OREGON AND WASHINGTON SOLAR WORKFORCE DIVERSITY REPORT

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The SOLAR FOUNDATION™

Contents

Acknowledgments

The *Oregon and Washington Solar Workforce Diversity Report* is the first of its kind. It seeks to evaluate the workforce pipeline in Oregon and Washington and the practices surrounding diversity and inclusion, hiring, and training.

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Executive Summary

The purpose of the *Oregon and Washington Solar Workforce Diversity Report* is to evaluate the workforce pipeline for the solar industry in Oregon and Washington, and specifically the practices surrounding diversity and inclusion, hiring, and training. In 2019, The Solar Foundation and the Solar Energy Industries Association (SEIA) published the latest national data on solar industry diversity and inclusion in the *U.S. Solar Industry Diversity Study 2019*.[1] The *Oregon and Washington Solar Workforce Diversity Report* builds upon this research and The Solar Foundation's *National Solar Jobs Census* to analyze the workforce pipeline in Oregon and Washington and identify best practices for establishing a highly skilled and diverse employee base. The following report outlines results from a combination of primary and secondary research stemming from qualitative interviews with solar companies, nonprofits, industry leaders, and training providers across both Oregon and Washington.[*]

In 2018, The Solar Foundation's annual *National Solar Jobs Census* found that just over 80 percent of solar employers in both Oregon and Washington found it either very difficult or somewhat difficult to find qualified applicants.[2] The most common reason for difficulty hiring was a lack of experience, training, or technical knowledge, followed by competition and/or a small applicant pool. This suggests that much more work could be done to ensure a talented candidate pool is available for this rapidly growing industry.

In order to build a skilled, innovative, and well-trained employee base, a commitment to diversity and inclusion is vital. The *Oregon and Washington Solar Workforce Diversity Report* dives further into the workforce pipeline in Oregon and Washington, with a focus on the policies and practices that support a diverse workforce. This study only addresses perspectives within the solar industry. Future work should go further to understand perspectives outside of the solar industry, such as community-based organizations, specifically with regard to barriers to access for marginalized communities. The following is a list of key findings from this study:

[*] Due to a low sample size, results from the interviews are not statistically significant. Therefore, results presented in this research should be viewed as qualitative data. However, these interviews with key solar industry stakeholders provide important insight into the state of the workforce in Oregon and Washington.

- Sixty-nine percent of companies we interviewed indicate they do not formally track employee gender, sexual orientation, ethnic, and racial diversity.

- Companies acknowledge the importance of workforce diversity, and are seeking to expand their workforce diversity and inclusion efforts, but many do not know where to start or do not have the resources to take steps to ensure a more diverse and inclusive workforce.

- Fifty-nine percent of companies rely on word-of-mouth as a recruiting technique, which reinforces the existing workforce demographics and often excludes underrepresented populations.

- A competitive hiring market leads to a general lack of applicants for open solar installation positions. The majority of the solar companies interviewed find it somewhat or very difficult to find qualified applicants for open positions. Of the companies that have difficulty, 66 percent feel the most difficult positions to fill are installers.

- Most of the companies interviewed struggle to find licensed electricians and Limited Renewable Energy Technicians (LRTs). Solar contractors should actively participate in the training of LRT and electrical apprentices to ensure a robust pipeline of licensed workers is available.

- Entry-level installation positions in the Oregon and Washington solar industry have low barriers to entry and opportunities for rapid advancement. New hires have the potential to be promoted to a mid-level unlicensed installer within one year or less, resulting in a 17 percent pay raise. For an entry-level licensed installer (i.e., LRT or electrician), new hires also have the potential to be promoted to a mid-level installer within one year or less, resulting in a 28 percent pay raise.

Finally, this report includes a list of barriers to diversity and inclusion uncovered through this research (page 26) and actionable items for solar companies to address these barriers and build a well-qualified and diverse workforce. The appendices to this report provide data comparing Oregon and Washington workforce diversity data to other industries in each state, as well as additional resources surrounding diversity and inclusion.

Introduction

According to The Solar Foundation's *National Solar Jobs Census 2018*, there are over 7,500 solar workers employed in Oregon and Washington (3,654 in Oregon and 4,045 in Washington). After a jobs loss in 2017, Washington added 18 percent to its solar workforce in 2018, while Oregon lost 8 percent of its solar workforce from 2017 to 2018. The majority of each workforce is composed of installers and project developers: 55 percent of Oregon's workforce and 71 percent of Washington's workforce.

The *Solar Jobs Census* data also finds that the workforce in both states is not as diverse as the overall state population. Women make up only 27 percent and 19 percent of the solar workforce in Washington and Oregon, respectively. People of color make up 19 percent of the solar workforce in both Washington and Oregon. For comparison, women make up 50 percent of the population in both states. People of color make up 31 percent of the population of Washington and 24 percent of the population of Oregon.[3] This suggests that there is both

ample opportunity and need for Oregon and Washington to improve diversity in recruitment and hiring, in order to ensure equitable access and supply of solar jobs to meet the needs of a modern grid.

As the industry works toward this goal, it is also important to understand the workforce development practices in Oregon and Washington, including licensing and training practices of installers; hiring difficulties; and advancement opportunities. Understanding these nuances can lead to a greater understanding of the workforce pipeline, and how this pipeline can be expanded to include more diverse candidates.

The following report outlines results from a combination of secondary research and primary research stemming from qualitative interviews with solar companies, nonprofits, industry leaders, and training providers across both Oregon and Washington. The goal of this research is to inform stakeholders and leaders across the industry about the current state of workforce development and diversity. Further, the research aims to aid companies in forming strategies to strengthen the workforce and promote diversity and inclusion in the solar industry.

Background: Solar Energy Growth in the Northwest

Clean energy policy in Oregon and Washington has driven the growth of the solar industry in both states. In 2016, Oregon updated its Renewable Portfolio Standard (RPS) to require that 50 percent of electricity purchased by investor-owned utilities serving Oregon come from renewable resources by 2040. Washington's RPS requires 15 percent of electricity from renewables by 2020.[4] Further, Governor Jay Inslee signed a 100% clean energy mandate in May 2019, requiring 100% of the state's electricity to come from carbon-free sources by 2050.[5]

Other policies that have driven the growth of the solar industry in Oregon include the Residential Energy Tax Credit (RETC) and Renewable Energy Development (RED) grants administered by the Oregon Department of Energy (ODOE), as well as programs administered by Energy Trust of Oregon. The RETC program, which provided customers with up to $6,000 for their system over four years, sunset in 2017, resulting in a 50 percent decrease in the number of residential solar applications in 2018, according to data from Energy Trust. The RED

grant – which sunset in 2017 as well – supported organizations investing in renewable energy systems for non-residential projects. This was a competitive grant that offered 35 percent of eligible project costs up to $250,000 per project.

Energy Trust provides comprehensive energy efficiency and renewable energy programs to the 1.6 million customers of Portland General Electric, Pacific Power, NW Natural, Cascade Natural Gas, and Avista in Oregon and southwest Washington. Energy Trust provides information, education, consumer protection, technical assistance, and cash incentives to decrease the upfront cost of solar projects for homes and businesses. Since 2002, Energy Trust has supported more than 14,500 solar projects that have been installed by a network of 153 solar trade ally installation contractors. The funding for renewable energy incentives that Energy Trust of Oregon administers was enabled in 1999 by legislation under SB 1149, which is set to expire in 2025.[6]

Washington has an Energy Efficiency and Solar Grant Program. This grant program funds projects at state public universities, local government facilities, state agencies, and K-12 public schools. The maximum amount awarded per project is $350,000, with $1.7 million in funds available. Another grant program is offered by Washington State Department of Commerce. The Solar Deployment Grant Program, part of the Clean Energy Fund, helps fund the development of solar systems of at least 500 kW. With over $3 million in funds available, this program just began accepting applications. At least 25 percent of these funds must provide direct benefits to low-income residents or communities.[7]

In addition to statewide policies, emerging technologies are driving growth in the solar industry in both states. For example, solar + storage — or solar paired with advanced battery storage — is continuing to decrease in cost and offers customers resilience during an extended electrical outage, while providing additional benefits to both the customer and the utility grid. It also complements utilities' grid modernization efforts and can be delivered by the existing solar workforce. Solar contractors in Oregon and Washington have begun installing solar + storage technologies, further expanding the industry and presenting the opportunity to grow the solar workforce to meet the needs of a modern grid.

Importance of Workforce Diversity and Inclusion

As the solar industry expands, there is a need for an inclusive clean energy economy and a diverse workforce to ensure those most affected by climate change can participate in the economic life of their community as employers, employees, and consumers.[8] **Diversity** covers multiple factors such as gender identity, age, socio-economic status, educational background, sexual orientation, race, and ethnicity. A diverse workplace will include many different backgrounds, recognizing that an organization is stronger when its employees bring unique lived experiences to solve problems.[9] In addition to diversity in hiring, an inclusive workforce is another important priority. One McKinsey & Company report states that "inclusion is a requirement if diversity is to have a real impact."[10] **Inclusion** refers to a culture where people with diverse needs and perspectives are free to "be themselves" at work. As defined by George Washington University, inclusion is "the active, intentional, and ongoing engagement with diversity — in people and in communities."[11]

Across U.S. industries, women currently make up 47 percent of the nation's workforce, while people of color (black or African American, Asian, and Hispanic) make up 36 percent of the workforce.[12] These proportions greatly decline, however, when looking at diversity in executive leadership positions. Women make up only 29 percent of executive or senior level positions, and people of color make up only 18 percent. The *U.S. Solar Industry Diversity Study* found that nationwide, men make up 80 percent of senior executive roles in the solar industry and white employees make up 88 percent of senior executives.[13]

Studies have shown that a diverse workforce makes companies more innovative, successful, and profitable. In 2018, Mckinsey & Company published a report, *Delivering through Diversity,* to analyze the relationship between profitability and diversity in the workplace. The analysis pulled data from over 1,000 companies across 12 countries and concluded that there is a positive correlation between diversity and profitability. Researchers found that companies in the top quartile for female representation in executive leadership teams were 21 percent more likely to outperform in profitability measures, compared to their peers in the lowest quartile of gender diversity. Similarly, they found that those companies with greatest ethnic and cultural diversity were 33 percent more likely to experience higher than average profitability than their peers in the lowest quartile of ethnic and racial diversity. The research also pointed to the importance of inclusion, noting there is likely a positive correlation between inclusiveness and financial performance.[14]

Additionally, addressing diversity and inclusion is vital as companies, policymakers, and communities take steps to meet the challenge of climate change, which has been shown to impact marginalized populations disproportionately. These populations are more likely to live in urban centers with less relief from heat and dirtier air, and they are less likely to have access to necessary resources in the face of an extreme weather event.[15] Additionally, people who live, work, and play in the most polluted areas of the country, near landfills and power plants, are commonly people of color.[16] Environmental justice is defined by the EPA as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies."[17] One of the components of environmental justice is to ensure marginalized communities play an active role in the economy through workforce participation. By prioritizing workforce diversity and inclusion through hiring workers who are black, indigenous, other people of color, or low-income workers, the solar industry can ensure everyone is actively involved in building a stronger, more sustainable green economy.

