Other Construction Equipment Operators	47-2073	1,960	260	\$78,360
Bus Drivers, Transit and Intercity	53-3052	1,650	330	\$54,960
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021	1,360	130	\$69,100
Telecommunications Line Installers and Repairers	49-9052	1,040	40	\$74,430
Aircraft Mechanics and Service Technicians	49-3011	1,020	130	\$75,070
Roofers	47-2181	930	120	\$57,720
Drywall and Ceiling Tile Installers	47-2081	830	80	\$80,590
Cement Masons and Concrete Finishers	47-2051	770	100	\$76,580
Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	760	90	\$59,340
Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	740	130	\$64,470
Welders, Cutters, Solderers, and Brazers	51-4121	700	70	\$66,020
Construction and Building Inspectors	47-4011	580	110	\$68,830
Industrial Machinery Mechanics	49-9041	550	70	\$78,780
Mobile Heavy Equipment Mechanics, Except Engines	49-3042	550	60	\$80,650
Tile and Stone Setters	47-2044	550	60	\$77,940

Source: Occupational Employment and Wage Statistics (OEWS) 2021, State of Hawaii Department of Business, Economic Development & Tourism. Long-term Projections to 2028, HireNet Hawaii.

As of 2021, Hawaii's skilled trades workforce is primarily concentrated in Honolulu County (42,320 employed), while the County of Kaua'i accounts for the smallest portion of the state's skilled trades workforce (2,660 employed). Likewise, Honolulu County is projected to see the greatest growth in skilled trades jobs from 2021 to 2028 (8,760), while Kaua'i County is projected to have the least growth (1,010). Honolulu County also offers the widest variety of different skilled trades occupations (67), while Kaua'i (30) and Maui County (30) have the least.



**Table 2: Hawai'i Skilled Trades Workforce Distribution by County**

County	Occupations	Employment (2021)	Projected Employment (2028)	Growth (2021-28)
Hawai'i	44	5,150	7,710	2,560
Honolulu	67	42,320	51,080	8,760
Kaua'i	30	2,660	3,670	1,010
Maui	30	5,920	7,610	1,690

Sources: Occupational Employment and Wage Statistics (OEWS) 2021, State of Hawaii Department of Business, Economic Development & Tourism. Long-term Projections to 2028, HireNet Hawaii.

As shown in Tables 3-6, annual openings for skilled trades occupations vary by county. Construction Laborers account for the most annual openings on average in both Honolulu County (600) and Hawai'i County (120). In Maui County, the most annual openings are for Maintenance and Repair Workers (150), and in Kaua'i County, the most annual openings are for Carpenters (60). Notably, Maui is the only county in which Operating Engineers and Other Construction Equipment Operators is one of the top 5 occupations in terms of annual openings. In Kaua'i County, Automotive Service Technicians and Mechanics is one of the top 5 occupations in terms of annual openings.

**Table 3: Skilled Trades with Most Annual Openings in Honolulu County**

Occupation	SOC Code	Employment (2021)	Annual Average Openings	Mean Annual Wage
Construction Laborers	47-2061	2,610	600	\$60,240
Carpenters	47-2031	4,050	580	\$81,730
Maintenance and Repair Workers, General	49-9071	4,130	450	\$49,800
Electricians	47-2111	2,360	380	\$80,530
Heavy and Tractor-Trailer Truck Drivers	53-3032	2,420	320	\$54,370

Sources: Occupational Employment and Wage Statistics (OEWS) 2021, State of Hawaii Department of Business, Economic Development & Tourism. Long-term Projections to 2028, HireNet Hawaii.

**Table 4: Skilled Trades with Most Annual Openings in Hawai'i County**

Occupation	SOC Code	Employment (2021)	Annual Average Openings	Mean Annual Wage
Construction Laborers	47-2061	580	120	\$55,600
Maintenance and Repair Workers, General	49-9071	700	100	\$53,180
Carpenters	47-2031	540	70	\$69,420
Heavy and Tractor-Trailer Truck Drivers	53-3032	510	60	\$51,150
Electricians	47-2111	260	50	\$74,420

Sources: Occupational Employment and Wage Statistics (OEWS) 2021, State of Hawaii Department of Business, Economic Development & Tourism. Long-term Projections to 2028, HireNet Hawaii.

**Table 5: Skilled Trades with Most Annual Openings in Maui County**

Occupation	SOC Code	Employment (2021)	Annual Average Openings	Mean Annual Wage
Maintenance and Repair Workers, General	49-9071	1,170	150	\$56,650
Carpenters	47-2031	670	120	\$76,320
Construction Laborers	47-2061	500	90	\$59,360
Electricians	47-2111	310	60	\$75,690
Operating Engineers and Other Construction Equipment Operators	47-2073	260	60	\$71,820

Sources: Occupational Employment and Wage Statistics (OEWS) 2021, State of Hawaii Department of Business, Economic Development & Tourism. Long-term Projections to 2028, HireNet Hawaii.

**Table 6: Skilled Trades with Most Annual Openings in Kaua'i County**

Occupation	SOC Code	Employment (2021)	Annual Average Openings	Mean Annual Wage
Carpenters	47-2031	410	60	\$71,720
Maintenance and Repair Workers, General	49-9071	440	50	\$54,300
Construction Laborers	47-2061	260	40	\$56,620
Heavy and Tractor-Trailer Truck Drivers	53-3032	170	40	\$53,960
Automotive Service Technicians and Mechanics	49-3023	150	20	\$52,080

Sources: Occupational Employment and Wage Statistics (OEWS) 2021, State of Hawaii Department of Business, Economic Development & Tourism. Long-term Projections to 2028, HireNet Hawaii.

Of the skilled trades occupations identified, more than half (57%) have been projected to grow statewide from 2018 to 2028. The average percent change for those occupations projected to grow is 8.2%. The skilled trades occupations with the highest projected growth rate from 2018-2028 statewide are Solar Photovoltaic Installers (72.4%); Radio, Cellular, Tower Equipment Installers and Repairers (21.4%); and Floor Layers, Except Carpet, Wood, and Hard Tiles (17.9%).

In every county, Solar Photovoltaic Installers has the highest projected growth from 2018-2028, with Maui County having the fastest growth (81%). Electricians and Plumbers are also one of the fastest growing skilled trades occupations in all counties.

**Table 7: Fastest-Growing Skilled Trades Occupations Statewide 2018-2028**

Occupation	SOC	Projected Employment Statewide (2028)	Growth (2018-28)	Percent Growth (2018-28)	Average Annual Openings	Mean Annual Wage
Solar Photovoltaic Installers	47-2231.00	500	210	72.4	70	\$57,930
Radio, Cellular, Tower Equipment Installers and Repairers	49-2021	170	20	21.4	20	\$70,360
Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042	330	50	17.9	40	\$74,650
Tile and Stone Setters	47-2044	540	70	14.9	60	\$77,940
Plumbers, Pipefitters, and Steamfitters	47-2152	2,470	230	10.3	280	\$72,830
Insulation Workers, Mechanical	47-2132	110	10	10.0	10	\$74,030
Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	110	10	10.0	10	\$48,900
Reinforcing Iron and Rebar Workers	47-2171	460	50	9.5	60	N/A
Glaziers	47-2121	470	50	9.3	60	\$71,390
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021	1,300	110	9.2	130	\$69,100

Source: Long-term Projections to 2028, HireNet Hawaii.

## LICENSING REQUIREMENTS

Licensing requirements for skilled trades vary significantly by state and occupation. For many skilled trades occupations in Hawai'i, a license is a requirement for employment. Skilled trades workers, such as electricians and plumbers, begin their careers as apprentices and must then become licensed as journey workers. With years of experience, they can increase their earning potential as they advance to supervisory roles and/or become licensed contractors.

**Figure 1: General Career Progression in the Skilled Trades**

Licensing requirements and certifying entities in Hawai'i differ by sector, occupation, and job role. The minimum age for many skilled trades licenses in Hawai'i is 18 years. Other qualifications for licensure are often based on work experience and passing an examination may also be required.



Detailed information on licensing requirements for skilled trades in Hawai'i are listed by sector and occupation(s) below.

## CONSTRUCTION AND EXTRACTION

### Journey Worker Electrician License

- Associated Occupation: Electricians
- Licensing Entity: [Board of Electricians and Plumbers](#), Hawaii Department of Commerce and Consumer Affairs
- Qualifications: 5 years (10,000 hours) in residential or commercial wiring and satisfactory completion of 240 hours of electrical academic coursework accepted by a University of Hawai'i Community College.
- Advanced Licensure: A Journey Worker Electrician can become licensed as a Supervising Electrician after 4 years of experience as a Journey Worker.

### Journey Worker Plumber License

- Associated Occupation: Plumbers, Pipefitters, and Steamfitters
- Licensing Entity: [Board of Electricians and Plumbers](#), Hawaii Department of Commerce and Consumer Affairs
- Qualifications: 5 years (10,000 hours) of plumbing work in compliance with the Uniform Plumbing Code (UPC).
- Advanced Licensure: A Journey Worker Plumber can become licensed as a Master Plumber after 2 years of experience as a Journey Worker.

### Contractor License

A contractor license is required for any Responsible Managing Employee, Sole Proprietor of a Contracting Entity, or Contracting Entity in Hawai'i.

- Associated Occupations Include: First-Line Supervisors of Construction Trades and Extraction Workers; First-Line Supervisors of Mechanics, Installers, and Repairers; Carpenters; Electricians; Plumbers; Roofers
- Licensing Entity: [Contractors License Board](#), Hawaii Department of Commerce and Consumer Affairs
- License Classifications: General Engineering, General Building, or Specialty. Specialty contractor license types include Carpentry Framing, Electrical, Flooring, Plumbing, Vacuum and Air Systems, Roofing, Sheet Metal, Waterproofing, and Welding, among other specialized trades.
- Qualifications:
  - *Responsible Managing Employee:* Must be employed by licensed contracting entity with 4 years of supervisory experience and pass examination.
  - *Sole Proprietor:* Must have 4 years of supervisory experience, pass examination, and have liability and workers' compensation insurance.
  - *Contracting Entity:* Registration with the Business Registration Division, liability and workers' compensation insurance, and have a designated Responsible Managing Employee in their employ.

## INSTALLATION, MAINTENANCE, AND REPAIR

### Mechanic License

- Associated Occupations Include: Automotive Service Technicians and Mechanics, Motorcycle Mechanics



- **Licensing Entity:** [Motor Vehicle Repair Industry Board](#), Hawaii Department of Commerce and Consumer Affairs
- **Qualifications:** At least 2 years of full-time experience as an automotive technician/mechanic or completion of an apprenticeship program and pass an examination for [Automotive Service Excellence](#) (ASE) Certification. High school or post-secondary training may also substitute for years of work experience.

## TRANSPORTATION AND MATERIAL MOVING

### Commercial Driver's License (CDL)

A CDL is required for drivers who operate any vehicle with a gross vehicle weight rating (GVWR) of 26,001 or that carries 16 or more passengers. The license type (Class A, B, or C) depends on the GVWR of the vehicle and whether the vehicle carries passengers.

- **Associated Occupations Include:** Heavy and Tractor-Trailer Truck Drivers, Bus Drivers
- **Licensing Entity:** [Hawaii Department of Transportation](#)
- **License Types:** Class A, Class B, or Class C
- **Qualifications:** Must be 18 to obtain CDL permit and 21 to obtain license. Must pass a combination of written and road testing. Written exam requirements vary depending on license type.

### Hoisting Machine Operators Board Certification

Certification is required for hoisting machine operators that work with machinery having a lifting capacity of one ton or more.

- **Associated Occupations Include:** Crane and Tower Operators
- **Licensing Entity:** [Hoisting Machine Operators Board](#), Department of Labor and Industrial Relations
- **Qualifications:** Must be 21 years of age and meet practical training requirements.

