The Clean Energy Technology Workforce in Washington

Workforce Training and Education Coordinating Board

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Washington Workforce Training & Education Coordinating Board

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I. EXECUTIVE SUMMARY

Background

Since its formation in September 2023, the Clean Energy Technology Workforce Advisory Committee, CETWAC, (pronounced 'set-whack") has coordinated with over 100 members representing business, labor, state agencies, tribal nations, educational institutions, non-governmental organizations, and apprenticeship programs. Led by co-chairs from both business and labor, CETWAC meets regularly to identify workforce needs, skill gaps, and barriers. The committee's work is deeply collaborative, aligning its strategies with other major state initiatives such as the Washington Climate Corps Network (WCCN), the State Board for Community and Technical Colleges (SBCTC), and the Employment Security Department's labor market analyses. CETWAC's efforts are closely coordinated with Washington's four-year workforce development plan, Talent and Prosperity for All (TAP), and the Energy Strategy formulated by the Department of Commerce.

CETWAC's mission is to convene stakeholders to discuss needs and opportunities, conduct research, and evaluate best practices across other jurisdictions to ensure Washington's workforce is prepared to meet the demands of a rapidly evolving clean energy sector, driving economic growth, climate resilience and good quality jobs.

Recent Developments

Federal incentives that once fueled optimistic clean energy job projections have largely been eliminated, creating uncertainty for Washington's workforce and business community. CETWAC is actively assessing these shifting dynamics and advancing a unified strategy that aligns employer and worker needs with state programs and resources to navigate the transition.

Key Findings

- Clean energy jobs are expected to remain in high demand despite rollbacks of federal incentives.
- Delays in project development and limited access to low-cost financing are slowing clean energy infrastructure and job creation.
- The clean energy workforce remains disproportionately white and male, leaving critical talent pools untapped.
- Employers, labor organizations, and educational institutions may find collaboration useful to their customers by expanding on-the-job training and paid internships.
- CETWAC's work directly supports and aligns with other statewide efforts to accelerate clean energy, advance technology workforce development, promote equity, and streamline regulatory barriers.

Policy Recommendations

Strengthen Registered Apprenticeships and Career and Technical Education (CTE) for Clean Energy

- Leverage existing training programs and institutions to scale proven models and promote equitable access to training across regions and populations.
- Clean energy technology education and training programs and registered apprenticeships need ongoing, flexible funding to grow.
- Resume a pilot grant program to assist clean energy apprentices and pre-apprentices to increase completion rates, including wraparound and other support services.
- Market opportunities in clean energy through a coordinated strategy, leveraging existing platforms such as Career Bridge and the PNW Center of Excellence for Clean Energy.
- Expand on-the-job training through public/private partnerships to address the growing demand and skillsets required for work in the clean energy sector.

Expand employment opportunities through supporting clean energy capital project acceleration

- Demonstrate the benefits of clean energy workforce opportunities in communities across the state to support efforts that accelerate clean energy capital projects, including:
    - Continuing work to accelerate clean energy permitting.
    - Easing access to low cost private-sector financing.
    - Expanding access to capital through public-purpose financing such as the Washington State Green Bank.

Advance Equity in Clean Energy Workforce Development for Underrepresented Groups

- Investigate opportunities to provide subsidized childcare for clean energy workers, students, and registered apprentices.
- Explore ways to incentivize employers to employ and retain individuals from disadvantaged populations. This includes providing education and training opportunities and support for on-the-job training, registered apprenticeships and career and technical education (CTE) opportunities.
- Support existing organizations and programs providing support services, including education, training, and registered apprenticeship wraparound services to underrepresented groups.

II. INTRODUCTION

The Climate Ready Communities legislation, HB1176 enacted in 2023, solidified a legislative focus on preparing Washingtonians to seize opportunities in the clean energy technology workforce. To advance these ambitions, business associations, governmental entities, labor groups, educational institutions, NGOs, training providers, registered apprenticeship providers, career schools, tribal nations and other stakeholders are building coalitions to respond to these opportunities at the state and local level.

Washington State is taking decisive action to lead the nation in clean energy transformation. The passage of the Climate Ready Communities legislation (HB 1176) in 2023 set a clear mandate: Support worker and employer needs in response to changing workforce requirements for clean energy technology. This report evaluates occupational training and skills already covered in existing training programs, new skills that can be integrated into existing training programs, occupations and skillsets that require new training programs to be developed, and resources needed to deliver training programs and support workers in the transition to clean energy technology. This report also included a feasibility study to evaluate a potential transition to retirement program to preserve income, medical and retirement benefits for workers close to retirement who face job loss or transition because of energy technology sector changes.