Nationwide, the solar industry acknowledges the benefits of workforce diversity and inclusion in order to become stronger and more competitive. Because the solar industry is relatively young compared to other energy industries, such as electric utilities and oil and gas extraction, this presents the opportunity to set baseline practices and goals as the solar workforce continues to grow. In May 2019, The Solar Foundation and the Solar Energy Industries Association (SEIA) released the *U.S. Solar Industry Diversity Study 2019* and an accompanying best practices guide to help the industry chart a path forward. Please see Appendix C (page 34) for a list of resources.

The *Oregon and Washington Solar Workforce Diversity Report* builds upon these national reports to identify diversity-focused best practices specific to Oregon and Washington. Following the presentation of results from qualitative interviews, this report presents action items for solar companies and other industry leaders to adopt in order to increase workforce diversity, thereby strengthening the solar workforce pipeline and ensuring firms remain competitive in the market.

Methodology

The *Oregon and Washington Solar Workforce Diversity Report* results include primary data stemming from qualitative interviews with solar companies in Oregon and Washington, as well as nonprofits that work in the

energy and solar space, training providers, and industry leaders. In addition to this primary data source, the report also cites secondary data sources, including;

- U.S. Census Quarterly Workforce Indicators (QWI)[18]
- The Solar Foundation's *National Solar Jobs Census 2018*[19]
- U.S. Census Bureau QuickFacts[20]

Interviews were administered over the phone, resulting in 50 interviews overall. The Solar Foundation aligned its methodology on race and ethnicity with the Bureau of Labor Statistics (BLS). Unlike the BLS, in addition to asking employers to identify their employees as male or female, they were asked whether any of their employees identify as gender non-binary. However, none of the employers in this survey reported gender non-binary employees. The research team asked employers two separate ethnicity and race-related questions. Respondents were asked whether they had employees who identify as Hispanic or Latino, and whether they had employees who identify as American Indian or Alaskan Native, Asian, black or African American, Native Hawaiian or other Pacific Islander, white, and more than one of the above.

The following is a list of definitions of terms used in this report:

- **Latinx:** This is a gender-neutral term for those that identify with the Latin American culture or race.
- **Gender Non-Binary:** This refers to a type of gender identity where individuals identify themselves as neither male nor female.
- **Cis-gender:** This is a term for those whose gender identity aligns with the sex that they were assigned at birth.

Solar employees in all the interviews are defined as employees that spend at least 50 percent of their time supporting the solar portion of their business.

Respondents for the employer interviews were recruited by Energy Trust of Oregon, Oregon Solar Energy Industries Association (OSEIA), and Solar Installers of Washington. Emails were sent to solar companies in both states urging them to participate in the research effort, resulting in 30 total interviews with solar companies. Of these companies, four are nonprofit organizations, three are consulting services, 19 are residential and commercial-scale installation companies, two are distribution companies, one is a manufacturing company, and one identified as a consulting firm that does not do the majority of its work in the solar industry. The following is a breakdown of the number of employees at each company:

# Employees	# Companies
<10	13
10-19	8
20-29	5
≥30	3

It is important to note that as with any survey or interview, there is an inherent risk of respondent bias in self-reported views and opinions. Additionally, because this survey was administered to employers and not employees themselves, their perception of employees' gender, ethnicity, and race may be different than how employees self-identify.

Due to the small sample size and the fact that gender, race, and ethnicity were determined by employers, the results of this survey must be viewed qualitatively.*

In addition to the employer survey, the research team conducted 12 interviews with individuals identified as leaders in the solar industry in Oregon and Washington who are familiar with the workforce pipeline. Qualitative results from these interviews, referenced throughout the report, present additional primary data to support the findings and conclusions of the employer interviews.

Finally, to round out the primary results from interviews and to better understand the solar workforce pipeline in Oregon and Washington, The Solar Foundation interviewed eight individuals involved in the training of both limited renewable energy technicians and electricians.

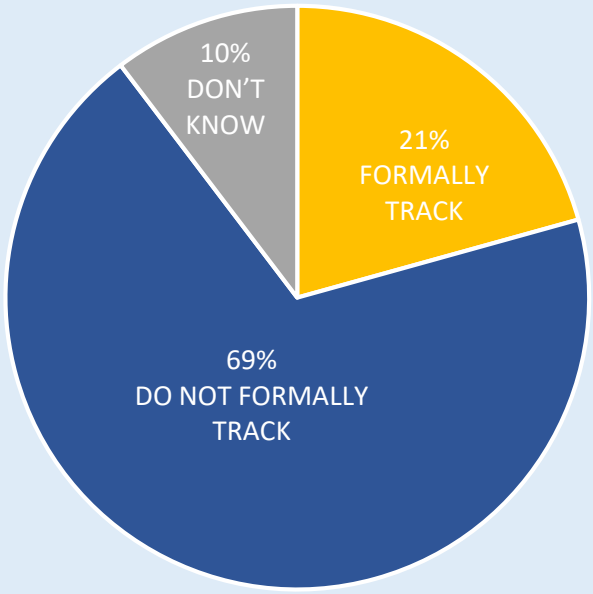
While this research obtained primary data from those within the solar industry, future research should focus on obtaining additional primary data from those that are outside of the industry, including community-based organizations that focus on representing marginalized communities and the potential barriers to access perceived by those groups.

Workforce Demographics and Diversity in the Northwest

Tracking Diversity Metrics

Sixty-nine percent of companies who participated in the Oregon and Washington solar workforce interviews do not formally track employee gender, sexual orientation, and ethnic and racial diversity. Tracking metrics is an important best practice for companies as they work toward a more diverse and inclusive workplace.

FIGURE 1: FIRMS THAT FORMALLY TRACK DIVERSITY



Nationally, the majority of solar companies also do not track employee demographics. The *U.S. Solar Industry Diversity Study* found that only 36% of companies formally track and monitor gender, ethnic, and racial diversity, though this is up from 27% in 2017.[21]

Industry Demographics

The interviews asked employers from Oregon and Washington to identify employee gender, ethnicity, and racial diversity, with the results shown in Tables 1-3. Please see Appendix A and B for detailed tables which break down other industries by state (pages 32-33). While the *National Solar Jobs Census* tracks overall statewide demographic data for the solar industry, the data presented in this report aims to provide a more detailed breakdown by position type. Employers specified the demographics of their management team, licensed installation staff, unlicensed installation staff, and administrative staff. For the purposes of this research, employees in management or

* Due to a low sample size, results from the interviews are not statistically significant. Therefore, results presented in this research should be viewed as qualitative data. However, these interviews with key solar industry stakeholders provide important insight into the state of the workforce in Oregon and Washington.

leadership positions are defined as supervising at least one additional person at their firm. In the state of Oregon, licensed installation employees are qualified under Limited Renewable Energy Technician (LRT) licenses or general journey level electrician licenses. In the state of Washington, installers are only considered licensed if they are general journey level licensed electricians or specialty residential journey level electricians. In this study, unlicensed installation employees are defined as either LRT and electrical apprentices, or general installation crew such as material handlers. Administrative employees encompass the staff that spend the majority of their time in the office, such as project managers, sales, customer service, and data entry employees.

Representation of Women

Results show an underrepresentation of women and no representation of employees identifying as gender non-binary, especially in installation positions, as shown in Table 1. Only 6.3 percent of employees represented in the sample were women installers, both licensed and unlicensed. Additionally, women were much less likely to hold management positions (17.5 percent) compared to men (82.5 percent).

TABLE 1: GENDER DEMOGRAPHIC RESULTS FROM WASHINGTON AND OREGON SOLAR WORKFORCE INTERVIEWS

	OR & WA Solar	Management Positions	Licensed Install Crew	Unlicensed Install Crew	Administrative Roles
Male	80.0%	82.5%	95.3%	98.5%	70.3%
Female	20.0%	17.5%	4.7%	1.5%	29.7%
Gender Non-Binary	0.0%	0.0%	0.0%	0.0%	0.0%

Table 2 presents the representation of women from the Oregon and Washington solar workforce interviews compared to the overall industry representation as presented in the *National Solar Jobs Census 2018*, along with comparisons to other industries in Oregon and Washington.[22] When compared to the national solar workforce, results from these interviews show that Oregon and Washington have fewer women in the solar industry, though Oregon and Washington solar is doing better than similar industries such as construction and oil and gas extraction.

TABLE 2: GENDER DEMOGRAPHIC RESULTS FROM INTERVIEWS COMPARED TO NATIONAL SOLAR COMPANIES AND OTHER STATEWIDE INDUSTRIES

	National Solar	OR & WA Solar	OR & WA Overall	OR &WA Construction	OR & WA Manufacturing	OR & WA Oil and Gas Extraction	OR &WA Information Services
Male	73.7%	80.0%	51.6%	81.4%	73.0%	85.4%	66.7%
Female	26.3%	20.0%	48.4%	18.6%	27.0%	14.6%	33.3%
Gender Non-Binary	1.4%	0.0%	-	-	-	-	-

NOTE: THE U.S. CENSUS DOES NOT COLLECT GENDER NON-BINARY DATA

A common theme throughout interviews with leaders familiar with the solar workforce in Oregon and Washington is that the trades are typically perceived as cis-gender-male-dominated fields. The common pathways to becoming a solar installer, such as construction work, LRT apprenticeships, and electrical apprenticeships, are cis-gender-male-dominated career pathways. Cis-gender girls from a young age are not exposed to the trades as a possible career pathway at the same level as boys. As a result, they may not be

equitably presented with solar installation as a possible career path. Some solar companies mentioned the desire to hire female installers to help change the perception of the trades as male-dominated, but they have had zero female applicants. This suggests women do not perceive the trades as a feasible career pathway.

Because no data was available about gender non-binary employees, the factors that influence access to the solar industry cannot be determined at this time and further exploration is needed, and it is worth noting that the gender binary terminology in the trade may pose a barrier.