## EDUCATION AND TRAINING LANDSCAPE

Generally, occupations in the skilled trades require at least a high school diploma or GED, or some post-secondary education at most. The type and level of on-the-job training required varies by occupation. Most of the high-volume, high-demand occupations in the skilled trades in Hawai'i begin with an apprenticeship program and/or post-secondary coursework. For approximately half of the skilled trades occupations identified in this analysis, there is an apprenticeship program in the state that provides a clear pathway for local job seekers to that occupation. For occupations that do not have a direct link to a local apprenticeship program, job seekers are often able to gain entry-level employment through relevant on-the-job training and/or post-secondary training.

### Secondary Training

Hawai'i students interested in working in the skilled trades can get a head start on developing relevant industry knowledge and skills at the high school level. The Hawai'i Department of Education (HIDOE) offers several Career & Technical Education (CTE) Career Pathways at public high schools throughout the state that are related to occupations in the skilled trades, such as Building and Construction, Advanced Manufacturing, Energy, and Transportation Services. Within each Career Pathway, students can select a specific Program of Study of their interest. For example, in Building and Construction, students can choose from the Mechanical, Electrical, and Plumbing (MEP) Systems or Residential and Commercial Construction Programs of Study.



Table 8 lists HIDOE Career Pathways and Programs of Study relevant to skilled trades occupations. Of the Career Pathways in Table 8, Building and Construction is the most commonly offered among HIDOE high schools statewide as of school year 2022-23. Career Pathway offerings vary significantly by school based on student interest, facilities and equipment, and the availability of teachers with content expertise. Programs offered are subject to change each academic year.

**Table 8: HIDOE Pathways & Programs of Study Relevant to Skilled Trades**

HIDOE Career Pathway	Programs of Study	HIDOE High Schools Offering Pathway (SY 2022-23)
Building and Construction	<ul style="list-style-type: none"> <li>Mechanical, Electrical, and Plumbing (MEP) Systems</li> <li>Residential and Commercial Construction</li> </ul>	36
Advanced Manufacturing	<ul style="list-style-type: none"> <li>Automation and Robotics Technology</li> <li>Electro-Mechanical Technology</li> <li>Welding</li> </ul>	9
Energy	<ul style="list-style-type: none"> <li>Alternative Fuels Technology</li> <li>Power Grid Technology</li> <li>Renewable Energies Technology</li> </ul>	3
Transportation Services	<ul style="list-style-type: none"> <li>Automotive Maintenance and Light Repair (MLR)</li> <li>Automotive Collision Repair</li> <li>Aviation Maintenance Technology</li> <li>Marine Maintenance Technology</li> </ul>	24

Source: Hawaii Department of Education

## Apprenticeship Programs

[Registered Apprenticeships](#) in Hawai'i are long-term, earn-and-learn training programs in which job seekers learn specialized skills while on the job<sup>2</sup>. These apprenticeship programs are approved by the Director of the Department of Labor and Industrial Relations with advisement from the state apprenticeship council. There are more than 50 registered apprenticeship programs in Hawai'i, predominantly in the construction trades. Apprenticeships are typically sponsored by joint apprenticeship committees comprising representatives from union or non-union associations that specialize in that particular trade. While there are also medical, information technology, and culinary registered apprenticeships in Hawai'i, occupations in these sectors do not fall within the definition of skilled trades employed in this analysis.

Skilled trades occupations associated with a Hawai'i apprenticeship program are listed in Table 9, along with apprenticeship sponsors and required training hours. Generally, 2,000 hours will equate to about 1 year of training. Apprenticeship program data was collected from a State of Hawaii Department of Labor and Industrial Relations list dated January 2021<sup>3</sup>.

<sup>2</sup> State of Hawaii Workforce Development Division, <https://labor.hawaii.gov/wdd/job-seekers/apprenticeship/>

<sup>3</sup> <https://labor.hawaii.gov/wdd/files/2021/05/List-Construction-Apprenticeships-01.04.21.pdf>



**Table 9: Skilled Trades Occupations and Associated Apprenticeships in Hawai'i**

Occupation	SOC Code	Apprenticeship Sponsor	Required Training Hours
Brickmasons and Blockmasons	47-2021	Joint Apprenticeship Committee for Bricklayer-Mason	8,000
Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	Maui Electric Company Joint Apprenticeship Committee	6,000
Bus Drivers, Transit and Intercity	53-3052	Robert's Hawaii	2,000
Cabinetmakers and Bench Carpenters	51-7011	Hawaii Carpenters Apprenticeship and Training Program or Associated Builders and Contractors Apprenticeship Committee	8,000
Carpenters	47-2031	Hawaii Carpenters Apprenticeship and Training Program or Associated Builders and Contractors Apprenticeship Committee	8,000
Cement Masons and Concrete Finishers	47-2051	Hawaii Masons & Plasterers Training	8,000
Construction and Building Inspectors	47-4011	Honolulu Community College	2,000
Construction Laborers	47-2061	Hawaii Laborers' Joint Apprenticeship Committee	4,000
Drywall and Ceiling Tile Installers	47-2081	Hawaii Carpenters Apprenticeship & Training Program	8,000
Electrical & Electronics Repairers, Powerhouse, Substation, Relay	49-2095	Hawaiian Electric Company, Inc. Joint Apprenticeship Committee	6,000
Electrical and Electronics Repairers, Commercial and Industrial Equipment	49-2094	Hawaiian Electric Company, Inc. Joint Apprenticeship Committee	6,000
Electrical Power-Line Installers and Repairers	49-9051	IBEW Local 1260 or Hawaii Electricians Joint Apprenticeship Committee	7,000
Electricians	47-2111	Hawaii Electricians Joint Apprenticeship Committee or Associated Builders and Contractors Hawaii Apprenticeship Committee	10,000
Elevator Installers and Repairers	47-4021	IUEC Local 126 Joint Apprenticeship Committee	6,800
Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042	Joint Apprenticeship and Training Committee for Floor Layers	8,000
Glaziers	47-2121	Joint Apprenticeship Committee for Glaziers, Architectural Metal and Glassworkers	10,000
Hazardous Materials Removal Workers	47-4041	Union Local 368	4,000
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021	Honolulu Joint Apprenticeship and Training Committee for the Plumbing and Pipefitting Industry	10,000
Heavy and Tractor-Trailer Truck Drivers	53-3032	Hawaii Joint Apprenticeship Committee for Operating Engineers	2,000
Machinists	51-4041	Hawaiian Electric Company, Inc. Joint Apprenticeship Committee - Machinist Mechanic	6,000
Maintenance and Repair Workers, General	49-9071	Hawaii Hotel and Restaurant Industry & Training Fund	8,000
Millwrights	49-9044	Hawaii Carpenters Apprenticeship and Training Program	8,000



Operating Engineers & Other Construction Equipment Operators	47-2073	Hawaii Joint Apprenticeship Committee for Operating Engineers	4,000
Painters, Construction and Maintenance	47-2141	Joint Apprenticeship and Training Committee for Painter	8,000
Plasterers and Stucco Masons	47-2161	Hawaii Masons & Plasterers Training	8,000
Plumbers, Pipefitters, and Steamfitters	47-2152	Joint Apprenticeship Committee for the Plumbing and Pipefitting Industry or Associated Builders and Contractors Hawaii	10,000
Power Plant Operators	51-8013	City and County of Honolulu Joint Apprenticeship Committee - Plant Electrical/Electronic Equipment Repairer	10,000
Radio, Cellular, Tower Equipment Installers and Repairers	49-2021	Joint Apprenticeship Committee for Telecommunications	6,000
Reinforcing Iron and Rebar Workers	47-2171	Joint Apprenticeship Committee for Ironworkers - Reinforcing	6,000
Roofers	47-2181	Joint Apprenticeship and Training Committee for Roofers (8,000 hours) or Associated Builders and Contractors Apprenticeship Committee	7,000
Security and Fire Alarm Systems Installers	49-2098	Fire Sprinkler Fitter - Honolulu Joint Apprenticeship and Training Committee for the Plumbing and Pipefitting Industry	10,000
Sheet Metal Workers	47-2211	Hawaii Joint Apprenticeship Committee for the Sheet Metal Industry	10,000
Structural Metal Fabricators and Fitters	51-2041	Hawaii Shopmen's Local 803 Joint Apprenticeship and Training Committee	8,000
Tapers	47-2082	Joint Apprenticeship Committee for Tapers	8,000
Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	Joint Apprenticeship Committee for Telecommunications	6,000
Telecommunications Line Installers and Repairers	49-9052	Joint Apprenticeship Committee for Telecommunications	7,000
Tile and Marble Setters	47-2044	Hawaii Masons & Plasterers Training	8,000
Welders, Cutters, Solderers, and Brazers	51-4121	Hawaii Joint Apprenticeship Committee for Operating Engineers	8,000

Source: State of Hawaii Department of Labor and Industrial Relations

All apprentices in Hawai'i must be at least 16 years old, although some apprenticeship programs have a minimum age of 17 or 18. Most programs require the candidate to have a high school diploma or GED and may require a driver's license. Many trades, particularly in construction, are labor-intensive, and apprentices must be physically able to perform the duties of their trade. Some programs require candidates to pass an aptitude test, such as industry knowledge or basic math. Select programs require candidates to pass an eye examination for color blindness.

The time commitment to complete an apprenticeship program is substantial. The required on-the-job training ranges from 2,000 to 10,000 hours and many programs require the completion of substantial classroom coursework during the first 1 to 2 years of training. This combination schedule can be overwhelming for many trainees. The benefit, however, is that the cost of schooling is almost always covered by the apprenticeship program/employers and the trainees





are able to work and earn money while obtaining their skilled trades license, and advance in job responsibilities and pay scale quickly thereafter.

### **The University of Hawai'i Community College Programs**

Several of the University of Hawai'i Community Colleges (UHCCs) offer coursework that helps to prepare students for registered apprenticeships or entry-level roles in various trades. Throughout the state, there is at least one UHCC in each county offering trades-related coursework. Students can earn a Certificate of Achievement or Associate in Applied Science degree from a UHCC for many trades.

This analysis has identified skilled trades programs at Hawai'i Community College, Honolulu Community College, Kaua'i Community College, Leeward Community College, and UH Maui College. Automotive technology, carpentry, and electrical are some of the most commonly offered programs. A list of skilled trades programs offered at the UHCCs can be found in Table 10.

Honolulu Community College offers the widest variety of trades-related coursework and programs in the state, including an apprenticeship program at the Pearl Harbor Naval Shipyard (PHNSY). The PHNSY Apprenticeship Program supports 27 trade occupations, including structural, mechanical, and electrical trades. Apprentices work at the PHNSY while also earning an Applied Trades degree at Honolulu Community College.

Another example of collaboration between a UHCC and industry partner to build the local skilled trades workforce is Hawai'i Community College's new electrical apprenticeship program with W.M. Keck Observatory<sup>4</sup>. Through this pilot program, apprentices gain hands-on experience in industrial electrical work at the observatory while enrolled in the college's Electrical Installation and Maintenance Technology program.