CETWAC staff have mobilized a coalition of business, labor, education, and government leaders to identify labor market trends, as well as current and projected workforce demand in both traditional and clean energy technology professions, the wage and benefits range of jobs within the clean energy technology sector, demographics of the traditional and clean energy technology sectors, an inventory of skills needed in clean energy technology jobs, and an analysis of how the skills and training of the existing workforce can fill those needs. The committee's research highlights both the promise and the urgency. Demand for clean energy jobs is growing, yet workforce shortages in some sectors, permitting delays, and underutilized training infrastructure threaten to slow progress. Clean energy jobs are expected to increase by an average of 2.95% annually until 2032. Growth in the aerospace sector is expected to grow 4% annually with mining and residential building construction work growing by 2.95% and 2.35% annually.[1]

This report highlights barriers to be addressed to accelerate workforce development by expanding access to existing training and educational opportunities and promoting equity across all communities. By leveraging existing partnerships and investing in proven strategies, Washington can secure its position as a clean energy leader—delivering economic growth, climate resilience, and good quality jobs. The recommendations herein are designed to guide legislative and executive action, ensuring that Washington's workforce is prepared to meet the demands of a rapidly evolving energy landscape.

[1] Employment Security Department's Clean Energy Workforce Report, 2025, Appendix J

III. CLEAN ENERGY TECHNOLOGY WORKFORCE ADVISORY COMMITTEE

Background

CETWAC was formed in September of 2023 and, consistent with its legislative mandate, is open to all interested parties. Membership in CETWAC includes, but is not limited to, business, labor, state agencies, NGOs, tribal nations, educational institutions, and registered apprenticeship programs and training providers from sectors affected by the transition to clean energy.

At more than 100 members strong, CETWAC is led by co-chairs, one from business and one representing workers, ensuring deliberations of the committee reflect a balance of employer and worker perspectives. Perry England, with MacDonald-Miller Facility Solutions, a Seattle-based design-build mechanical contractor, is the co-chair representing the business community. Todd Mitchell with the Heat and Frost Insulators and Allied Workers Local 7 insulators union is the co-chair representing the labor community. By uniting business and labor interests in a collaborative leadership role, CETWAC fosters a cohesive strategy to develop a robust and resilient workforce. This synergy positions Washington's clean energy sector as an innovative, competitive leader, benefiting both workers and businesses alike.

By fostering a cohesive strategy that unites employer and worker perspectives, CETWAC plays a crucial role in ensuring that both businesses and workers can thrive amidst the technological changes brought about by the clean energy transition, and emerging technology. This report serves as a call to action for policymakers to support these efforts, recognizing that a well-prepared workforce is key to maintaining Washington's leadership in clean energy innovation. The balanced and inclusive approach of CETWAC and the Workforce Board is instrumental in supporting policies and research to build a robust talent pipeline that will drive economic growth, enhance job quality, and promote social equity across the state.

The Role of the Workforce Board and Partner Agencies

CETWAC is modeled after the tripartite composition of the state's Workforce Board, with business and labor co-chairs and agency staff involved in the effort. The Workforce Board's leadership role and use of its proven strategies to address complex, multi-stakeholder issues are paramount. CETWAC is charged with recommending strategies to prevent workforce displacement, support job creation, and provide support for workforce-related changes to business and adversely impacted workers through the transition to a clean energy economy.

The Departments of Commerce and Ecology provide input and coordination with CETWAC to avoid duplication of efforts. The Employment Security Department (ESD) provides critical data gathering and analysis in analyzing jobs within the state and verifying job growth in clean energy fields meets projections. The Office of Financial Management, the entity responsible for the Washington Climate

Corps Network, has been an important partner in CETWAC workforce development activities in supporting service programs for young adults and veterans.

In addition to the duties involved in staffing CETWAC, Workforce Board staff engage with industry and labor groups and other partner initiatives to understand the economic pressures and workforce needs of clean energy industries in our state. Related state partner initiatives are outlined below.

Career and Technical Education Advancement

The U.S. Department of Education has recently approved the Energy and Natural Resources career cluster to be established as a standalone career and technical education (CTE) cluster supporting the efforts of K-12 and postsecondary educational providers to expose students and new workers to the opportunities for exciting careers in the clean energy sector. Planning is underway at the state level to explore implementation of the new energy and natural resources career cluster. CTE programs have been shown to increase awareness of and progression into industries for which they are associated.

Washington Climate Corps Network

The Washington Climate Corps Network (WCCN) was created to support and grow climate-related service opportunities for young adults and veterans with the objective of building low-carbon and climate-resilient communities, ecosystems, and economies while providing education, workforce development, and career pathways to young adults and service members, with a focus on overburdened communities.