A few educational programs were mentioned by respondents that aim to educate girls and non-binary children about the trade industry and inspire them to seek nontraditional careers. One such program is the Girls Build program based in Portland, Oregon.[23] Girls Build is a summer camp that teaches girls and non-binary kids ages 8-14 basic construction skills including electrical skills. The program employs women and non-binary instructors to teach kids trade skills and industry knowledge, inspiring and empowering them at a young age to join the trades. Girls Build invites guest instructors to educate students about different trades and features solar installers to introduce them to the field of solar. Some kids from the camp go on to become counselors and interns, further supporting a career in the trades.

Oregon Tradeswomen is a program that encourages women to enter the trades by providing education, leadership, and mentorship opportunities. They aim to empower women through training programs and offer technical assistance to trades-focused organizations seeking to provide an inclusive work environment for women. Specific programs they offer include pre-apprenticeship courses, career fairs, and courses that give women the skills to advocate for a more inclusive trades industry.[24]

Additionally, the Apprenticeship and Non-Traditional Employment for Women (ANEW), based in Washington, aims to increase representation of women in historically cis-gender-male-dominated fields. It is dedicated to "improving access and advancement into non-traditional career paths," and is the oldest pre-apprenticeship program in the nation.[25] ANEW offers pre-apprenticeship programs specifically for women, including training around technical skills, math skills, and even the importance of fitness. The program gives women the skills to be competitive when applying for apprenticeships. Please see Appendix C (page 34) for a full list of resources.

Representation of Communities of Color

Similar to gender representation, results from the Oregon and Washington solar workforce interviews show an underrepresentation of people of color, as shown in Table 3. This is especially true in management and installation roles (both unlicensed and licensed). There is greater representation of people of color in administrative roles, suggesting it may be more difficult for these populations to enter installation roles compared to administration. The exception is Latinx populations, where there is greater representation in management and installation roles compared to administrative roles. In fact, the greatest representation of Latinx employees is in management positions; however, they still only make up 6.8 percent of these employees.

TABLE 3: ETHNIC AND RACIAL DEMOGRAPHIC RESULTS FROM WASHINGTON AND OREGON SOLAR WORKFORCE INTERVIEWS

	All Solar	Management Positions	Licensed Install Crew	Unlicensed Install Crew	Administrative Roles
Latinx	4.8%	6.8%	4.5%	4.1%	3.2%
Asian	3.0%	1.1%	2.2%	0.0%	3.2%
Black or African American	2.1%	1.1%	0.0%	0.0%	2.4%
White	89.2%	93.2%	91.0%	95.9%	90.4%
Native Hawaiian or other Pacific Islander	0.3%	0.0%	1.1%	0.0%	0.0%
American Indian or Alaskan Native	0.6%	0.0%	1.1%	0.0%	0.8%
More than one race	0.0%	0.0%	0.0%	0.0%	0.0%

Table 4 presents the ethnic and racial demographics from the Oregon and Washington solar workforce interviews compared to the *National Solar Jobs Census 2018* and other industries at the state level.[26] The Oregon and Washington demographic results are comparable to similar industries in those states, such as construction and oil and gas extraction, though they show lower representation of communities of color compared to the *National Solar Jobs Census 2018*. It is important to consider that Oregon and Washington have smaller populations of communities of color compared to the national population. There is an especially low population of communities of color in smaller cities such as Bend, Oregon and Spokane, Washington, where some interview respondents are located, as shown in Table 5.

TABLE 4: ETHNIC AND RACIAL DEMOGRAPHIC RESULTS FROM INTERVIEWS COMPARED TO NATIONAL SOLAR COMPANIES AND OTHER STATEWIDE INDUSTRIES

	National Solar	OR & WA Solar	OR & WA Overall	OR & WA Construction	OR & WA Manufacturing	OR & WA Oil and Gas Extraction	OR & WA Information Services
Latinx	16.9%	4.8%	11.1%	12.5%	12.9%	6.4%	6.0%
Asian	8.5%	3.0%	8.0%	2.7%	10.8%	1.1%	18.5%
Black or African American	7.6%	2.1%	3.9%	2.5%	2.9%	0.7%	2.9%
White	73.3%	89.2%	82.6%	89.8%	81.5%	94.6%	74.6%
Native Hawaiian or Other Pacific Islander	1.2%	0.3%	0.6%	0.5%	0.7%	0.2%	0.3%
American Indian or Alaska Native	1.1%	0.6%	1.5%	1.6%	1.3%	1.5%	0.6%
More than one race	8.3%	0.0%	3.4%	2.9%	2.7%	1.9%	3.1%

TABLE 5: ETHNIC AND RACIAL REPRESENTATION ACROSS VARIOUS CITIES IN OREGON AND WASHINGTON

	Bend, OR	Ashland, OR	Portland, OR	Vancouver, WA	Spokane, WA	Seattle, WA	U.S. Total
Latinx	8.7%	5.1%	9.7%	12.4%	8.2%	6.6%	17.3%
Non-Latinx	91.3%	94.9%	90.3%	87.6%	91.8%	93.4%	82.7%
Asian	1.6%	2.2%	7.6%	5.2%	5.9%	14.1%	5.2%
Black or African American	0.5%	1.7%	5.7%	2.7%	1.4%	7.1%	12.6%
White	93.1%	91.5%	77.7%	79.1%	82.8%	69.2%	73.3%
Native Hawaiian or Other Pacific Islander	0.1%	0.0%	0.6%	1.6%	0.2%	0.4%	0.2%
American Indian or Alaska Native	0.2%	0.1%	0.7%	0.7%	1.8%	0.6%	0.8%
More than one race	2.9%	3.5%	5.2%	5.6%	4.9%	6.5%	3.1%

Throughout company and industry leader interviews, there was an acknowledgement that the solar industry in Oregon and Washington should prioritize increasing the representation of people of color in the workforce. Though many of the companies recognize this as a priority, they stress the fact that as a small business in an unpredictable field it is hard to dedicate the necessary time and resources to meet this goal. Multiple companies indicated they are attempting to be more diverse, but do not know where to start or do not have the resources to take steps to hire a more racially and ethnically diverse workforce.

A common sentiment across solar company interviews was the fact that their communities are fundamentally less diverse than the rest of the country, making it difficult to seek out diverse candidates. Companies note that because of a lack of resources and a low population to target, workforce diversity presents a challenge. Companies indicated they are willing to improve their hiring practices and are open to expanding the racial and ethnic diversity of their hiring pool to be more inclusive, but they need information and support to improve their practices.

Though there are fewer people of color in these communities, the broader counties where the smaller cities are located are typically more diverse. For example, while Ashland, Oregon has a Latinx population of 5.1 percent, Jackson County has a Latinx population of 12.9 percent. Therefore, strategies should address the broader county area rather than focusing on the city where the company is located, in order to have their worker demographics meet that of the county-level demographics.

Licensing and Training of Installation Workers

As part of the context for workforce development in the solar industry, it is important to review the licensing and training requirements for installation workers in Oregon and Washington. These licensing and training procedures have a very significant impact on the workforce development pipeline, as well as the industry's ability to foster a diverse and inclusive workforce. This section presents general information on licensing for both states and qualitative findings from interviews with licensing providers in Oregon and Washington.

Oregon

Solar installation workers in Oregon must hold a Journey Level Electrician's License or LRT License, or be participating in an apprenticeship program and working under supervision by a license holder. For a typical residential installation crew, only one licensed installer, either an LRT or a licensed electrician, is necessary to perform the electrical work, while there can be an unlimited number of unlicensed installers for tasks such as material handling and racking. While journey level electricians can work on all aspects of solar electrical work, LRTs can only work on solar installations under 25 kW in capacity, and only on the DC solar components of the installation. They cannot "plug in" the system and connect it to the home or business.

Oregon has set regulations on the ratio of journey level electricians to electrical apprentices and the ratio of journey level LRTs to LRT apprentices. Each job site is allowed two apprentice electricians for every three

journey level electricians.[27] The LRT standards are the same, with each job site allowing a ratio of two LRT apprentices for every three LRT journeymen.[28] A residential crew can be made up of two LRT apprentices, three journey level LRTs, and two unlicensed installers to perform work such as material handling and unpacking.

Journey level electrician licensure requires more time and coursework than LRT licensing. Journey level electrician licensing requires 8,000 on-the-job-training (OJT) hours spanning roughly four years as an apprentice working under licensed electricians for a company registered as a training agent. As an apprentice, trainees must simultaneously enroll in a minimum of 180 hours of classroom training a year. Classroom training can be accomplished through evening or day classes at a local training provider site. Classroom training is provided by multiple training providers in Oregon such as local Joint Apprenticeship and Training Committees (JATC) and International Brotherhood of Electrical Workers (IBEW) union halls.[29] Some hours of classroom training are dedicated to solar energy to cover a broad range of career opportunities.

The LRT licensing program requires only 4,000 OJT hours with simultaneous classroom training, lasting roughly two years. Most classroom training is available through Clackamas Community College, with three campuses in Clackamas County, Oregon, while some training opportunities are offered by the Oregon Solar Energy Industry Association as well as online.[30] The LRT licensing program is administered by Northwest Apprenticeship Services as part of the Renewable Energy Joint Apprenticeship and Training Committee (RE-JATC) program. Applicants who meet the minimum qualifications have their applications scored based on a point system and are offered an in-person interview. Those who complete the interview are placed on a list of eligible apprentices ranked according to their combined application and interview score. Once accepted, the program administrator works with solar installation companies to place applicants in an LRT apprenticeship program.

The LRT licensing program faces a shortage of training agents. Training agents are solar installation contractors that hire and train apprentices so they can receive their required on-the-job training. The program now has 43 qualified applicants ready to be hired for an apprenticeship, but there are only 19 training agents active in the state. This shortage of training agents has led to a bottleneck, limiting the number of LRTs completing and receiving their journey level license. The requirements and details of each program are outlined in Table 6.

TABLE 6: TRAINING REQUIREMENTS FOR ELECTRICIANS AND LRTS IN OREGON

	LRT	Journey Level Electrician
Minimum Qualifications	• 18 years of age • High school graduate or GED • Successful completion of one year of high school math	• 18 years of age • High school graduate or GED • One year of high school algebra or with a passing grade of C or better
Length of Apprenticeship	2 years	4 years
Classroom Hours	144 hours a year	144-180 hours a year
OJT Hours	4,000 hours	8,000 hours
Average Journey Level Wage	$30.85	$36.20
Union Membership	Not part of a state union	Part of a state union, which provides workers with career placement assistance as well as wages and benefits that are consistent between employer companies.
Solar Training	LRTs obtain a specialized knowledge base and skill set specific to solar energy, though there is a shortage of training agents able to take on apprentices.	Electricians obtain a broad range of electrical training and experience outside of solar installation, though there are few solar specific training agents, leading to few licensed electricians with solar experience.
Scope of Solar Installations	LRTs are limited to work on solar installations smaller than 25 kW DC, which limits them to working on residential and small commercial projects.	Electricians can perform all aspects of a solar installation and are not limited by the size of the system.