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<sup>4</sup> <https://keckobservatory.org/electrician-apprenticeship/>



Table 10: Skilled Trades Programs Offered at UH Community Colleges

Campus	Skilled Trades Programs
Hawaii Community College	<ul style="list-style-type: none"> <li>• Auto Body Repair and Painting</li> <li>• Automotive Technology</li> <li>• Carpentry</li> <li>• Diesel Mechanics</li> <li>• Electrical Installation and Maintenance Technology               <ul style="list-style-type: none"> <li>◦ W.M. Keck Observatory Pilot Program</li> </ul> </li> <li>• Machine, Welding and Industrial Mechanics Technologies</li> </ul>
Honolulu Community College	<ul style="list-style-type: none"> <li>• Carpentry Technology</li> <li>• Electrical Installation and Maintenance Technology</li> <li>• Sheet Metal and Plastics Technology</li> <li>• Refrigeration and Air Technology</li> <li>• Welding Technology</li> <li>• Aeronautics Maintenance Technology</li> <li>• Auto Body Repair &amp; Painting</li> <li>• Automotive Technology</li> <li>• Diesel Mechanics Technology</li> <li>• Pearl Harbor Naval Shipyard Cooperative Education Training/Apprenticeship Program</li> <li>• <u>Apprenticeship Training:</u> <ul style="list-style-type: none"> <li>◦ Boilermaker</li> <li>◦ Bricklayer Mason</li> <li>◦ Building Maintenance (Hotel Workers)</li> <li>◦ Carpenter</li> <li>◦ Cement Finisher</li> <li>◦ Ceramic Tile Setter</li> <li>◦ City and County Water Supply</li> <li>◦ City and County Waste Water</li> <li>◦ City and County Electrical Maintenance</li> <li>◦ Construction Craft Laborer</li> <li>◦ Drywall, Acoustic and Lathe Workers</li> <li>◦ Drywall Taper</li> <li>◦ Electrician</li> <li>◦ Elevator Constructor</li> <li>◦ Fire Sprinkler Fitter</li> <li>◦ Floor Layer</li> <li>◦ Glazier</li> <li>◦ Heat/Frost Insulator &amp; Allied Workers</li> <li>◦ Ironworker (Fabricator)</li> <li>◦ Ironworker (Reinforcing Steel)</li> <li>◦ Ironworker (Structural)</li> <li>◦ Operating Engineer</li> <li>◦ Painter</li> <li>◦ Plasterer</li> <li>◦ Plumber</li> <li>◦ Refrigeration &amp; Air Conditioning Fitter</li> <li>◦ Roofer</li> <li>◦ Sheet Metal Worker</li> <li>◦ Steam Fitter Welder</li> <li>◦ Telecommunications Installer/Technician</li> </ul> </li> </ul>
Kauai Community College	<ul style="list-style-type: none"> <li>• Automotive Technology</li> <li>• Carpentry Technology</li> <li>• Electrical Installation and Maintenance Technology</li> </ul>
Leeward Community College	<ul style="list-style-type: none"> <li>• Automotive Technology</li> <li>• Forklift Operator Training</li> <li>• Commercial Driver License Training</li> </ul>



UH Maui College	<ul style="list-style-type: none"> <li>• Automotive Technology</li> <li>• Construction Technology</li> </ul>
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## INDUSTRY CREDENTIALS

An industry credential is a verification of an individual's qualification or competence in a certain skill or skillsets that are issued by a third party with the relevant authority to issue such credentials<sup>5</sup>. Industry credentials include educational certificates, certifications, degrees, and government-issued licenses.

In the skilled trades, government-issued licenses are the primary industry credentials, and are required for several occupations in Hawai'i. Beyond a high school diploma, educational certificates and degrees are generally not required to gain entry to the trades. Various industry certifications can benefit skilled trades workers across many occupations by providing industry exposure and validating their knowledge and skills. Some certifications may be provided by employers upon hire.

Based on feedback from local employers of skilled trades workers and job postings associated with skilled trades in Hawai'i, below are some of the most commonly requested industry certifications. These include general workplace health and safety certifications and certifications for technical skillsets.

### WORKPLACE HEALTH AND SAFETY

#### First Aid and CPR Certification

Being certified in First Aid and CPR prepares skilled trades workers to provide basic care in case of injuries or emergencies on the job. First Aid is particularly important in the skilled trades, as the use of tools and equipment can pose safety hazards for workers.

#### OSHA 10

OSHA 10-hour training teaches basic workplace healthy and safety knowledge that applies to many skilled trades. Some employers may require an OSHA 10 card for employment. OSHA offers construction, general industry, and maritime training options.

#### OSHA Fall Prevention Certification

OSHA Fall Prevention training teaches workers to recognize common fall hazards in the construction industry and how to avoid them. This certification is recommended for construction workers and supervisors.

#### Working at Heights Certification

Many skilled trades involve working at heights, including on roofs and electrical poles. Training on proper protocols and protective equipment while working at heights, such as the OSHA Competent Person for Fall Protection Training, is commonly recommended in construction trades.

#### Working in Confined Space Certification

Training and certification on the prevention of injuries while working in confined spaces, such as in crawl spaces, is also commonly requested in construction trades.

<sup>5</sup> Bureau of Labor Statistics, 2010

**Scaffolding Competent Person Certification**

For trades that involve the use of scaffolds, such as carpentry, OSHA requires a designated competent person on the work site to be trained in identifying scaffolding hazards and corrective measures.

**TECHNICAL SKILLS****Automotive Service Excellence (ASE) Certifications**

ASE Certifications are commonly requested by employers in the automotive service industry. ASE Certification is also one of the requirements for licensure as a mechanic in Hawai'i. ASE offers a variety of certification exams for different types of automotive technicians and mechanics.

**Commercial Driver's License (CDL)**

A CDL is required for drivers of large tractor-trailer and passenger vehicles in Hawai'i. Having a CDL can also be advantageous for various occupations in construction and repair.

**Forklift Operator Certification**

Forklift Operator Certification can be beneficial for occupations in construction and transportation. An OSHA-approved training course is required, and candidates must also complete on-the-job training.

**Scissor Lift Certification**

Training and certification on the proper use of scissor lifts is valuable for various trades workers in construction and maintenance occupations.

**Construction Estimating Software Certifications**

Builders and contractors utilize construction estimating software to plan projects and their associated costs. Online training is available for various software types.

**Computer-Aided Design (CAD) Software Certifications**

Computer-Aided Design software, such as Autodesk AutoCAD, is used in the construction industry for 2D and 3D drafting, design, and modeling. Autodesk offers various certifications, including Autodesk Certified User (ACU) for secondary students and Autodesk Certified Associate (ACA) for postsecondary students and early career professionals.

**US Army Corps of Engineers Construction Quality Management (CQM)**

For contractors working on US Army Corps of Engineers projects, a Quality Control Representative must have completed this Construction Quality Management training.

**Accelerated Training in Defense Manufacturing Program (ATDM)**

Offered only in Virginia, completion of the ATDM Program is desirable for trades workers who build and repair military equipment, such as welders working on submarines.



## TRANSFERRABLE SKILLS

While every occupation in the skilled trades has its own specialized knowledge and skills, there are many broad abilities and skillsets that apply across occupations. These transferrable skills, both professional and technical, are relevant for career success throughout the sector. Technical skills tend to be more occupation-specific, while professional skills or “soft skills” are more broadly applicable.

Based on national industry survey data from the Occupational Information Network (O\*NET), the following professional and technical skills were most frequently associated with the skilled trades occupations included in this analysis.

### PROFESSIONAL SKILLS

- **Critical Thinking:** Using logic and reasoning to identify the strengths and weaknesses of alternative solutions, conclusions, or approaches to problems.
- **Active Listening:** Giving full attention to what other people are saying, taking time to understand the points being made, asking questions as appropriate, and not interrupting at inappropriate times.
- **Verbal Communication:** Talking to others to convey information effectively.
- **Time Management:** Managing one's own time and the time of others.
- **Problem Solving:** Identifying complex problems and reviewing related information to develop and evaluate options and implement solutions.

### TECHNICAL SKILLS

- **Operations Monitoring:** Watching gauges, dials, or other indicators to make sure a machine is working properly.
- **Operation and Control:** Controlling operations of equipment or systems.
- **Equipment Maintenance:** Performing routine maintenance on equipment and determining when and what kind of maintenance is needed.
- **Troubleshooting:** Determining causes of operating errors and deciding what to do next.
- **Quality Control Analysis:** Conducting tests and inspections of products, services, or processes to evaluate quality or performance.

According to employers in Hawai'i's skilled trades sector, basic computer skills and project management skills are valuable across various trades. Employers emphasized that many technical skills can be taught through apprenticeships and training, but soft skills are also essential – and can be harder to teach. Problem-solving, communication, attention to detail, reliability, and work ethic are highly valued. Having the right attitude is also a must; employers prefer candidates that demonstrate a willingness to learn and strong commitment to the work. These skills and traits will serve local candidates well throughout the sector.



## CLEAN ENERGY SKILLED TRADES

### OVERVIEW

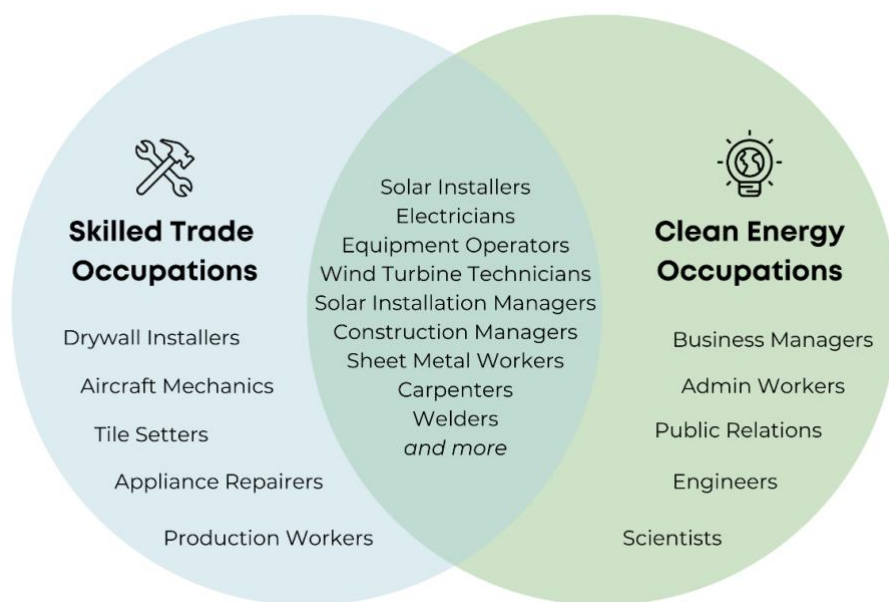
The demand for clean energy in Hawai'i is increasing rapidly, which has led to a need for skilled workers to support the industry. Clean energy is a crucial part of Hawai'i's economy and the state's efforts to reduce its dependence on imported fossil fuels. The Hawai'i Clean Energy Initiative aims to achieve 100 percent clean energy by 2045, creating many opportunities for skilled trades workers in the state<sup>6</sup>. Skilled trades workers are necessary to ensure the successful implementation and long-term sustainability of clean energy projects.

A successful transition to clean energy requires a broad range of specialized skills and knowledge, and as the industry continues to grow, so does the need for skilled trades workers. This section provides an overview of the clean energy sector in Hawai'i, including the key occupations, sectors, growth opportunities, and relevant industry credentials.

### OCCUPATIONS IN CLEAN ENERGY

Figure 2 illustrates the overlap between skilled trades and clean energy occupations. The diagram shows that not all clean energy occupations are considered skilled trades. For example, some Engineers, Business Managers, Public Relations Specialists, and Scientists may work in clean energy, but these roles are not considered skilled trades, as they typically require a 2- or 4-year college degree as opposed to an apprenticeship and/or on-the-job training. Such occupations fall outside the scope of this workforce analysis.

**Figure 2: Skilled Trades and Clean Energy Venn Diagram**



<sup>6</sup> Hawaii State Energy Office, [energy.hawaii.gov/hawaii-clean-energy-initiative/](https://energy.hawaii.gov/hawaii-clean-energy-initiative/)



Of the 85 total skilled trades occupations included in this analysis, nearly half (46%) are relevant to the clean energy sector<sup>7</sup>. Thirteen occupations are clean energy-specific trades, such as Solar Photovoltaic Installers. A sub-set of workers in other skilled trades, such as Electricians, also work in clean energy-related roles.

The 13 skilled trades occupations specific to clean energy and their associated pay are listed in Table 11. These occupations are classified in the following major SOC groups: Production Occupations (6); Construction and Extraction Occupations (5); and Installation, Maintenance, and Repair Occupations (2). With the exception of Solar Photovoltaic Installers, Hawai'i-specific labor market data, including average wages, employment volume, and projected growth, is not yet available for these occupations. Based on national estimates from O\*NET, their average annual wage nationwide is \$72,359.

**Table 11: Clean Energy Specific Skilled Trades Occupations**

Occupation	SOC	State Employment (2021)	State Growth Projections (2018-2028)	National Growth Projections (2021-2031)	Average Annual Wage <sup>8</sup>
Solar Photovoltaic Installers	47-2231.00	410	72.4%	27%	\$57,930
Biofuels Processing Technicians	51-8099.01	N/A	N/A	N/A	\$65,160
Biomass Plant Technicians	51-8013.03	N/A	N/A	N/A	\$98,680
Chemical Equipment Operators and Tenders	51-9011.00	N/A	N/A	N/A	\$48,090
Chemical Plant and System Operators	51-8091.00	N/A	N/A	N/A	\$70,200
Energy Auditors	47-4011.01	N/A	N/A	N/A	\$62,020
Geothermal Technicians	49-9099.01	N/A	N/A	N/A	\$70,740
Hydroelectric Plant Technicians	51-8013.04	N/A	N/A	N/A	\$98,680
Nuclear Power Reactor Operators	51-8011.00	N/A	N/A	N/A	\$104,620
Solar Energy Installation Managers	47-1011.03	N/A	N/A	N/A	\$94,850
Solar Thermal Installers and Technicians	47-2152.04	N/A	N/A	N/A	\$73,590
Weatherization Installers and Technicians	47-4099.03	N/A	N/A	N/A	\$39,850
Wind Turbine Service Technicians	49-9081.00	N/A	N/A	44%	\$56,260

Sources: State of Hawaii Occupational Employment and Wages, 2021. Long-term Projections to 2028, HireNet Hawaii. Fastest Growing Occupations, Bureau of Labor Statistics, 2022.

<sup>7</sup> Green Jobs, U.S. Bureau of Labor Statistics, [www.bls.gov/green/](http://www.bls.gov/green/)

<sup>8</sup> For all occupations in Table 11 other than Solar Photovoltaic Installers, average annual wages are national approximations provided by O\*NET.



## SECTORS AND GROWTH

Clean energy encompasses a variety of renewable energy generation sectors. These include Battery Energy Systems, Bioenergy, Geothermal, Hydroelectric, Hydrogen, Ocean, Solar, Wind, and Renewable Natural Gas<sup>9</sup>. There are also clean energy jobs related to energy efficiency, including installation, maintenance, and repair of energy-efficient buildings, appliances, and vehicles. Clean energy skilled trades occupations are among the fastest growing occupations nationwide; Wind Turbine Service Technicians are projected to grow 44% and Solar Photovoltaic Installers are projected to grow 27% from 2021-2031<sup>10</sup>.

There are an estimated 143 large-scale renewable energy projects currently operational or in development in Hawai'i as of April 2023 (Table 12), spanning a variety of renewable technologies<sup>11</sup>. More than half (66%) are Solar Photovoltaic, 13% are Hydroelectric, 6% are Wind, and 4% are Biofuel or Biomass. The majority of projects are located in Honolulu County (72) and Hawai'i County (28). Of the 143 total projects in the state, 27 are currently in development: 26 Solar PV projects and 1 Microgrid project.

**Table 12: Hawai'i Renewable Energy Projects Operational or In Development**

TECHNOLOGY	COUNTY				STATE TOTAL
	Hawai'i	Honolulu	Kaua'i	Maui	
Biofuel/Biomass	1	3	1		5
Geothermal	1				1
Hydroelectric	10		8	1	19
Microgrid	3	3			6
Solar PV & Storage	9	58	11	16	94
Wave		1			1
Wind	2	3		3	8
Other <sup>12</sup>	2	4	1	2	9
<b>COUNTY TOTAL</b>	<b>28</b>	<b>72</b>	<b>21</b>	<b>22</b>	<b>143</b>

Source: Statewide Energy Projects Directory, Hawaii State Energy Office

A robust workforce is needed to meet the needs of Hawai'i's growing clean energy industry. According to the National Renewable Energy Laboratory (NREL), the Solar Energy sector accounted for 3,728 jobs in Hawai'i in 2020, and Battery Storage accounted for 319 jobs<sup>13</sup>. Solar Energy and Battery Storage are the clean energy sectors with the highest projected workforce demand in the state. According to NREL's projections, to meet the state's clean energy workforce needs, Solar Energy jobs will need to grow by at least 2,727 and Battery Storage jobs will need to grow by at least 623 from 2020-2030.

<sup>9</sup> Hawaii State Energy Office

<sup>10</sup> Bureau of Labor Statistics

<sup>11</sup> Statewide Energy Projects Directory, Hawaii State Energy Office

<sup>12</sup> Other includes Feedstock Production, Waste-to-Energy, and Ocean Thermal Energy Conversion.

<sup>13</sup> Hawai'i's Clean Energy Jobs Potential Through 2030, National Renewable Energy Laboratory, 2022



**Table 13: Hawai'i Clean Energy Job Estimates 2020-2030**

Technology	2020 Job Estimates	2030 Job Estimates	Job Growth Needed to Meet 2030 Demand
Solar Energy	3,728	6,455-9,608	2,727-5,880
Wind Energy	261	320-491	59-230
Battery Storage	319	942-1,796	623-1,477
Energy Efficiency	178	783	605

Source: Hawaii's Clean Energy Jobs Potential Through 2030, National Renewable Energy Laboratory

Solar Photovoltaic Installers are the fastest-growing skilled trade occupation in Hawai'i from 2018-2028. Table 14 shows the projected growth rates of Solar Photovoltaic Installers by county. Maui County is expected to have the highest growth rate (81%), followed by Hawai'i County (79%), Honolulu County (74.4%), and Kaua'i County (57%). However, Honolulu County will have the most annual openings on average (30).

**Table 14: Solar Photovoltaic Installers Growth Rate by County 2018-2028**

County	Percent Change (2018-28)	Projected Employment (2028)	Annual Average Openings	Mean Annual Wage
Hawai'i	78.57	50	10	\$56,920
Honolulu	74.4	220	30	\$58,720
Kaua'i	56.98	140	20	N/A
Maui	81.13	100	10	N/A

Source: Long-term Projections to 2028, HireNet Hawaii.

In addition to clean energy-specific roles like Solar Photovoltaic Installers, renewable energy projects in Hawai'i require a variety of skilled trades workers. A 2020 survey conducted on 8 utility-scale solar projects under development in the state found that 87% of the 1,340 resident jobs created were skilled trades roles: Installers (520), Electricians (520), and Heavy Equipment Operators (120)<sup>14</sup>. Respondents reported that Solar Management and Technicians were among the most difficult positions to fill.

Projects in up-and-coming renewable technologies like Bioenergy and Hydrogen & Fuel Cells also require various skilled trades workers, including Construction Laborers and Foremen, Industrial Equipment Mechanics, Plant Operators, and Heavy and Tractor-Trailer Truck Drivers<sup>15</sup>. Although renewable projects utilizing these technologies are not yet prominent in the state, there is potential for and interest in their future development.

<sup>14</sup> Hawaii State Energy Office, 2020

<sup>15</sup> US Department of Energy, [www.energy.gov/eere/education/map-career-clean-energy](https://www.energy.gov/eere/education/map-career-clean-energy)



## CLEAN ENERGY SPECIFIC CREDENTIALS

As many skilled trades occupations are needed in the clean energy sector, specific credentials are generally not necessary for trades workers to take on clean energy roles. For those interested in pursuing a skilled trades career in clean energy in Hawai'i, enrolling in an apprenticeship program and/or courses at a UHCC for the trade of interest is recommended.

For skilled trades workers interested in pursuing nationally-recognized credentials to gain specialized skills and knowledge in clean energy, a variety of certification programs exist for different renewable technologies. The following certification programs are some of the most commonly associated with clean energy occupations in solar and wind energy, electric vehicle supply equipment, energy storage, and energy efficiency.

### SOLAR ENERGY

- [North American Board of Certified Energy Practitioners \(NABCEP\)](#): Associate credentials include PV Associate and Solar Heating Associate. Makaha Learning Center offers a [Solar 101 program](#) that satisfies the formal training requirement for NABCEP PV Associate testing.
- [Solar Energy International](#): Several Solar Professionals certificate programs and online courses available.

### WIND ENERGY

- [ETA International](#): Small Wind Installer certification.

### ELECTRIC VEHICLE SUPPLY EQUIPMENT

- [Electric Vehicle Infrastructure Training Program \(EVITP\)](#): The EVITP is a certification program for licensed electricians who specialize in the installation of electric vehicle supply equipment.

### ENERGY STORAGE

- [Energy Storage and Microgrid Training and Certification \(ESAMTAC\)](#): This certification program is targeted at preparing electricians for work in assembly and maintenance of energy storage and microgrid systems.

### ENERGY EFFICIENCY

- [Association of Energy Engineers \(AEE\)](#): The AEE offers Certified Energy Manager and Certified Energy Auditor credentials. These certifications have minimum eligibility requirements based on level of education and work experience.



## STAKEHOLDER FEEDBACK

Outreach conducted for this research included two stakeholder focus groups, one with general trades professionals and one specific to clean energy, as well as ten anonymous interviews with unions, associations, and industry leaders. Below is a high-level summary of the feedback received from those conversations.

### HAWAI'I'S CURRENT SKILLED TRADES WORKFORCE

Across the sector, stakeholders emphasized there are a number of projects in the pipeline and a **variety of employment opportunities**, including those in clean energy technologies such as solar, wind, and geothermal. It is likely that any projections included in the data are conservative, as new projects and plans continue to come online daily. Hawai'i is already starting to transition the current energy workforce into **clean energy jobs**, and the **Good Jobs Hawai'i** initiative will support this effort by funding local training. The **Clean Energy Sector Partnership** will bring industry, educators, and community partners together to address shared needs in the sector. There are already **strong partnerships** and collaboration between industry and local training providers, though the sector could benefit from increased cooperation between organized and non-organized labor.

Many stakeholders voiced concern about the **lack of qualified local workers** and aging workforce. They have observed that **younger students seem to be less interested** in and less willing to commit to apprenticeships and long-term career progression in the trades. From the perspective of training providers, accessing funding to expand their training capacity can be challenging. Stakeholders also noted that **students could be better informed** about and prepared for skilled trades careers while in high school, and there is a desire for **more experienced industry professionals to teach** courses in the trades at the high school level. In Clean Energy, there is a need for local training around long-term maintenance of photovoltaic systems, electric vehicle and charging station repair, as well as new alternative fuels as the state continues to transition to 100% renewable.

### BUILDING HAWAI'I'S FUTURE SKILLED TRADES WORKFORCE

#### BARRIERS AND CHALLENGES

Stakeholders were asked about the specific barriers and challenges to building the skilled trades workforce. Below are the key themes of those discussions.

**Access to Transportation:** Many students and trainees face difficulties getting to their job site, classes, or shop because they lack vehicles or reliable transportation options. This can lead to challenges with timeliness and dependability that are out of their control.

**Aging Workforce:** Hawai'i faces a major challenge of upskilling an aging workforce and attracting new talent as baby boomers retire. The phasing out of many energy technologies leaves workers associated with the fossil fuel industry in need of professional support to transition to new technologies. Many of those older, more seasoned workers will also be leaving the workforce for retirement while the demand for skilled workers continues to increase. The



retirement of these experienced workers will also leave a significant gap in supervisory and management roles.

**Application Processes:** For government opportunities, which are often very high paying and provide great benefits, hiring processes through USAJOBS and other platforms can be complicated and automated, which often makes it difficult for local candidates to successfully navigate the system. The high level of interest in federal jobs can make the competition for these positions fierce.

**Awareness, Interest, and Exposure:** Locally, the demand for skilled workers is growing, but younger generations often have misperceptions and negative stereotypes about trades, and lack exposure. These challenges are especially pronounced on the neighbor islands, where it has been difficult to increase enrollment in apprentice programs.

Many students have limited exposure to trades, leading them to drop out of apprenticeships after only a few months. They may not be adequately prepared for the physical demands, such as working at heights or performing strenuous labor.

**Family Demands:** It can be difficult for some candidates to balance their family responsibilities and education due to the lack of available childcare and strenuous schedules, which often include Saturday classes. In the past, some programs provided free childcare, but have discontinued this benefit due to lack of consistent demand. This can be a limiting factor for many candidates.

**Inconsistent Employment:** Employers had concerns regarding the short-term nature of construction jobs and renewable energy projects. This often leads to an ebb and flow in demand for workers which can leave many without work for long periods of time. More experienced trades workers plan for this financially but less seasoned employees often end up seeking other employment and leaving the industry during slower times.