Washington

In contrast to Oregon, Washington does not offer a specific license separate from a journey level electrician license for those interested in performing solar installation electrical work. Workers that are certified to install solar systems are licensed as either an O1 general electrical contractor not limited by occupancy system, or an O2 residential contractor who is limited to work in single-family, two-family, and multifamily dwellings. General labor functions of the solar installation process, such as material handling, do not require a license. Therefore, solar installation up to the point of the electrical aspect of the installation can be done by an unlicensed installer. Installation crews must have one licensed electrician for every two electrical apprentices.[31] A residential installation crew may include one O2 residential electrician, two apprentices, and a support crew of two other unlicensed installers performing unpacking and material handling.

The process to become a general journey level electrician in Washington is similar to Oregon, involving 8,000 OJT hours working as an electrical apprentice under the supervision of a certified electrician while simultaneously being enrolled in 200 hours per year of classroom training.[32] For example, one training council offers 800 hours of classroom training across the four years of OJT apprenticeship. The courses are offered at six different locations across Washington. Students are enrolled in classes for six hours per week, typically spanning two three-hour evening classes with flexibility to attend weekend classes. As with Oregon's training, some classroom hours are dedicated to solar energy, as the program aims to train electricians across industries.

O1 and O2 training providers have relationships with training agents in Washington to complete the apprenticeship portion of their training. Most often, these apprenticeships lead to full-time employment following the completion of their training, though solar-specific training agents must be available to hire and train apprentices. Table 7 shows the requirements and details of the training for both the O1 general journey level electrician and O2 residential journey level electrician.

TABLE 7: TRAINING REQUIREMENTS FOR ELECTRICIANS IN WASHINGTON

	O2 Residential Electrician	O1 General Electrician
Minimum Qualifications	• 18 years of age • High school graduate or GED • Successful completion of one year of high school math	• 18 years of age • High school graduate or GED • One year of high school algebra or with a passing grade of C or better
Length of Apprenticeship	2 years	4 years
Classroom Hours	200 hours a year	200 hours a year
OJT Hours	4,000 hours	8,000 hours
Average Journey Level Wage	Pass Limited Residential Journey Level Exam	Pass Inside Electrician Journey Level Exam
Union Membership	Part of a state union, which provides workers with career placement assistance as well as wages and benefits that are consistent between employer companies.	
Solar Training	Electricians obtain a broad range of electrical training and experience outside of solar installation, though there are few solar specific training agents, leading to few license electricians with solar experience. Further, there is no specific pathway for those interested solely in solar installation.	
Scope of Solar Installations	Electricians can perform all aspects of a solar installation and are not limited by the size of the system.	

On-the-Job Training

Contractors were asked to provide details about their internal training practices, which are separate from the requirements for training apprentices discussed above. The following practices apply to all solar installation employees, including licensed electricians, apprentices, or general material handlers.

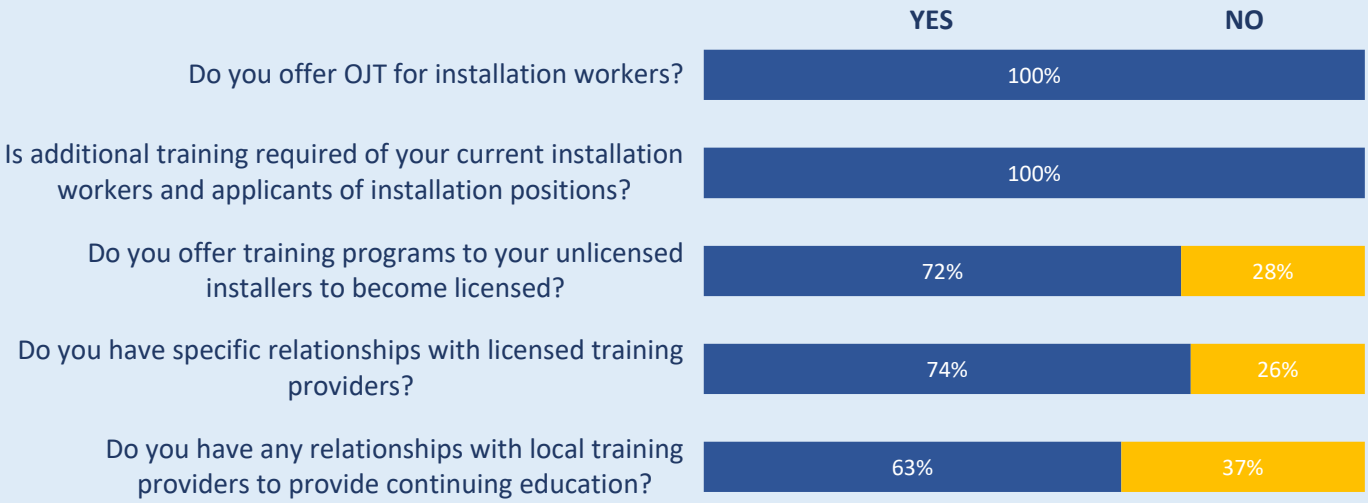
Companies see a need for additional training after employees are hired; therefore, they tend to provide these training opportunities on the job. This fact matches past research in the *Solar Training and Hiring Insights Report* by the Solar Training Network, a program led by The Solar Foundation. This report found that 79.6% of employers saw a general need for additional solar training.[33]

Interviewed respondents described their existing training practices as follows. All of the installation companies interviewed provide OJT to orient workers with company-wide best practices and policies and basic safety training. Companies often enroll their new hires in the OSHA-30 training

program to ensure the highest safety standards are met on installation sites. Employers emphasized the importance of OJT for licensed journey level electricians, as most of them have not previously worked on solar installations, requiring basic training and orientation in PV design and installation. All installation companies provide general OJT to their employees, emphasizing it is necessary to orient all employees with company practices. In addition to initial OJT, companies stated that training and education is ongoing for solar installers. Some firms even mentioned they provide stipends for continuing education to ensure their installers are up to date on best practices.

Figure 2 illustrates results from specific questions solar companies were asked surrounding their training practices. Respondents indicated they address additional training needs through OJT and by offering continuing education through opportunities with local training providers.

FIGURE 2: PRACTICES SURROUNDING THE TRAINING OF INSTALLATION WORKERS



Benefits and Wages

Of the companies that provided information on the benefits they provide their employees, almost all employers provide health insurance, paid time off, and matching 401(k) plans. Other, less common benefits provided include reimbursement for continuing education, gym membership, time off for volunteer hours, and stipends for public transportation.

Wages

Employers provided wages data for their licensed and unlicensed installation employees based on entry-level, mid-level, and senior level positions. Unlicensed installation positions include both apprentices and general material handlers on solar installation sites. Median hourly wages are presented in Table 8. Licensed installers in both states have higher wages than unlicensed installers.

TABLE 8: MEDIAN HOURLY WAGE FOR INSTALLATION

	OR & WA Unlicensed	OR & WA Licensed	Solar Jobs Census Non-Electrician	Solar Jobs Census Electrician
Entry-level Wage	$17.00	$25.00	$18.92	$24.32
Mid-level Wage	$20.00	$32.00	$28.11	$32.43
Senior Level Wage	$24.50	$36.00	-	-

While apprentices are not yet licensed, they are training to be either a LRT or general electrician, which will inherently lead to more skills and education and therefore a higher wage than a material handler. Therefore, the median hourly wage presented in Table 8, which does not differentiate between apprentices and general installers, may not fully capture the wages of LRT and electrical apprentices. In fact, each state has a set standard hourly wage for employees in the apprenticeship programs separated by each period of training, based on the average journey level wage, as shown in Table 9.

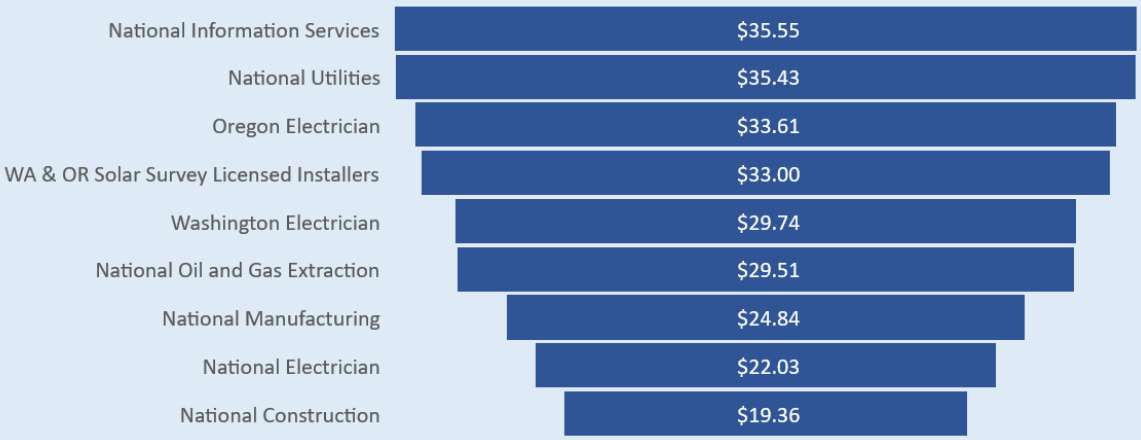
TABLE 9: HOURLY WAGE SCHEDULE FOR APPRENTICES IN OREGON AND WASHINGTON

LRT apprentice wage schedule in Oregon: 1st period: $15.43 2nd period: $18.51 3rd period: $21.60 4th period: $24.68 **AVERAGE JOURNEY LEVEL WAGE FOR LICENSED: $30.85**	**General Journey Level Electrician apprentice wage schedule in Oregon:** 1st period: $14.48 2nd period: $18.10 3rd period: $19.91 4th period: $21.72 5th period: $23.53 6th period: $25.34 7th period: $27.15 8th period: $28.96 **AVERAGE JOURNEY LEVEL WAGE FOR LICENSED: $36.20**
General Journey Level Electrician apprentice wage schedule in Washington: 1st period: $17.94 2nd period: $20.18 3rd period: $22.43 4th period: $26.91 5th period: $31.40 6th period: $38.12 **AVERAGE JOURNEY LEVEL WAGE FOR LICENSED: $44.85**	**Residential Journey Level Electrician apprentice wage schedule in Washington:** 1st period: $16.84 2nd period: $18.37 3rd period: $21.43 4th period: $22.97 5th period: $26.03 **AVERAGE JOURNEY LEVEL WAGE FOR LICENSED: $30.62**

Results from interviews suggest entry-level unlicensed and licensed positions in Oregon and Washington have comparable median wages to nationwide entry-level installation positions, according to the *National Solar Jobs Census*. Licensed installers in Oregon and Washington earn about the same as mid-level licensed installers across the U.S., though the median hourly wage for mid-level unlicensed installers in Oregon and Washington is much lower than the national median.

When compared to other industries nationally, results from the Oregon and Washington solar workforce interviews show the median hourly wage for licensed installation employees, regardless of level, is higher than the median hourly wage for similar industries. Industries with lower median hourly wages include oil and gas extraction, manufacturing, general electricians, and

FIGURE 3: MEDIAN HOURLY WAGE OF OREGON AND WASHINGTON INSTALLERS COMPARED TO BLS INDUSTRIES



construction workers. These licensed solar installation employees earn about the same median hourly wage as Oregon general electricians, $3.00 more than Washington general electricians, and $11.00 more than electricians across the U.S.

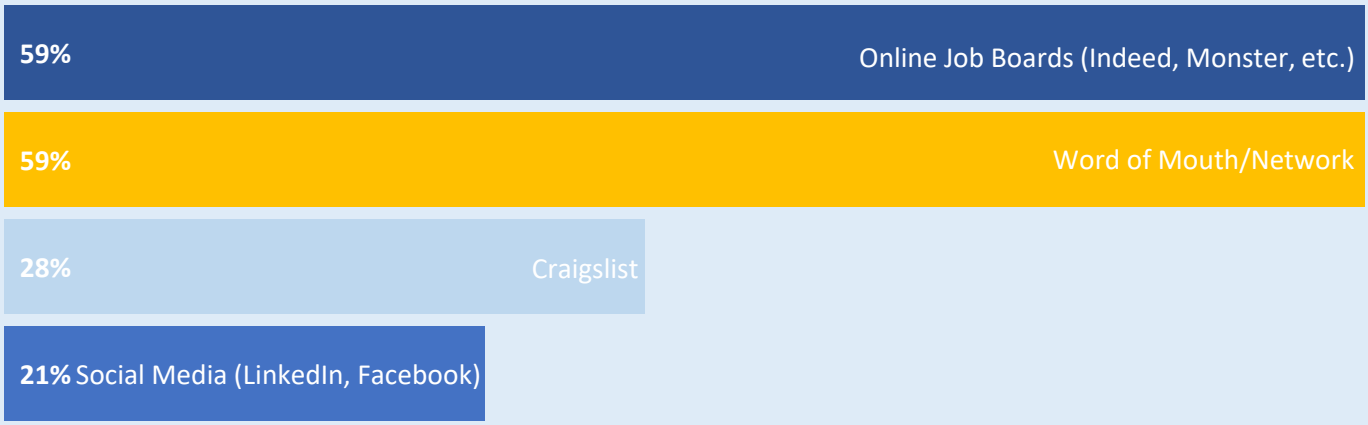
Hiring Practices

Respondents provided information regarding company hiring practices and the methods and difficulties they face during the hiring process. This information helps to better understand the recruitment landscape in Oregon and Washington and the challenges companies face in hiring diverse candidates for solar positions.

Recruitment Methods

The two most common tools for recruitment are online job boards, such as Indeed and Monster or company websites; and word of mouth using personal and professional networks (Figure 4). Fifty-nine percent of the companies indicated these tools as their preferred methods to recruit. These results are consistent with the data in the *U.S. Solar Industry Diversity Study 2019*, which found that three of the top five methods for recruitment rely on personal and professional connections.[34]

FIGURE 4: RESPONDENTS PREFERRED METHOD TO RECRUIT EMPLOYEES



Industry leaders in both Oregon and Washington noted that word of mouth recruitment is a barrier to hiring a more diverse workforce. When asked specifically what barriers they perceive to hiring more women, gender non-binary employees, and people of color, respondents frequently mentioned the reliance on word of mouth as a recruiting technique. Industry leaders indicated that outreach limited to word of mouth often fails to target specific, marginalized communities. In fact, the *U.S. Solar Industry Diversity Study 2019* found that Hispanic or Latino and black or African American employees are less likely to find their positions through employee referrals or by word of mouth. Just 28% of each of these groups found their position this way, while 49% of non-Hispanic employees did so and 44% of white employees.[35]

In Oregon and Washington, only 17 percent of companies interviewed have strategies in place to increase female, gender non-binary, and ethnic and racial representation (Table 9). This percentage increases slightly when respondents were asked if they have a strategy in place to target employees within the local community (22 percent).

TABLE 9: DIVERSITY AND INCLUSION PRACTICES AT OREGON AND WASHINGTON SOLAR FIRMS

	Yes	No	Don't Know
Employees Allowed the Option to Identify as Gender Non-Binary in Hiring Documents	14%	59%	28%
Strategy to Increase Female and Gender Non-Binary Representation	17%	76%	0%
Strategy to Increase Representation of People of Color	17%	76%	0%
Strategy to Target Employees Within Local Community	22%	70%	0%

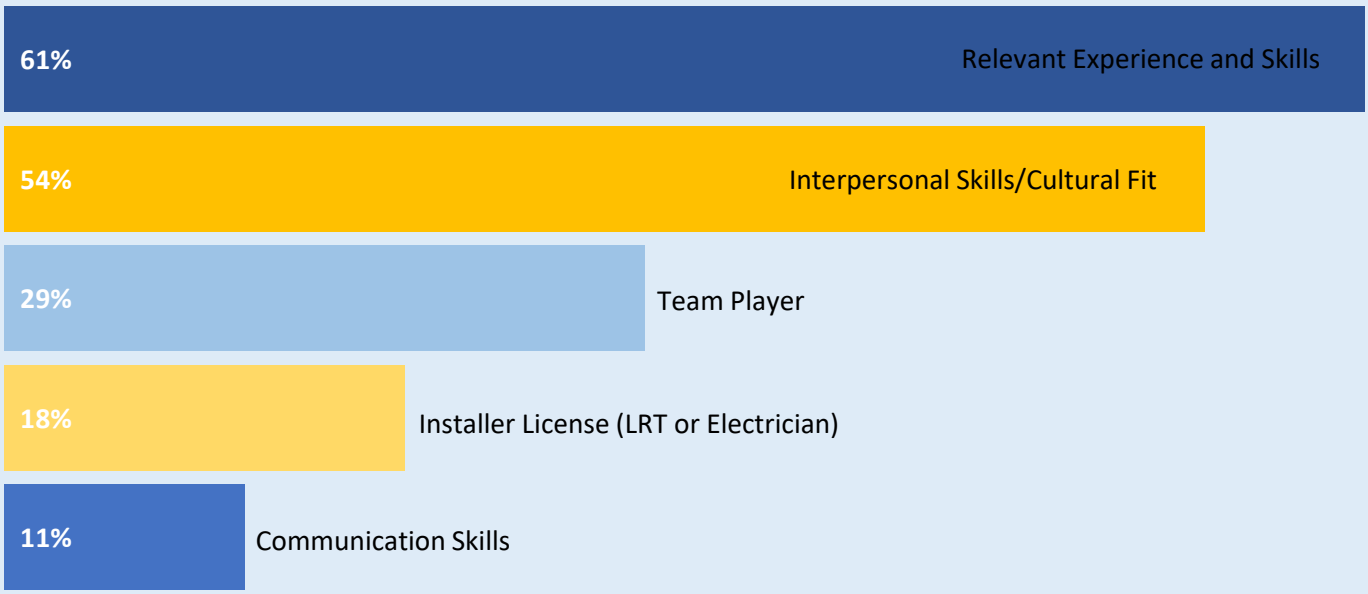
Small solar companies in Oregon and Washington noted that they do not have the available time or resources to foster relationships with community-based organizations to target potential employees. Additionally, some companies that have strategies in place to target women and people of color continue to have difficulty hiring such candidates. One respondent commented: "The last time we reached out to job boards that focus on diversity we got zero applicants. There is a big push for this, but it is difficult to get any applicants from underrepresented groups." In a competitive employment market, employers find it difficult to form strategies around targeting recruitment to diverse populations.

Qualifications Required

All solar companies were asked to provide the most important qualifications they consider when hiring a new employee. These qualifications provide important insight into the workforce pipeline and how to attract and retain a more robust and diverse solar workforce in Oregon and Washington. Just over 60 percent of solar

companies indicated a candidate's relevant experience and skills are the most important qualification (Figure 5). This is consistent with the *Solar Training and Hiring Insights* report, in which a majority of employers nationally (61 percent) consider experience in a non-solar construction trade important to their hiring considerations.[36]

FIGURE 5: MOST IMPORTANT QUALIFICATIONS WHEN HIRING A NEW EMPLOYEE



Additionally, over half of the companies in this survey consider an applicant's soft skills, such as interpersonal skills, and their fit with company culture as important qualifications, as shown in Figure 5.

To understand the qualifications necessary for solar installers (both licensed and unlicensed), the research team asked only solar installation companies to specify the ideal qualifications and work experience they expect in candidates applying for entry-level installation positions.

Most installation companies stressed that little to no work experience is necessary for unlicensed entry-level installation positions, placing greater value on candidates' soft skills. These candidates are then trained on-the-job to orient them with company best practices. Employees look for entry-level applicants with strong soft skills including their attitude, work ethic, and fit with the company culture. This suggests there are few technical skills necessary to be an unlicensed installer, resulting in a low barrier to entry for these positions in Oregon and Washington. In fact, the *Solar Training and Hiring Insights* report also concluded that "employers look less to installation-specific training among job applicants, and place more value on those experiences that develop technical abilities, safety techniques, and soft skills that are common to all companies."[37] The solar industry offers a potential career pathway for lower skilled workers, as it offers competitive wages and benefits and includes on-the-job training.

The skills for licensed entry-level positions are inherently different, as these candidates will have undergone apprenticeship training. These applicants must have their electrician or LRT license in Oregon, or their electrician license in Washington, or be enrolled in the respective apprenticeship programs. A few companies stressed that an ideal licensed candidate will have solar experience, but often that is not the case as electricians are not trained extensively in solar installation. As discussed in the next section, employers in both states find it difficult to hire licensed installers.