**Industry Cooperation:** The expansion or development of some training opportunities in the state may have been hindered in the past due to competition and political challenges between organizations and labor groups. Feedback was received regarding the need for industry cooperation to prevent similar issues in the future.

**Lack of Experienced Trades Educators:** In Hawai'i, the Department of Education (DOE) has strict requirements that teachers must hold certain certifications and/or degrees to be eligible for employment. While this requirement ensures that teachers have a certain level of education and training, it also creates a limitation for the DOE in terms of recruiting experienced trade workers to teach vocational and technical skills. Many skilled workers who have years of experience in trades such as carpentry, plumbing, or welding, may not have a bachelor's degree or State Approved Teacher Education Program (SATEP) certification. This means that they are automatically excluded from consideration for teaching positions within the DOE, even though they may have valuable industry knowledge and experience to share with students.

**Skill Development and Preparation:** In addition to a high school diploma or GED, candidates are often required to pass a math and English test to qualify. Meeting the math prerequisites tends to be challenging for many hopefuls. Math prerequisites are typically around an 8th-grade level but also require the ability to apply those concepts to real-life work situations. Furthermore, many candidates may also lack certain professional skills that are highly valued by employers.



These skills include having a positive attitude, being willing to work hard, and possessing strong communication, safety, logistics, project management, and dependability skills.

## OPPORTUNITIES

Stakeholders also discussed the opportunities that exist to support Hawaii's skilled trades workforce development. Below are the key themes of those discussions.

**Early Exposure for Students:** Stakeholders believe there is an opportunity to improve alignment between local training providers and the DOE for outreach to students and professional development for CTE teachers who may lack industry knowledge. They would like high school counselors to be more knowledgeable about career opportunities in the trades to inform students about their options. They also pointed to a general need to market careers in the trades more effectively, such as by emphasizing high wages and good benefits, in order to recruit students. They suggested incorporating newer technologies in outreach and training programs to help attract students. Additionally, there is potential to expand pre-apprenticeship programs for high school students through industry and DOE partnerships. A pre-apprenticeship program can be offered to those interested in pursuing an apprenticeship and is designed to prepare individuals with the skills and exposure necessary to enter and succeed in a registered apprenticeship program.

It is crucial to offer young students the opportunity to learn and explore skilled trades in order to establish a strong foundation in this industry. A great way to achieve this is by providing more helper/pre-apprenticeship programs, which can enhance exposure and improve retention in the workforce. Furthermore, addressing challenges within the Department of Education that prevent schools from hiring trades professionals as instructors may help increase more authentic career exposure and experiences for students.

**Growth in Clean Energy:** In Clean Energy, stakeholders anticipate jobs will grow in commercial and utility-scale battery storage, transportation (electric planes/gliderns, electric vehicles and charging stations), and long-term maintenance of renewable installations.

**Improved Project Coordination:** One way to prevent worker shortages and the loss of interest among new trades workers during slow times is to better coordinate projects to avoid fluctuations in demand. Stakeholders recommended phasing projects to help prevent these issues.

## APPRENTICESHIP TRAINING PROGRAMS

### Local Training Opportunities

In Hawaii, there are numerous apprenticeship programs available for local skilled trades, both through union and non-union organizations. These programs involve a blend of classroom education and on-the-job training, with the specifics varying depending on the program. Typically, programs last between three to five years, with participants spending at least one to two years in classroom education while simultaneously working on the job.

### Enrollment Prerequisites

Typically, candidates need to be at least 17 years old and have a high school diploma or GED to enroll in vocational or trade programs. Additionally, some programs may require candidates to pass a Math/English test for admission. In some cases, candidates may also need to have prior employment with a membership organization in their trade of interest before enrolling.



### Costs

Apprenticeship programs cover the cost of education, allowing students to avoid the debt associated with traditional college education. However, it is important to note that certain expenses, such as books, basic tools, and safety gear (such as steel-toed boots), may not be covered.

## EMPLOYMENT AND CAREER ADVANCEMENT

### Entry-Level Jobs

It is advisable to have some experience in the field before joining an apprentice program. It is recommended to work as a laborer, helper, or participate in pre-apprenticeship programs on-site. These entry-level jobs and apprentice positions often pay a minimum of \$20 per hour, which increases with the number of hours completed.

### Career Advancement

There are advancement opportunities within skilled trades careers. A simplified career trajectory looks like:



1. *Apprentice*: 3-5 year program (varies by trade)
2. *Journey Worker*: Required work experience varies by trade (e.g., 5 years for Journey Worker Electrician licensure)
3. *Supervisor*: Required work experience varies by trade (e.g., 4 years of experience as a Journey Worker for Supervising Electrician licensure)
4. *Contractor*: 4 years of supervisory experience required



## RECOMMENDATIONS

1. **Increase Early Exposure to the Skilled Trades:** To combat misconceptions about blue-collar careers and to prepare students with the professional skills to succeed in the sector, it is important to provide early exposure to work in the skilled trades. An increased focus to promote these careers as a viable path, including through work-based learning and pre-apprenticeship programs, will allow students to gain hands-on experience and an introduction to the trades.
2. **Increase Industry-Education Collaboration:** Stronger collaboration and partnerships between industry, local training providers, and the state Department of Education could help improve outreach to and exposure for students and ensure that educators have the industry knowledge necessary to inform students about skilled trades opportunities.
3. **Improve Access to Trades Educators:** Address prerequisite education barriers within the state Department of Education that limit hiring trades educators directly from industry.
4. **Promote Careers in the Skilled Trades:** In order to increase the number of students pursuing trade careers, it is advised to enhance the marketing of these professions throughout the state, such as by highlighting their attractive wages and associated benefits. Additionally, integrating modern technologies into training programs and outreach efforts can appeal to younger generations of students.
5. **Address Student Readiness:** Consider developing math readiness courses tailored to preparing students for entrance exams for various skilled trades apprenticeships.
6. **Reduce Personal Barriers to Success:** Exploring solutions or considering options for financial assistance for expenses like books, equipment, application fees, transportation, and childcare would increase accessibility to training programs for candidates who face financial barriers or have family obligations.
7. **Emphasize Upskilling of Existing Workforce in New Technologies:** Upskilling the current skilled trades workforce in new technologies will be key to ensuring their continued employment in the field. Particularly in energy sectors, the state will need to address the growing demand and need for long-term maintenance of increasing renewable installations as it downsizes the workforce in other older technologies. It is recommended that training in photovoltaic systems, battery storage, and electric vehicle and charging station repair be expanded and prioritized.
8. **Increase Industry Cooperation:** To promote growth and sustainability in the sector, it is crucial for organized and non-organized labor to collaborate to expand and create new programs that increase access to training opportunities for more local candidates. A great way to achieve this is through sector partnerships, which offer an ideal platform for partnership and engagement.



## APPENDIX A: TABLES

**Table 15: Statewide Labor Market Data on Skilled Trades Occupations**

Links to additional supporting information from O\*NET, including occupation descriptions and associated job titles, are provided for each occupation.

Occupation	SOC	Statewide Employment (2021)	Average Annual Wage	Projected Employment Statewide (2028)	Growth (2018-28)	Percent Growth (2018-28)	Average Annual Openings	Clean Energy
Aircraft Mechanics and Service Technicians	49-3011	1,020	\$75,070	1,580	50	3.3	130	
Automotive Body and Related Repairers	49-3021	480	\$49,020	670	20	3.1	70	
Automotive Service Technicians and Mechanics	49-3023	2,650	\$52,410	2,950	-50	-1.7	280	X
Biofuels Processing Technicians	51-8099.01							X
Biomass Plant Technicians	51-8013.03							X
Brickmasons and Blockmasons	47-2021	160	\$79,590	220	10	4.8	20	
Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	760	\$59,340	920	50	5.7	90	X
Bus Drivers, Transit and Intercity	53-3052	1,650	\$54,960	2,590	140	5.7	330	X
Cabinetmakers and Bench Carpenters	51-7011	140	\$52,660	250	0	0.0	30	
Carpenters	47-2031	5,670	\$79,200	8,010	210	2.7	840	X
Carpet Installers	47-2041	120	\$54,130	160	-10	-5.9	20	
Cement Masons and Concrete Finishers	47-2051	770	\$76,580	960	70	7.9	100	X
Chemical Equipment Operators and Tenders	51-9011.00							X
Chemical Plant and System Operators	51-8091.00							X
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9124	250	\$50,370					
Construction and Building Inspectors	47-4011	580	\$68,830	920	40	4.5	110	X
Construction Laborers	47-2061	3,950	\$59,210	7,510	430	6.1	850	X





Control & Valve Installers & Repairers, exc. Mechanical Door	49-9012	150	\$84,240	70	0	0.0	10	
Crane and Tower Operators	53-7021	90	\$92,660	130	0	0.0	20	
Drywall and Ceiling Tile Installers	47-2081	830	\$80,590	830	10	1.2	80	
Electrical and Electronics Repairers, Commercial and Industrial Equipment	49-2094	380	\$73,560	130	0	8.3	10	
Electrical & Electronics Repairers, Powerhouse, Substation, Relay	49-2095	90	\$106,930	450	20	4.7	40	
Electrical Power-Line Installers and Repairers	49-9051	470	\$104,480	400	20	2.6	40	X
Electricians	47-2111	3,040	\$79,290	4,290	370	9.2	510	X
Elevator Installers and Repairers	47-4021	380	\$113,360	240	20	9.1	30	
Energy Auditors	47-4011.01							X
Fence Erectors	47-4031	N/A	\$54,090	150	10	7.1	20	
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	2,930	\$89,720	3,470	250	7.8	370	X
First-Line Supervisors of Mechanics, Installers, and Repairers	49-1011	2,730	86130	3,000	100	3.1	280	X
Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042	220	\$74,650	330	50	17.9	40	
Geothermal Technicians	49-9099.01							X
Glaziers	47-2121	270	\$71,390	470	50	9.3	60	
Hazardous Materials Removal Workers	47-4041	390	\$42,630	370	30	5.7	50	X
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021	1,360	\$69,100	1,300	110	9.2	130	X
Heavy and Tractor-Trailer Truck Drivers	53-3032	3,510	\$54,190	4,020	210	5.5	470	X
Home Appliance Repairers	49-9031	100	\$51,920	250	0	-3.8	30	
Hydroelectric Plant Technicians	51-8013.04							X



Industrial Machinery Mechanics	49-9041	550	\$78,780	800	20	2.6	70	X
Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	320	\$57,370	780	-220	-22.0	90	X
Insulation Workers, Mechanical	47-2132	60	\$74,030	110	10	10.0	10	
Machinists	51-4041	250	\$70,760	300	10	3.4	30	X
Maintenance and Repair Workers, General	49-9071	6,440	\$51,710	7,660	330	4.5	760	X
Maintenance Workers, Machinery	49-9043	40	\$59,040	70	10	0.0	10	
Medical Equipment Repairers	49-9062	290	\$57,430	180	0	5.9	20	
Miscellaneous Construction and Related Workers	47-4090			80	0	0.0	10	
Mixing & Blending Machine Setters, Operators, Tenders	51-9023	80	\$54,590	140	0	0.0	20	X
Mobile Heavy Equipment Mechanics, Except Engines	49-3042	550	\$80,650	620	20	3.3	60	
Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	N/A	\$48,900	110	10	10.0	10	
Motorboat Mechanics and Service Technicians	49-3051	50	\$55,970	90	0	0.0	10	
Motorcycle Mechanics	49-3052	40	\$41,130	130	10	8.3	10	
Nuclear Power Reactor Operators	51-8011.00							X
Operating Engineers & Other Construction Equipment Operators	47-2073	1,960	\$78,360	2,180	160	7.9	260	X
Outdoor Power Equipment & Other Small Engine Mechanics	49-3053	290	\$48,780	250	20	8.7	30	
Packaging and Filling Machine Operators and Tenders	51-9111	260	\$36,230	650	40	6.6	80	
Painters, Construction and Maintenance	47-2141	2,010	\$59,070	3,180	120	3.9	330	



Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093	260	\$77,530					
Plant and System Operators, All Other	51-8099	40	\$62,180	90	-10	0.0	10	
Plasterers and Stucco Masons	47-2161	140	\$72,360	210	10	5.0	20	
Plumbers, Pipefitters, and Steamfitters	47-2152	2,330	\$72,830	2,470	230	10.3	280	X
Power Plant Operators	51-8013	550	\$91,680	200	-20	-9.1	20	X
Precision Instrument and Equipment Repairers, All Other	49-9069	150	\$74,950	220	0	0.0	20	
Production Workers, All Other	51-9199	90	\$50,360	180	0	0.0	20	
Radio, Cellular, Tower Equipment Installers and Repairers	49-2021	110	\$70,360	170	20	21.4	20	
Reinforcing Iron and Rebar Workers	47-2171			460	50	9.5	60	
Riggers	49-9096	200	\$65,220	310	20	3.3	30	
Roofers	47-2181	930	\$57,720	1,160	90	7.4	120	X
Security and Fire Alarm Systems Installers	49-2098	250	\$54,790	400	-20	-4.8	50	
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	51-9012	110	\$44,460	120	10	9.1	10	X
Septic Tank Servicers and Sewer Pipe Cleaners	47-4071	70	\$58,460					
Sheet Metal Workers	47-2211	470	\$77,800	920	70	8.2	100	X
Ship Engineers	53-5031	90	\$92,040	40	0	0.0	< 10	
Solar Energy Installation Managers	47-1011.03							X
Solar Photovoltaic Installers	47-2231.00	410	\$57,930	500	210	72.4	70	X
Solar Thermal Installers and Technicians	47-2152.04							X
Structural Metal Fabricators and Fitters	51-2041	30	\$67,380	100	-10	0.0	10	X
Tapers	47-2082	330	\$86,700	390	0	2.6	40	



Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	740	\$64,470	1,160	-10	-1.7	130	
Telecommunications Line Installers and Repairers	49-9052	1,040	\$74,430	330	-10	-5.7	40	
Tile and Stone Setters	47-2044	550	\$77,940	540	70	14.9	60	
Water & Wastewater Treatment Plant & System Operators	51-8031	460	\$58,780	490	-10	0.0	40	
Weatherization Installers and Technicians	47-4099.03							X
Welders, Cutters, Solderers, and Brazers	51-4121	700	\$66,020	680	20	4.6	70	X
Wind Turbine Service Technicians	49-9081.00							X
Woodworkers, All Other	51-7099	40	\$54,200	250	20	4.2	30	
Woodworking Machine Setters, Operators, and Tenders, Except Sawing	51-7042	50	\$40,820	50	0	0.0	10	



Table 16: Honolulu County Labor Market Data on Skilled Trades Occupations

Occupation	SOC Code	Employment (2021)	Mean Annual Wage	Projected Employment (2028)	Change (2018-28)	Percent Change (2018-28)	Annual Average Openings	Clean Energy
Aircraft Mechanics and Service Technicians	49-3011	870	\$74,360	1,240	30	2.4	100	
Automotive Body and Related Repairers	49-3021	290	\$51,430	420	0	0.47	40	
Automotive Service Technicians and Mechanics	49-3023	1,760	\$52,370	2,040	-70	-3.17	200	X
Brickmasons and Blockmasons	47-2021	100	\$78,890	130	10	4.96	10	
Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	560	\$60,150	670	30	5.21	60	X
Bus Drivers, Transit and Intercity	53-3052	1,410	\$56,800	2,220	110	5.17	280	X
Cabinetmakers and Bench Carpenters	51-7011	80	\$51,140	170	-10	-2.94	20	
Carpenters	47-2031	4,050	\$81,730	5,580	70	1.21	580	X
Carpet Installers	47-2041	N/A	N/A	140	0	-2.84	10	
Cement Masons and Concrete Finishers	47-2051	560	\$75,660	730	50	7.52	80	X
Construction and Building Inspectors	47-4011	430	\$70,800	740	30	3.92	90	X
Construction Laborers	47-2061	2,610	\$60,240	5,310	250	4.88	600	X
Control and Valve Installers and Repairers, Except Mechanical Door	49-9012	120	\$84,290	50	0	2.08	<10	
Crane and Tower Operators	53-7021	70	\$89,620	90	0	2.41	10	
Drywall and Ceiling Tile Installers	47-2081	630	\$80,970	650	-10	-0.91	60	
Electrical & Electronics Repairers, Commercial & Industrial Equipment	49-2094	350	\$73,500	370	10	3.62	30	
Electrical & Electronics Repairers, Powerhouse, Substation, & Relay	49-2095	60	\$103,530	100	0	0	10	
Electrical Power-Line Installers and Repairers	49-9051	390	\$104,170	340	20	4.91	30	X
Electricians	47-2111	2,360	\$80,530	3,190	250	8.48	380	X
Elevator and Escalator Installers and Repairers	47-4021	360	\$113,480	240	20	10.7	30	
Fence Erectors	47-4031	N/A	\$53,800					
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	2,170	\$91,190	2,460	160	6.81	260	X
First-Line Supervisors of Mechanics, Installers, and Repairers	49-1011	2,110	\$87,950	2,230	60	2.72	210	X
Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042	170	\$75,560					
Glaziers	47-2121	180	\$70,030	350	30	10.38	40	



Hazardous Materials Removal Workers	47-4041	360	\$43,100	330	20	7.79	40	X
Heating, Air Conditioning, & Refrigeration Mechanics & Installers	49-9021	1,070	\$70,200	1,220	100	9.29	120	X
Heavy and Tractor-Trailer Truck Drivers	53-3032	2,420	\$54,370	2,810	120	4.59	320	X
Home Appliance Repairers	49-9031	90	\$54,360	210	0	-1.43	20	
Industrial Machinery Mechanics	49-9041	440	\$79,800	650	10	1.88	60	X
Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	280	\$57,260	670	-200	-23.39	70	X
Insulation Workers, Mechanical	47-2132	60	\$74,030	110	10	5.77	10	
Machinists	51-4041	230	\$71,070	250	10	4.15	30	X
Maintenance and Repair Workers, General	49-9071	4,130	\$49,800	4,590	180	3.99	450	X
Maintenance Workers, Machinery	49-9043	30	\$60,420	40	0	2.38	<10	
Medical Equipment Repairers	49-9062	250	\$58,540	140	0	0	10	
Mixing and Blending Machine Setters, Operators, and Tenders	51-9023	50	\$54,370	90	0	-1.08	10	X
Mobile Heavy Equipment Mechanics, Except Engines	49-3042	400	\$82,520	440	10	2.82	50	
Motorboat Mechanics and Service Technicians	49-3051	30	\$55,200	70	0	-2.7	10	
Motorcycle Mechanics	49-3052	30	\$42,680	70	10	7.58	10	
Operating Engineers and Other Construction Equipment Operators	47-2073	1,170	\$82,710	1,150	80	7.27	140	X
Outdoor Power Equipment and Other Small Engine Mechanics	49-3053	130	\$46,970	130	10	4.17	10	
Packaging and Filling Machine Operators and Tenders	51-9111	190	\$36,850	480	20	5.27	60	
Painters, Construction and Maintenance	47-2141	1,520	\$59,870	2,430	70	3.1	250	
Plant and System Operators, All Other	51-8099	N/A	N/A	80	-10	-5.81	10	
Plasterers and Stucco Masons	47-2161	110	\$75,260					
Plumbers, Pipefitters, and Steamfitters	47-2152	1,800	\$73,620	1,870	160	9.3	210	X
Power Plant Operators	51-8013	380	\$90,100	130	-20	-11.26	10	X
Precision Instrument and Equipment Repairers, All Other	49-9069	120	\$78,210	200	0	1.02	20	
Production Workers, All Other	51-9199	80	\$48,900	130	-10	-6.02	10	
Radio, Cellular, and Tower Equipment Installers and Repairers	49-2021	80	\$71,780	140	20	18.64	20	



Riggers	49-9096	190	\$65,680	300	20	5.59	30	
Roofers	47-2181	730	\$57,240	940	70	7.76	100	X
Security and Fire Alarm Systems Installers	49-2098	200	\$54,590	350	-20	-5.15	40	
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	51-9012	N/A	\$45,400	70	0	0	10	X
Septic Tank Servicers and Sewer Pipe Cleaners	47-4071	30	\$54,780					
Sheet Metal Workers	47-2211	400	\$79,200	860	70	8.45	100	X
Ship Engineers	53-5031	90	\$90,010	30	0	-2.94	<10	
Solar Photovoltaic Installers	47-2231	270	\$58,720	220	90	74.4	30	X
Structural Metal Fabricators and Fitters	51-2041	N/A	N/A	90	-10	-8	10	X
Tapers	47-2082	270	\$86,880	330	0	0	30	
Telecommunications Equipment Installers & Repairers, Ex. Line Installers	49-2022	550	\$63,480	980	-20	-1.51	110	
Telecommunications Line Installers and Repairers	49-9052	810	\$74,870	160	0	-1.27	20	
Tile and Stone Setters	47-2044	350	\$83,400	330	40	12.37	30	
Water and Wastewater Treatment Plant and System Operators	51-8031	230	\$60,730	200	-10	-5.21	20	
Welders, Cutters, Solderers, and Brazers	51-4121	590	\$66,920	520	20	3.37	60	X
Woodworking Machine Setters, Operators, & Tenders, Ex. Sawing	51-7042	50	\$40,130	30	0	0	<10	



Table 17: Hawai'i County Labor Market Data on Skilled Trades Occupations

Occupation	SOC Code	Employment (2021)	Mean Annual Wage	Projected Employment (2028)	Change (2018-28)	Percent Change (2018-28)	Annual Average Openings	Clean Energy
Aircraft Mechanics and Service Technicians	49-3011	40	\$80,700	100	10	7.29	10	
Automotive Body and Related Repairers	49-3021	80	\$48,200	150	10	8.03	20	
Automotive Service Technicians and Mechanics	49-3023	390	\$50,400	380	10	2.95	40	X
Brickmasons and Blockmasons	47-2021	N/A	N/A	80	10	8.33	10	
Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	70	\$51,610	90	10	10.26	10	X
Bus Drivers, Transit and Intercity	53-3052	N/A	\$40,360					X
Cabinetmakers and Bench Carpenters	51-7011	30	\$48,510	50	0	0	10	
Carpenters	47-2031	540	\$69,420	700	40	6.37	70	X
Cement Masons and Concrete Finishers	47-2051	N/A	\$77,840	80	10	6.85	10	X
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9124	30	\$48,950					
Construction and Building Inspectors	47-4011	70	\$59,190	90	0	4.88	10	X
Construction Laborers	47-2061	580	\$55,600	1,040	70	7.34	120	X
Crane and Tower Operators	53-7021	N/A	N/A	30	0	0	< 10	
Drywall and Ceiling Tile Installers	47-2081	40	\$72,250	70	0	4.84	10	
Electrical & Electronics Repairers, Commercial & Industrial Equipment	49-2094	N/A	N/A	50	0	3.92	10	
Electricians	47-2111	260	\$74,420	450	40	10.49	50	X
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	260	\$83,200	380	20	6.7	40	X
First-Line Supervisors of Mechanics, Installers, and Repairers	49-1011	240	\$78,690	390	20	5.38	40	X
Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042	N/A	N/A	50	10	22.5	10	
Glaziers	47-2121	30	\$71,100	60	10	11.54	10	
Heating, Air Conditioning, & Refrigeration Mechanics & Installers	49-9021	N/A	\$60,000					X
Heavy and Tractor-Trailer Truck Drivers	53-3032	510	\$51,150	490	30	7.44	60	X