Hiring Challenges

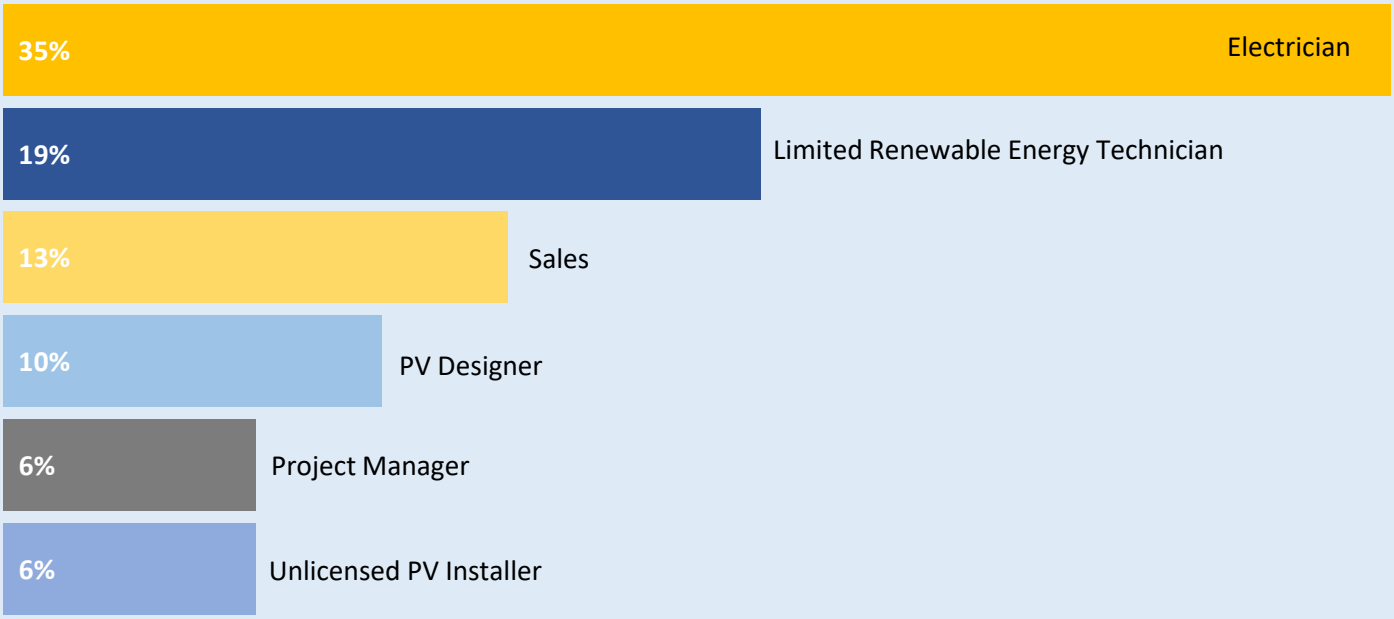
Seventy-nine percent of companies interviewed indicate it is either very difficult or somewhat difficult to find qualified applicants for open positions. Of the installation companies, 57 percent find it very difficult to find qualified applicants, while 22 percent find it somewhat difficult (Table 10). According to the *National Solar Jobs Census*, 33 percent of installation companies across the nation find it very difficult to find qualified applicants, indicating that hiring is especially difficult in Oregon and Washington. This suggests these states have room for improvement.

TABLE 10: DIFFICULTY HIRING IN OREGON AND WASHINGTON AND NATIONAL SOLAR COMPANIES

	OR & WA Overall	OR & WA Installation	National Overall	National Installation
Very Difficult	47%	56%	26%	33%
Somewhat Difficult	33%	22%	56%	52%
Not at all Difficult	21%	22%	18%	15%

Respondents were asked to list the two most difficult positions to fill, specified in Figure 6. Of the 29 positions listed by respondents, 61 percent of the most difficult positions to fill are installers of any type (i.e., electrician, LRT, unlicensed installer). Of these installation positions, 58 percent are specifically licensed electricians, while 32 percent are LRTs and the rest are unlicensed installers. The *National Solar Jobs Census* indicates that 32 percent of solar companies across the U.S. find that sales positions are the most difficult to fill, while only 22 percent find that electricians are the most difficult positions to fill. This suggests Oregon and Washington may find greater difficulty hiring electricians than the national solar industry.

FIGURE 6: MOST DIFFICULT POSITIONS TO FILL IN OREGON AND WASHINGTON



Companies described specific difficulties they have encountered during the hiring process for solar installers. The majority of companies indicated that finding applicants with significant solar experience is the biggest difficulty. This is especially prevalent in Washington, as the state does not have a renewables-specific license like the LRT license in Oregon. Other difficulties employers have during the hiring process include the general shortage of electricians in both states, which makes it difficult to meet state requirements for hiring licensed electricians. One company said "electricians are in high demand with not enough workers; it doesn't help that solar electrical work is difficult. Solar installers must be out in the elements on the roof, rather than inside."

Industry leaders reported that the rapid economic growth in the Portland and Seattle areas makes it more difficult to find electricians in Oregon and Washington. In recent years, there has been an increase in construction work in Portland and Seattle, generating high demand for licensed electricians. According to research commissioned by Metro and the City of Portland, from 2017 to 2021, known public construction projects will require nearly 14,000 additional construction workers.[38] In King County, which includes Seattle, the state Employment Security Department predicts that from 2016 to 2021, an estimated 9,100 construction jobs will be added.[39] As the construction industry grows across Oregon and Washington, the demand for electricians increases, reducing the available supply for solar companies. Respondents emphasized that companies in rural regions of Oregon and Washington find it especially difficult to attract electricians, as most workers prefer to live in metropolitan areas.

Industry leaders noted that the shortage of electricians working in solar in Oregon and Washington is also due to the solar industry's limited promotion of solar installation as a viable career path in the trades. In order for LRTs and electricians to become licensed, they must undergo OJT with a contractor who is a training agent. A training agent becomes an active part of "turning out" licensed workers by hiring apprentices to fulfill their OJT requirements. Solar contractors should actively participate in the training of LRTs and electrical apprentices to ensure a robust pipeline of licensed workers is available in the solar industry.

In addition, electricians tend to choose jobs in other trades industries because the solar industry is perceived as volatile and unstable. This is especially true right now because of the policy changes in Oregon and Washington and the discussion at the national level around increasing solar tariffs. In Oregon, a tax credit that provided homeowners up to $6,000 for qualifying solar installations sunset at the end of 2017, causing a contraction in the solar industry.[40] Additionally, due to the high interest in Washington's Renewable Energy System Incentive Program (RESIP), the $110 million state funding limit has almost been reached and the program will be unable to receive any more applications as of early 2019.[41] This policy uncertainty in both states has led to employment uncertainty, dissuading electricians from entering the solar field.

Career Development

Solar companies provided the typical amount of time for their installation staff to advance within their companies. The median time to advance to a mid-level position is 1.75 years, and the median time to advance from a mid-level position to a senior-level position is two years. The break out of responses is provided in Figures 7 and 8.

These findings show that the solar industry in Oregon and Washington provides installers with ample advancement opportunities. An entry-level unlicensed installer may start work with little experience, and within one to two years could then potentially become a mid-level installer and receive a 17 percent pay increase. Unlicensed installers can even go on to obtain their LRT or electrician's license to further advance their careers, leading to almost a doubling of their wages. Entry-level unlicensed installation jobs also provide a foundation of

understanding that could lead to job roles such as sales, marketing, system design, or project management if working in the trades is not the preferred end goal for the applicant.

FIGURE 7: TIME TO ADVANCE FROM AN ENTRY-LEVEL INSTALLER TO A MID-LEVEL INSTALLER

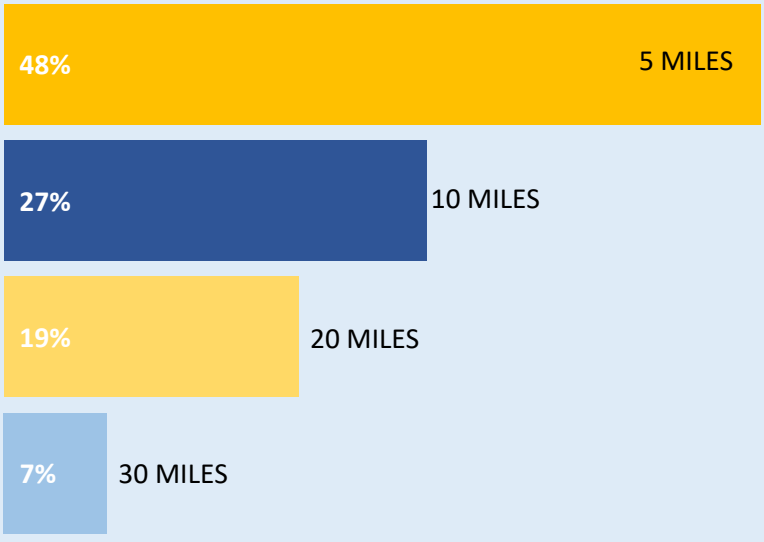
FIGURE 8: TIME TO ADVANCE FROM A MID-LEVEL INSTALLER TO A SENIOR LEVEL INSTALLER

Transportation: A Barrier to Employment

Lack of adequate transportation is a potential barrier to employment in the solar industry, especially for solar installation positions. Installation positions, like other trades or construction jobs, require significant offsite travel often far from employee residences.

Over half of the installation companies interviewed indicate their installation sites are often greater than 10 miles from the office, similar to other trade industries, though all but one of the installation companies provide the installation crew with company vehicles to arrive at work sites. Commonly, the installation crew will meet at the office prior to arriving at the work site. Several employers indicate their employees can even take company vehicles home and travel straight to the work site the following day. Solar installers, as with other trades or construction jobs, must have a driver's license to be hired, presenting a barrier for people who may not have a driver's license.

FIGURE 9: HOW FAR EMPLOYEES TRAVEL TO ARRIVE AT WORK



Of the companies that were able to provide estimates on the distance their employees travel to arrive at work, almost half of employees live five miles from work, while over half live ten miles or further, as shown in Figure 9. According to previous research, the proximity of jobs affects employment opportunities, as those workers that live closer to jobs are more likely to gain employment and tend to face shorter time between jobs.