Industrial Machinery Mechanics	49-9041	N/A	\$80,620	80	10	10.14	10	X
Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	N/A	N/A	90	-10	-9.57	10	X
Maintenance and Repair Workers, General	49-9071	700	\$53,180	980	60	6.51	100	X
Mobile Heavy Equipment Mechanics, Except Engines	49-3042	60	\$73,500	70	10	7.69	10	
Motorcycle Mechanics	49-3052	N/A	N/A	30	0	13.79	< 10	
Operating Engineers and Other Construction Equipment Operators	47-2073	360	\$71,590	440	20	5.78	50	X
Outdoor Power Equipment and Other Small Engine Mechanics	49-3053	50	\$47,760					
Packaging and Filling Machine Operators and Tenders	51-9111	N/A	N/A	80	10	9.59	10	
Painters, Construction and Maintenance	47-2141	220	\$53,420	370	30	7.62	40	
Plant and System Operators, All Other	51-8099	N/A	\$48,550					
Plasterers and Stucco Masons	47-2161	N/A	\$54,840	30	0	3.33	< 10	
Plumbers, Pipefitters, and Steamfitters	47-2152	180	\$72,100	230	20	11.48	30	X
Power Plant Operators	51-8013	80	\$92,700					X
Roofers	47-2181	100	\$64,640	60	10	8.62	10	X
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	51-9012	N/A	N/A	30	0	6.9	< 10	X
Sheet Metal Workers	47-2211	40	\$66,020	30	0	9.68	< 10	X
Solar Photovoltaic Installers	47-2231	30	\$56,920	50	20	78.57	10	X
Telecommunications Equipment Installers & Repairers, Ex. Line Installers	49-2022	90	\$66,380	120	0	2.61	10	
Telecommunications Line Installers and Repairers	49-9052	N/A	\$71,750	60	0	0	10	
Tile and Stone Setters	47-2044	N/A	\$62,330	100	10	15.48	10	
Water and Wastewater Treatment Plant and System Operators	51-8031	70	\$60,750	80	0	-1.3	10	
Welders, Cutters, Solderers, and Brazers	51-4121	N/A	\$60,200	50	0	0	10	X



Table 18: Maui County Labor Market Data on Skilled Trades Occupations

Occupation	SOC Code	Employment (2021)	Mean Annual Wage	Projected Employment (2028)	Change (2018-28)	Percent Change (2018-28)	Annual Average Openings	Clean Energy
Aircraft Mechanics and Service Technicians	49-3011	80	\$75,990	180	10	4.09	20	
Automotive Body and Related Repairers	49-3021	50	\$49,790	60	0	3.51	10	
Automotive Service Technicians and Mechanics	49-3023	340	\$55,030	360	0	-1.11	40	X
Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	90	\$62,840	130	10	8.13	10	X
Carpenters	47-2031	670	\$76,320	1,110	90	8.73	120	X
Cement Masons and Concrete Finishers	47-2051	80	\$82,820	100	10	16.09	10	X
Construction and Building Inspectors	47-4011	50	\$69,590					X
Construction Laborers	47-2061	500	\$59,360	790	90	13	90	X
Drywall and Ceiling Tile Installers	47-2081	110	\$81,460					
Electrical Power-Line Installers and Repairers	49-9051	40	\$105,130					X
Electricians	47-2111	310	\$75,690	460	60	15.14	60	X
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	350	\$88,250	400	50	14.78	40	X
First-Line Supervisors of Mechanics, Installers, and Repairers	49-1011	250	\$81,350	300	20	5.69	30	X
Heating, Air Conditioning, & Refrigeration Mechanics & Installers	49-9021	130	\$70,320					X
Heavy and Tractor-Trailer Truck Drivers	53-3032	400	\$57,040	390	40	10.29	50	X
Industrial Machinery Mechanics	49-9041	50	\$69,730	60	0	5.17	10	X
Maintenance and Repair Workers, General	49-9071	1,170	\$56,650	1,560	70	4.98	150	X
Mobile Heavy Equipment Mechanics, Except Engines	49-3042	60	\$78,440	40	0	4.76	< 10	
Operating Engineers and Other Construction Equipment Operators	47-2073	260	\$71,820	460	60	13.48	60	X



Outdoor Power Equipment and Other Small Engine Mechanics	49-3053	80	\$51,960	90	10	16	10	
Packaging and Filling Machine Operators and Tenders	51-9111	N/A	N/A	70	10	9.52	10	
Painters, Construction and Maintenance	47-2141	160	\$59,430	280	20	7.25	30	
Plumbers, Pipefitters, and Steamfitters	47-2152	260	\$68,760	300	40	16.34	40	X
Power Plant Operators	51-8013	50	\$101,000					X
Roofers	47-2181	70	\$52,440	120	10	10.58	10	X
Solar Photovoltaic Installers	47-2231	N/A	N/A	100	40	81.13	10	X
Telecommunications Line Installers and Repairers	49-9052	90	\$72,740					
Tile and Stone Setters	47-2044	90	\$73,330	90	20	24	10	
Water and Wastewater Treatment Plant and System Operators	51-8031	100	\$55,620	80	0	-3.45	10	
Welders, Cutters, Solderers, and Brazers	51-4121	30	\$64,430	80	0	2.74	10	X



**Table 19: Kaua'i County Labor Market Data on Skilled Trades Occupations**

Occupation	SOC Code	Employment (2021)	Mean Annual Wage	Projected Employment (2028)	Change (2018-28)	Percent Change (2018-28)	Annual Average Openings	Clean Energy
Aircraft Mechanics and Service Technicians	49-3011	30	\$83,970	60	0	6.78	10	
Automotive Body and Related Repairers	49-3021	70	\$39,450	40	0	5.88	< 10	
Automotive Service Technicians and Mechanics	49-3023	150	\$52,080	160	10	4.46	20	X
Brickmasons and Blockmasons	47-2021	40	\$87,230					
Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	40	\$53,150					X
Carpenters	47-2031	410	\$71,720	620	10	2.31	60	X
Cement Masons and Concrete Finishers	47-2051	N/A	N/A	60	0	3.7	10	X
Construction and Building Inspectors	47-4011	30	\$60,720	40	0	10	10	X
Construction Laborers	47-2061	260	\$56,620	370	20	5.97	40	X
Drywall and Ceiling Tile Installers	47-2081	50	\$80,890					
Electrical Power-Line Installers and Repairers	49-9051	N/A	N/A	30	0	0	< 10	X
Electricians	47-2111	110	\$74,200	190	10	7.3	20	X
Fence Erectors	47-4031	N/A	N/A	50	0	6.67	10	
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	150	\$83,190	230	10	6.02	20	X
First-Line Supervisors of Mechanics, Installers, and Repairers	49-1011	120	\$79,500	90	0	2.35	10	X
Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042	N/A	N/A	70	10	11.67	10	
Glaziers	47-2121	N/A	N/A	30	0	0	< 10	
Heavy and Tractor-Trailer Truck Drivers	53-3032	170	\$53,960	330	20	5.05	40	X
Machinists	51-4041	N/A	N/A	30	0	0	< 10	X
Maintenance and Repair Workers, General	49-9071	440	\$54,300	530	20	4.14	50	X
Mobile Heavy Equipment Mechanics, Except Engines	49-3042	30	\$75,290	70	0	4.84	10	
Operating Engineers and Other Construction Equipment Operators	47-2073	180	\$72,870	120	0	3.36	10	X



Outdoor Power Equipment and Other Small Engine Mechanics	49-3053	30	\$50,090					
Painters, Construction and Maintenance	47-2141	120	\$58,780	100	0	4.12	10	
Plumbers, Pipefitters, and Steamfitters	47-2152	100	\$70,540	70	0	6.45	10	X
Power Plant Operators	51-8013	40	\$92,670	40	0	5	< 10	X
Roofers	47-2181	30	\$58,320	40	0	2.63	< 10	X
Solar Photovoltaic Installers	47-2231	N/A	N/A	140	50	56.98	20	X
Water and Wastewater Treatment Plant and System Operators	51-8031	60	\$54,620	130	10	5.04	10	
Welders, Cutters, Solderers, and Brazers	51-4121	N/A	N/A	30	0	14.29	< 10	X



Table 20: Statewide Training and Education Data

Occupation	SOC Code	Hawaii Licensing Requirement	Local Registered Apprenticeship	Other Local Education and Training	Clean Energy
Aircraft Mechanics and Service Technicians	49-3011			Honolulu Community College	
Automotive Body and Related Repairers	49-3021			Honolulu Community College, Leeward Community College, Hawai'i Community College, UH Maui College, Kaua'i Community College	
Automotive Service Technicians and Mechanics	49-3023	Mechanic's License		Honolulu Community College, Leeward Community College, Hawai'i Community College, UH Maui College, Kaua'i Community College	X
Biofuels Processing Technicians	51-8099.01				X
Biomass Plant Technicians	51-8013.03				X
Brickmasons and Blockmasons	47-2021		Hawaii Masons & Plasterers Training (8,000 hours)	Honolulu Community College, Hawai'i Community College, Kaua'i Community College, UH Maui College	
Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	Mechanic's License	Maui Electric Company Joint Apprenticeship Committee (6,000 hours)	Honolulu Community College, Hawai'i Community College	X
Bus Drivers, Transit and Intercity	53-3052	Commercial Driver's License	Robert's Hawaii (2,000 hours)	TheBus Operator Training, Leeward Community College CDL	X
Cabinetmakers and Bench Carpenters	51-7011		Hawaii Carpenters Apprenticeship and Training Program or Associated Builders and Contractors Apprenticeship Committee (8,000 hours)	Honolulu Community College, Hawai'i Community College, Kaua'i Community College, UH Maui College, Council for Native Hawaiian Advancement	
Carpenters	47-2031		Hawaii Carpenters Apprenticeship and Training Program or Associated Builders and Contractors Apprenticeship Committee (8,000 hours)	Honolulu Community College, Hawai'i Community College, Kaua'i Community College, UH Maui College, Council for Native Hawaiian Advancement	X
Carpet Installers	47-2041				
Cement Masons and Concrete Finishers	47-2051		Hawaii Masons & Plasterers Training (8,000 hours)	Honolulu Community College	X



Chemical Equipment Operators and Tenders	51-9011.00				X
Chemical Plant and System Operators	51-8091.00				X
Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9124				
Construction and Building Inspectors	47-4011		Honolulu Community College (2,000 hours)	Honolulu Community College	X
Construction Laborers	47-2061		Hawaii Laborers' Joint Apprenticeship Committee (4,000 hours)	Council for Native Hawaiian Advancement Construction Craftsmen training, Honolulu Community College, Kaua'i Community College, UH Maui College	X
Control & Valve Installers & Repairers, exc. Mechanical Door	49-9012				
Crane and Tower Operators	53-7021	Hawaii Hoisting Machine Operators Board Certification		Training Resources provided by Hoisting Machine Operators Board	
Drywall and Ceiling Tile Installers	47-2081		Hawaii Carpenters Apprenticeship & Training Program (8,000 hours)	Honolulu Community College	
Electrical & Electronics Repairers, Powerhouse, Substation, Relay	49-2095		Hawaiian Electric Company, Inc. Joint Apprenticeship Committee (6,000 hours)	Electronics Mechanic - Pearl Harbor Naval Shipyard Apprentice Program.	
Electrical and Electronics Repairers, Commercial and Industrial Equipment	49-2094		Hawaiian Electric Company, Inc. Joint Apprenticeship Committee (6,000 hours)	Electronics Mechanic - Pearl Harbor Naval Shipyard Apprentice Program.	
Electrical Power-Line Installers and Repairers	49-9051		IBEW Local 1260 or Hawaii Electricians Joint Apprenticeship Committee (7,000 hours)	Honolulu Community College	X
Electricians	47-2111	Licensed Journeyman Electrician	Hawaii Electricians Joint Apprenticeship Committee or Associated Builders and Contractors Hawaii Apprenticeship Committee (10,000 hours)	Honolulu Community College, Hawai'i Community College + W. M. Keck Observatory, Leeward Community College, Kaua'i Community College, UH Maui College	X