According to a 2015 study by the Brookings Institution, between 2000 and 2012, the number of jobs located near residents in major metropolitan areas declined at a greater rate for marginalized populations than for white populations. While jobs in proximity to white residents only declined 6 percent, those in proximity to Latinx residents dropped 17 percent, and those in proximity to black residents dropped 14 percent.[42] The Brookings Institution calculated "near" by counting how many jobs fall within the typical commute distance of the center point of each metro area. Each commute distance is determined by the

median commute distance for each metro area in the U.S. For example, in the Portland-Vancouver-Hillsboro metro area, the typical commute distance is 7.1 miles, while in the Spokane-Spokane Valley metro area the distance is 5.6 miles.[43] This statistic suggests people of color are being pushed further away from metropolitan employment centers, and therefore, further away from jobs. Similarly, the National Conference of State Legislatures reported that low-income groups, which include large numbers of people of color, may not have adequate transportation to arrive at the office due to various factors such as proximity, the struggle to afford transportation costs, inadequate access to public transit or lack of appropriate routes, and access to a driver's license.[44] According to the definition of "near" by the Brookings Institution, almost half of solar employees represented in the surveys live near their jobs, while the rest do not, as shown in Figure 9.

Conclusion

The following is a summary of barriers to increasing diversity within the solar workforce in Oregon and Washington, as detailed in this report.

- **Perception of the Trades as a Cis-Gender-Male-Dominated Career Pathway.** Communication and perception of the trades in general is dominated by the view of cis-gender male workers. The trade industry jobs are not perceived as a career choice for girls from a young age and not targeted at people who identify as gender non-binary at all.
- **Reliance on Word of Mouth as a Recruiting Technique.** Solar companies rely heavily on word of mouth as a recruiting technique. The solar industry in both Oregon and Washington is quite small, especially in less developed areas. Therefore, companies rely on their known networks to seek potential candidates. This fails to target marginalized populations, leading to inequitable access to solar jobs.
- **Competitive Hiring Market Leads to a Shortage of Applicants.** The current state of the construction industry in both Oregon and Washington has led to a shortage in available licensed solar installation workers, due to a general lack of electricians and their choice to perform general electrical contracting work. Licensed electricians typically choose not to work for solar contractors, potentially due to the general instability of the industry. The competitive hiring market leads to a general lack of applicants for open solar installation positions.
- **Lack of Internal Strategy to Hire a More Diverse Workforce.** The majority of companies do not have a strategy in place to hire a more diverse workforce, though many indicated a desire to address company-wide diversity. While they are attempting to be more diverse, most companies do not know where to start or do not have the necessary resources.

Supporting Workforce Development in Oregon and Washington

The following policies and programs could help develop a pipeline of skilled employees in Oregon and Washington and also encourage diversity in the solar industry.

1. **Stable incentive programs would support solar industry growth**. State-wide incentive structures in Oregon and Washington are needed to support solar energy growth, especially for residential scale installation, which is most of the work done by small solar companies in Oregon and Washington. In Oregon, the residential energy tax credit sunset at the end of 2017, along with Washington's residential incentive program, leading to a slowdown in residential projects and less need for workers. A reliable workforce is important not only for installation jobs, but for sales, engineering, finance, R&D, and administration work positions. Incentive programs that are consistent over a period of time become a signal to job seekers that the solar industry is a stable source of employment.
2. **LRT and electrical apprenticeship programs can broaden outreach efforts to reach marginalized populations.** While electrical apprenticeships may have a robust pipeline of candidates, the training programs must improve efforts to target specific marginalized groups. Apprenticeship programs can form a strategy to target diverse populations for potential apprentice candidates. Strategies include: attending job fairs specifically targeted to people of color, women, and people who are gender non-binary; creating an outreach program to provide mock training opportunities to young kids during school; reaching students throughout K-12 so that cis-gender girls, kids who are gender non-binary, and people of color are exposed to the trades as a career pathway from a young age; and working with community-based organizations that have relationships with local marginalized groups. Targeted education will allow members of those communities to realize the potential to pursue the LRT or electrical apprenticeship program.
3. **An updated LRT apprenticeship program can help address the workforce needs of the industry.** Creating updated standards for LRT apprenticeship programs will help to meet the needs of the industry in

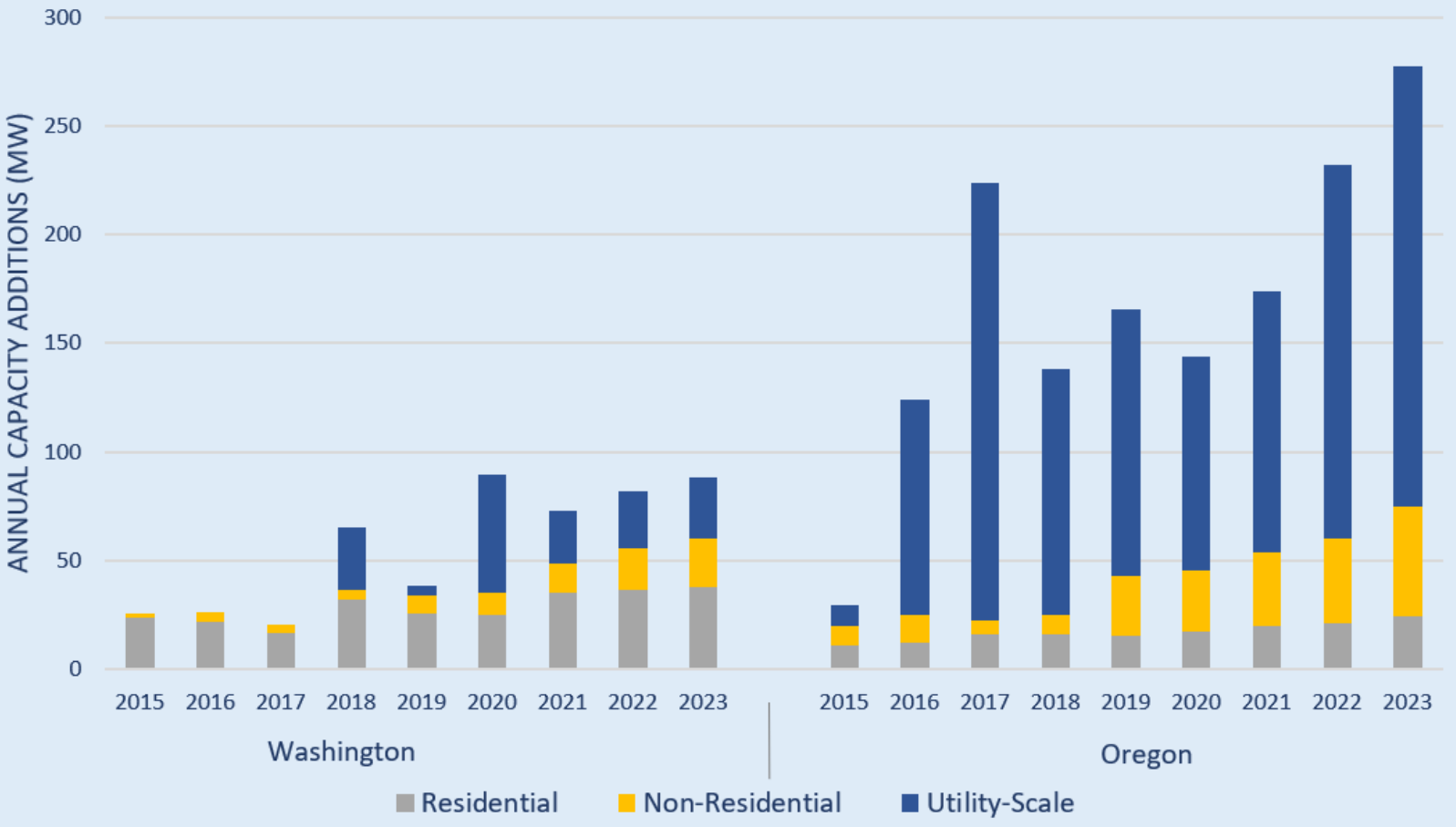
Oregon and strengthen the workforce. Updates could include revisiting and considering expanding the 25 kW work limit; offering better direction to apprentices regarding classroom requirements; offering additional tools and resources to help solar companies become training agents; and increasing marketing and outreach for the LRT opportunity. If these are addressed, both solar companies and potential apprentice candidates will realize greater benefits from the LRT program in Oregon. Solar companies will be incentivized to hire apprentices, and job seekers will be incentivized to join the program. Such LRT program revisions will address issues on both sides of the pipeline to ensure stable growth of the workforce.

4. **A different pathway to license solar-specific installers in Washington would support solar workforce growth.** By offering a specific pathway in the electrical apprenticeship program for solar installation, Washington can address the bottleneck in solar-specific training of electricians. Apprentices in this program will gain both electrical and solar knowledge to ensure a pipeline of qualified applicants for licensed solar installation positions in Washington. Additionally, those interested only in solar installation may be more inclined to join the industry, as they can choose a solar-specific pathway rather than completing the broad general electrical apprenticeship program, further building out the workforce pipeline.

Future Trends

According to the SEIA/Wood Mackenzie Power & Renewables 2018 *U.S. Solar Market Insight Year In Review* report, both Washington and Oregon are expected to increase their solar capacity additions through the next five years.[45] Historical capacity additions along with estimated future additions are summarized in Figure 10.

FIGURE 10: ANNUAL PV CAPACITY ADDITIONS AND ESTIMATED CAPACITY ADDITIONS THROUGH 2023



SOURCE: SEIA/WOOD MACKENZIE POWER & RENEWABLES

Oregon is projected to have steep growth in PV capacity additions over the next couple of years, potentially declining in 2020, then gradually increasing. The majority of historical capacity additions and projections through 2023 stem from utility-scale PV installations. Washington's solar market is expected to steadily grow over the next five years, with the majority of capacity additions from residential and utility-scale PV installations.

The national solar industry is also facing growth in emerging technologies such as solar + storage. Solar + storage projects are on the rise across the U.S. in response to policy changes. Net metering tariffs are being reduced, reconfigured, or eliminated, presenting the need for storage to ensure cost effectiveness of residential solar systems. Time-of-use rates are now being adopted in some states, providing an incentive for storage systems to capture energy for sale back to the grid during peak rate periods.

Solar companies could fill new roles as new technologies achieve market penetration. Some companies interviewed do not expect these technologies to change their business or the various roles of their workers. One company indicated that "there is still so much unknown and given that we are a small business, we would likely look to larger companies to fill this demand." Others said they feel it is important for their workers to be trained and knowledgeable about new technologies, especially storage projects, which some companies in Oregon and Washington have already begun installing. Companies mentioned the increased customer interest in solar + storage and will need to meet this demand through creation of more storage-specific jobs. Workers' specific roles may not change, but they should understand solar+storage and adapt their current roles to include this technology.

The industry is also adopting to state policy frameworks such as community solar, which is becoming more widespread in Oregon and Washington. In terms of community solar, companies mentioned the need for sales and community outreach specifically geared toward customers (subscribers). Along with knowledge of community solar, employees must also understand how to sell the program to subscribers. Oregon's community solar law requires that 10 percent of the capacity serve low-income customers. Therefore, employers will need to establish and develop community-based relationships to reach these residents. Hiring a diverse workforce from such communities can help companies reach out to customers to subscribe to these projects.

Actionable Items to Advance Diversity and Inclusion

The solar industry is still an emerging and growing industry that has the potential to be a leader in workforce diversity. Companies can implement the following report action items to help ensure the development of a thriving and diverse solar workforce, especially for people who have been underrepresented or marginalized in this space. Though this report specifically applies to Oregon and Washington, industry stakeholders across the country can apply many of these recommendations to make their solar and solar + storage workforce development practices more effective.

1. **Formally track and monitor employee demographics**. The first step to addressing diversity as a company-wide issue is to track current employee demographics. This information can be used as a baseline to monitor and inform specific diversity goals and milestones the company hopes to achieve.
2. **Create and disseminate transparent goals and metrics to all employees to promote diversity and inclusion.** Once companies begin tracking demographics, they can set specific goals and metrics that will ensure these goals are being met. These metrics should be tied to key organizational values and specific performance measures such as sales targets, customer acquisition, market penetration, and revenues. In addition, companies should provide new hires with an overview of the diversity and inclusion strategy and provide updates to employees about specific diversity and inclusion initiatives and the metrics tied to both practices. By creating transparent goals and metrics and disseminating this information to employees, this will create a culture that values and encourages workplace diversity and inclusion and holds employees and management accountable.
3. **Devote time and resources to building relationships with training providers to hire and train apprentices.** Solar companies can ensure there is a stable supply of licensed solar installers to meet hiring

needs by being directly involved in the training of solar installers. If companies do not become a training agent for LRT or electrician apprenticeships, it is impossible to address the challenges identified here and build out the skilled solar installation workforce. Not only should contractors become training agents, they should focus on reaching out to electrician training programs in their states to form professional relationships and encourage the career pathways available for solar installers. If training providers better understand the solar industry, they may encourage their apprentices to seek careers there. This broader solar company network will help to ensure that electrician apprentices are aware of solar installation as a possible career path. Forming these relationships with training providers will increase the likelihood that electrical apprentices are receiving training in solar installation.

4. **Devote the necessary time and resources to broaden hiring outreach to more diverse populations.** Solar companies should diversify their recruitment techniques well before they are looking to hire employees for a position, in order to ensure equitable access for diverse populations. Solar companies in Oregon and Washington can work with community-based organizations that have relationships with marginalized populations. Additionally, groups such as Oregon Tradeswomen and Washington Women in Trades host career fairs targeted specifically toward those underrepresented populations. Oregon Tradeswomen even offers technical assistance to employers looking to hire entry-level trades workers. Companies should work with such organizations to seek out different applicants outside of their known networks and pursue more targeted outreach and recruitment. Investing in these relationships and networks over time can build trust and directly impact outreach and diversity goals.
5. **Draft job descriptions to be more inclusive and encouraging to marginalized populations.** Companies should draft job descriptions that focus on lived experience rather than strict educational requirements. While there may be a long list of qualifications for a position in mind, it is important to limit this list so as not to turn people away before they even apply. Marginalized populations are less likely to apply for a job if they don't meet all of the requirements, as opposed to white, cis-gender males. Therefore, to encourage women, gender non-binary, and people of color applicants, companies should parse down their qualifications listed in job descriptions and focus more on lived experience rather than set skills and education requirements. In addition to this, companies should emphasize their commitment to diversity and inclusion in their job descriptions by going a step further past listing an “equal opportunity employer” statement. By putting this language in their own words, companies can emphasize to applicants their commitment to diversity.

Despite near-term challenges and policy changes, both the Oregon and Washington solar industries are expected to grow over the next five years, totaling over 2,000 MW of additional capacity across both states. Lower costs and state strategies and policies will drive this growth. It is essential that industry leaders, solar companies, training providers, and advocates understand the need for a robust workforce pipeline to meet new capacity additions and take advantage of emerging technologies such as storage. The action items outlined in this report will allow both Oregon and Washington to continue to grow an equitable and stable workforce to meet the needs of the growing solar industry.

Appendix A: Demographic results for Oregon and Washington compared to other Washington industries and the national solar workforce

Demographics	National Solar	OR & WA Solar	WA Overall	WA Construction	WA Manufacturing	WA Oil and Gas Extraction	WA Information
Male	73.7%	80.0%	51.7%	81.8%	73.1%	85.8%	67.5%
Female	26.3%	20.0%	48.3%	18.2%	26.9%	14.2%	32.5%
Gender Non-Binary	1.4%	0%	-	-	-	-	-

Demographics	National Solar	OR & WA Solar	WA Overall	WA Construction	WA Manufacturing	WA Oil and Gas Extraction	WA Information
Latinx	16.9%	4.8%	10.9%	13.0%	11.5%	6.4%	5.9%
Asian	8.5%	3.0%	9.7%	3.2%	12.0%	1.3%	22.0%
Black or African American	7.6%	2.1%	4.6%	2.9%	3.5%	0.8%	3.1%
White	73.3%	89.2%	79.8%	88.5%	79.5%	94.2%	70.8%
Native Hawaiian or Other Pacific Islander	1.2%	0.3%	0.7%	0.6%	0.8%	0.3%	0.3%
American Indian or Alaska Native	1.1%	0.6%	1.5%	1.7%	1.2%	1.6%	0.5%
More than one race	8.3%	0.0%	3.6%	3.1%	2.9%	1.7%	3.1%

Appendix B: Demographic results for Oregon and Washington compared to other Oregon industries and the national solar workforce

Demographics	National Solar	OR & WA Solar	OR Overall	OR Construction	OR Manufacturing	OR Oil and Gas Extraction	OR Information
Male	73.7%	80.0%	51.3%	80.8%	73.0%	84.9%	63.9%
Female	26.3%	20.0%	48.7%	19.2%	27.0%	15.1%	36.1%
Gender Non-Binary	1.4%	0%	-	-	-	-	-

Demographics	National Solar	OR & WA Solar	OR Overall	OR Construction	OR Manufacturing	OR Oil and Gas Extraction	OR Information
Latinx	16.9%	4.8%	11.5%	11.7%	14.8%	6.5%	6.7%
Asian	8.5%	3.0%	5.0%	1.8%	9.0%	0.8%	5.4%
Black or African American	7.6%	2.1%	2.6%	1.6%	2.1%	0.5%	2.1%
White	73.3%	89.2%	87.5%	92.2%	84.5%	95.3%	88.3%
Native Hawaiian or Other Pacific Islander	1.2%	0.3%	0.5%	0.4%	0.6%	0.0%	0.3%
American Indian or Alaska Native	1.1%	0.6%	1.4%	1.5%	1.5%	1.4%	0.8%
More than one race	8.3%	0.0%	3.0%	2.5%	2.4%	2.1%	3.0%

Appendix C: Report Resources

The following is a list of resources that may be helpful as companies develop strategies for advancing diversity and inclusion.

Apprenticeship in Washington

General information on becoming an apprentice in Washington, with links on how to become an apprentice, apprenticeship for employers, what you need to know, resources for women, rules and policies, Washington Apprenticeship and Training Council, calendar of events, and much more.

https://www.lni.wa.gov/TradesLicensing/Apprenticeship/default.asp

Apprenticeship & Non-Traditional Employment for Women (ANEW)

This pre-apprenticeship program for women is the oldest such program still running in the nation and provides training around technical skills, math skills, and improved fitness.

http://anewaop.org

Diversity and Inclusion Best Practices Guide for the Solar Industry

Guide for solar companies of all sizes to implement best practices to achieve company-wide diversity and inclusion, released by the Solar Energy Industries Association and The Solar Foundation.

https://www.seia.org/initiatives/diversity-inclusion

Find an Apprenticeship Program in Washington

Database with all active apprenticeship programs in Washington. The list can be narrowed down by location and occupation.

https://secure.lni.wa.gov/arts-public/#/

Girls Build

A summer camp based in Portland, Oregon, which teaches girls and non-binary kids ages 8-14 basic construction skills.

https://www.girlsbuild.org/

Limited Renewable Energy Technician (LRT)

Information for the LRT program in Oregon, including minimum qualifications, contact information, and application forms.

https://nwapprenticeship.org/apprenticeship-committees/renewable-energy-jatc-1126/

National Solar Jobs Census

Annual report from The Solar Foundation on solar employment nationwide and state by state, including demographic information for the solar workforce.

https://www.thesolarfoundation.org/national/

Oregon Apprenticeship and Training Division

List of apprenticeships and training providers for the programs in Oregon, including general journeyman electrician.

https://www.oregon.gov/boli/ATD/pages/ElectricianTrades.aspx

Oregon Tradeswomen

This program promotes women to enter the trades by providing pre-apprenticeship courses, career fairs, mentorship opportunities, and technical assistance for trades-focused organizations seeking to provide an inclusive work environment for women.

http://www.tradeswomen.net/

PowerPNW

A community of women and allies who work to generate a more inclusive renewable industry in the Pacific Northwest. Efforts include community networking events and projects focused on diverse workforce development and empowerment.

http://powerpnw.org/

Solar Training and Hiring Insights

Published by the Solar Training Network, a program led by The Solar Foundation, *Solar Training and Hiring Insights* explores the workforce challenges presented by rapid industry growth, and outlines the business case for investment in work-based learning. It emphasizes the

importance of practical experience, particularly for the installation sector, and explores the relative value of industry certification as workforce demand varies by region.

https://www.americansolarworkforce.org/resources/sthi/

U.S. Solar Industry Diversity Study 2019

A report by The Solar Foundation and the Solar Energy Industries Association which takes a comprehensive look at diversity and inclusion in the U.S. solar industry, based on a survey of hundreds of solar employers and employees. Includes information on career paths, wages, and company practices related to diversity and inclusion.

https://www.thesolarfoundation.org/diversity/

Washington Women in Trades

Provides information about apprenticeships, the organization's Trades Fair, and job boards.

http://www.wawomenintrades.com/about-us

Endnotes

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