Elevator Installers and Repairers	47-4021		IUEC Local 126 Joint Apprenticeship Committee (6,800 hours)	Honolulu Community College	
Energy Auditors	47-4011.01				X
Fence Erectors	47-4031				
First-Line Supervisors of Construction Trades and Extraction Workers	47-1011	General Contractor's License			X
First-Line Supervisors of Mechanics, Installers, and Repairers	49-1011	General Contractor's License			X
Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042		Joint Apprenticeship and Training Committee for Floor Layers (8,000 hours)	Honolulu Community College	
Geothermal Technicians	49-9099.01				X
Glaziers	47-2121		Joint Apprenticeship Committee for Glaziers, Architectural Metal and Glassworkers (10,000 hours)	Honolulu Community College	
Hazardous Materials Removal Workers	47-4041		Union Local 368 (4,000 hours)		X
Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021		Honolulu Joint Apprenticeship and Training Committee for the Plumbing and Pipefitting Industry (10,000 hours)	Honolulu Community College, Kaua'i Community College, UH Maui College, Air Conditioning and Refrigeration - Pearl Harbor Naval Shipyard Apprentice Program.	X
Heavy and Tractor-Trailer Truck Drivers	53-3032	Commercial Driver's License (CDL)	Hawaii Joint Apprenticeship Committee for Operating Engineers (2,000 hours)	Leeward Community College	X
Home Appliance Repairers	49-9031				
Hydroelectric Plant Technicians	51-8013.04				X
Industrial Machinery Mechanics	49-9041			Industrial Equipment Mechanic - Pearl Harbor Naval Shipyard Apprentice Program.	X
Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061				X
Insulation Workers, Mechanical	47-2132				





Machinists	51-4041		Hawaiian Electric Company, Inc. Joint Apprenticeship Committee - Machinist Mechanic (6,000 hours)	Machinist - Pearl Harbor Naval Shipyard Apprentice Program; Hawai'i Community College	X
Maintenance and Repair Workers, General	49-9071		Hawaii Hotel and Restaurant Industry & Training Fund (8,000 hours)	Hawai'i Community College, Honolulu Community College, Kaua'i Community College, UH Maui College	X
Maintenance Workers, Machinery	49-9043				
Medical Equipment Repairers	49-9062				
Miscellaneous Construction and Related Workers	47-4090				
Mixing & Blending Machine Setters, Operators, Tenders	51-9023				X
Mobile Heavy Equipment Mechanics, Except Engines	49-3042			Pearl Harbor Naval Shipyard Apprentice Program	
Molders, Shapers, and Casters, Except Metal and Plastic	51-9195				
Motorboat Mechanics and Service Technicians	49-3051			Marine Machinery Mechanic - Pearl Harbor Naval Shipyard Apprentice Program.	
Motorcycle Mechanics	49-3052	Motorcycle Mechanic License			
Nuclear Power Reactor Operators	51-8011.00				X
Operating Engineers & Other Construction Equipment Operators	47-2073		Hawaii Joint Apprenticeship Committee for Operating Engineers (4,000 hours)	Honolulu Community College	X
Outdoor Power Equipment & Other Small Engine Mechanics	49-3053				
Packaging and Filling Machine Operators and Tenders	51-9111				
Painters, Construction and Maintenance	47-2141		Joint Apprenticeship and Training Committee for Painters (8,000 hours)		



Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093				
Plant and System Operators, All Other	51-8099				
Plasterers and Stucco Masons	47-2161		Hawaii Masons & Plasterers Training (8,000 hours)	Honolulu Community College	
Plumbers, Pipefitters, and Steamfitters	47-2152	Journey Worker Plumber	Joint Apprenticeship Committee for the Plumbing and Pipefitting Industry or Associated Builders and Contractors Hawaii (10,000 hours)	Honolulu Community College, Hawai'i Community College, Kaua'i Community College, UH Maui College	X
Power Plant Operators	51-8013		City and County of Honolulu Joint Apprenticeship Committee - Plant Electrical/Electronic Equipment Repairer (10,000 hours)		X
Precision Instrument and Equipment Repairers, All Other	49-9069				
Production Workers, All Other	51-9199				
Radio, Cellular, Tower Equipment Installers and Repairers	49-2021		Joint Apprenticeship Committee for Telecommunications (6,000 hours)	Honolulu Community College	
Reinforcing Iron and Rebar Workers	47-2171		Joint Apprenticeship Committee for Ironworker - Reinforcing (6,000 hours)	Honolulu Community College	
Riggers	49-9096			Pearl Harbor Naval Shipyard Apprentice Program.	
Roofers	47-2181		Joint Apprenticeship and Training Committee for Roofers (8,000 hours) or Associated Builders and Contractors Apprenticeship Committee (7,000 hours)	Honolulu Community College, Hawai'i Community College, Kaua'i Community College, UH Maui College	X



Security and Fire Alarm Systems Installers	49-2098		Fire Sprinkler Fitter - Honolulu Joint Apprenticeship and Training Committee for the Plumbing and Pipefitting Industry (10,000 hours)		
Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	51-9012				X
Septic Tank Servicers and Sewer Pipe Cleaners	47-4071				
Sheet Metal Workers	47-2211		Hawaii Joint Apprenticeship Committee for the Sheet Metal Industry (10,000 hours)	Honolulu Community College, Hawai'i Community College, Kaua'i Community College, UH Maui College	X
Ship Engineers	53-5031			Marine Machinery Mechanic - Pearl Harbor Naval Shipyard Apprentice Program.	
Solar Energy Installation Managers	47-1011.03				X
Solar Photovoltaic Installers	47-2231.00			Makaha Learning Center Solar 101 course, Council for Native Hawaiian Advancement Solar Energy program	X
Solar Thermal Installers and Technicians	47-2152.04				X
Structural Metal Fabricators and Fitters	51-2041		Hawaii Shopmen's Local 803 Joint Apprenticeship and Training Committee (8,000 hours)	Honolulu Community College	X
Tapers	47-2082		Joint Apprenticeship Committee for Ttapers (8,000 hours)	Honolulu Community College	
Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022		Joint Apprenticeship Committee for Telecommunications (6,000 hours)	Honolulu Community College	
Telecommunications Line Installers and Repairers	49-9052		Joint Apprenticeship Committee for Telecommunications (7,000 hours)	Honolulu Community College	
Tile and Marble Setters	47-2044		Hawaii Masons & Plasterers Training - (8,000 hours)	Honolulu Community College	



Water & Wastewater Treatment Plant & System Operators	51-8031	Wastewater Treatment Plant Personnel Certification		Honolulu Community College	
Weatherization Installers and Technicians	47-4099.03				X
Welders, Cutters, Solderers, and Brazers	51-4121		Hawaii Joint Apprenticeship Committee for Operating Engineers (8,000 hours)	Welder - Pearl Harbor Naval Shipyard Apprentice Program; Hawai'i Community College	X
Wind Turbine Service Technicians	49-9081.00				X
Woodworkers, All Other	51-7099				
Woodworking Machine Setters, Operators, and Tenders, Except Sawing	51-7042				



## APPENDIX B: METHODOLOGY

### Defining Skilled Trades

SMS worked with the project team to define “skilled trades” for the purposes of this analysis. The following definition of skilled trades from Jobs for the Future<sup>16</sup> was used as a baseline: “Professions that emphasize the expert use of tools and materials to build or repair products and structures, and which lead to good jobs with strong potential for advancement and high wages.” SMS also reviewed skilled trades workforce analyses conducted in other parts of the United States to identify occupations that are commonly considered skilled trades. It was decided that service-sector trades, such as in the medical and culinary industries, would not be considered skilled trades within the scope of this analysis.

### Wage Threshold

SMS gathered labor market data on 87 occupations that met the chosen definition and criteria for skilled trades. An hourly wage threshold of \$15.53 (equivalent to an annual wage of \$31,056) was then applied to ensure that all occupations included in the analysis paid the minimum wage for an individual to survive in Hawai‘i. This wage threshold was based on the [ALICE report](#), published by Aloha United Way in 2020. Two occupations on the initial list did not meet the individual living wage threshold:

1. Highway Maintenance Workers (\$14.15/hr)
2. Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders (\$14.49/hr).

After the wage threshold was applied, the final list of skilled trades occupations included in the analysis was 85.

### Stakeholder Engagement Plan

The stakeholder engagement plan was designed to gather industry insights to validate and contextualize the labor market data, and to subsequently inform recommendations. The engagement plan consisted of 2 stakeholder meetings and 10 one-on-one interviews. SMS facilitated a general stakeholder meeting on skilled trades occupations in Hawai‘i and a separate meeting targeting skilled trades in the Clean Energy sector. Stakeholders in attendance primarily included local employers, government officials, and representatives from industry associations.

After the stakeholder meetings, SMS conducted anonymous one-on-one interviews with representatives from local industry associations in the skilled trades, both union and non-union, from a variety of occupational areas. The stakeholder meetings were intended to produce general feedback on the current and future demands on Hawai‘i’s skilled trades workforce, while the one-on-one interviews asked more targeted questions about apprenticeship and training programs offered by the associations.

The stakeholder meeting and interview guides can be found in Appendix C: Outreach Guides.

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<sup>16</sup> Breaking Ground: A First Look at American High School Skilled Trades Education, Jobs for the Future, 2020



## APPENDIX C: OUTREACH GUIDES

### Stakeholder Meeting Guide

1. Describe the current state of Hawai'i's skilled trades / Clean Energy workforce.
  - a. What are the strengths?
  - b. What are the gaps?
2. Describe the future demands on the skilled trades / Clean Energy workforce.
  - a. What are the growth and opportunities?
  - b. Barriers and challenges?
3. What are the most prominent opportunities and career pathways?
  - a. What are the in-demand entry-level jobs?
  - b. What about career advancement opportunities and barriers to career advancement?
4. What strategies do you use to recruit new candidates?
  - a. What are the challenges to recruiting new candidates?
5. What are the minimum qualifications for entry-level employment?
  - a. What are the education requirements?
  - b. What priority skills and experience are needed?

### Interview Guide

#### General:

- How would you characterize the skilled trades workforce in Hawaii in the past few years (supply, demand, talent sourcing, etc.)?
- What strategies would you recommend to strengthen or grow Hawaii's skilled trades workforce?
- Do you have any thoughts specific to the demand for skilled trades workers within the clean energy sector? What portion of tradesmen in your purview work within clean energy?

#### Apprenticeships:

- What apprenticeship programs do you offer?
- How many apprentices do you typically have? Annual output? What programs are more popular?
- Demographics of apprentices (e.g., age, gender)?
- Changes in interest or success in recent years?
- How do you recruit (e.g. high schools, community colleges, others)?
  - Prerequisites
  - Barriers
  - What are the costs (program/material) to participate in the apprenticeship program?

#### Employment:

- Generally, how successful are your apprentices in finding employment after completing the program?
- Where do your apprentices most often find employment (e.g., private vs. public sector, major employers)?
- What are the difficulties/barriers to finding employment (if any)?



- What support do you offer to address these difficulties?
- What additional support is needed?

Career Advancement:

- What are the additional licensing requirements (if any) for trades covered by your association?
- Is getting a contractor's license recommended/beneficial in terms of employment and earning potential? Why or why not?
- Other than apprenticing and basic licensing, are there any certifications or credentials that employers require or prefer candidates to have? If so, what are they?
- Any additional career advancement opportunities?

Anything else you would like to share?



## APPENDIX D: PRIMARY DATA SOURCES

**DBEDT Research & Economic Analysis Division:** Occupational Employment and Wage Statistics (OEWS) provided by the Research & Economic Analysis Division of the Department of Business, Economic Development & Tourism (DBEDT) were used to identify the volume of workers employed in 2021 and average annual wages for each occupation statewide and by county. For more information, see [dbedt.hawaii.gov/economic](https://dbedt.hawaii.gov/economic).

**HireNet Hawai'i:** HireNet Hawai'i was the main source of labor market data for this analysis. It has the most current occupation-related data and long-term occupational projections available in Hawai'i, including both statewide and county data. For more information, see [www.hirenethawaii.com](https://www.hirenethawaii.com).

**Occupational Information Network (O\*NET):** The O\*NET Program, developed by the U.S. Department of Labor/Employment and Training Administration, provided state wage data and supplemental national data, including growth estimates, industry credentials, and skills associated with occupations. For more information, see [www.onetonline.org](https://www.onetonline.org).