Despite absorbing a significant funding reduction in 2025, WCCN staff leveraged insights from prior cycles to simplify the application process and expand the suite of technical assistance and resources available to applicants and grantees. These enhancements improved accessibility and encouraged participation from smaller and first-time organizations. Staff also advanced WCCN's strategic priorities by promoting biennial goals focused on energy innovation, carbon sequestration, and maritime sector development.

To strengthen program delivery and amplify impact, WCCN staff forged new partnerships and deepened collaboration with state agencies and mission-aligned NGOs. The team formalized several relationships through Memoranda of Understanding and initiated co-funding discussions with the newly established Washington State Green Bank and industry partners such as Maritime Blue. Staff also maintain active engagement with CETWAC to ensure alignment with statewide clean energy workforce development strategies.[2]

Career Connect Washington and Clean Energy Alliance

Career Connect Washington (CCW) is a statewide network of business, labor, education, and community leaders creating work-based and academic programs for young people in Washington to explore, prepare, and launch themselves into college and careers.

[2] Appendix B

CCW releases specific grants to sector leaders, such as industry associations, Centers of Excellence, sector-focused workforce development organizations and community-based organizations, to foster improved collaboration and coherency among employers to scale their work-based learning programs and create equitable opportunities for students. CCW chose leaders to support workforce development and collaborate with employers for 10 high-demand sectors.

The Cleantech Alliance, the sector leader for CCW in the clean energy sector, completed their updated sector strategy[3] in June 2025, with many of their recommendations aligning with CETWAC's. These include support and outreach for underrepresented groups, as well as accelerating career exploration and preparation programs. The full clean energy sector strategy is available in Appendix D.

Commerce

Commerce's Energy Division is managing various workforce development studies that will provide valuable data, findings, and recommendations that can help inform discussions with CETWAC. In the past year, Commerce has completed a Residential Energy Workforce Gaps Analysis[4], identifying a need for HVAC workers in our state. The Washington State Refinery Economic Impact Study[5] completed in 2025 evaluated the economic impact of oil refining in Washington and likely scenarios as the state transitions from dependence on fossil fuels. Key findings of this work include:

- Washington's refineries are major local employers and provide high wages compared to other local industries in the communities where they are located.
- Washington's refineries may be able to produce a significant amount of renewable or alternative fuels, although they are unlikely to match the current employment or production levels of the current five refineries in Washington.
- There are alternative industries that are well-aligned with many skillsets held by current refinery workers, although misalignment in timing, location, and demand may cause obstacles for workers.

Commerce is also completing an Electrical Transmission Workforce Study to explore workforce needs among line workers, and that information will be important for future work of CETWAC.

Department of Ecology

As part of the state's Comprehensive Climate Action Plan (CCAP), Commerce and the Washington State Department of Ecology (Ecology) are working on a project which includes a plan to address climate related responsive actions. There is a component of that effort which is expected to also include a section on the anticipated workforce shortages needed to fulfill the CCAP; identification of potential solutions and partners to address challenges to meet these needs; and identification of existing funding, programs, and policies that support these workforce needs. Ecology, Commerce and CETWAC

[3]Appendix D
[4]Appendix G
[5] Appendix F

agree there is significant overlap between this effort and the research required by CETWAC. This provides an opportunity to align the CCAP workforce plan with the CETWAC recommendations. For more on the CCAP, visit Washington Climate Partnership .

Employment Security Department

ESD provides regular labor market data to CETWAC. The most recent report[6] contained in Appendix J focuses on baseline employment and wage data for industries and occupations associated with clean, traditional, and mixed-source energy. The report contains the following:

- Current employment and wage data on clean, traditional, and mixed energy industries.
- Industry employment trends.
- Projected industry employment.
- Current employment and wage data on clean, traditional and mixed energy occupations, with a focus on primary areas of interest such as solar photovoltaic installers, electricians, weatherization and energy efficiency occupations, etc.
- Projected employment by occupation.
- The important role of the aerospace and maritime industries in Washington.

Clean energy industry definitions are aligned as much as possible with North American Industry Classification System (NAICS) codes used in existing reports from the U.S. Department of Energy, Energy and Employment report (USEER) and the Clean Energy Technology Transition Institute (CETI). Occupational codes are drawn from a review of the 2018 Standard Occupational Classification manual. Employment and wage data come from the Quarterly Census of Employment and Wages (QCEW) and ESD's quarterly unemployment insurance wage records. Projections data in this report are drawn from ESD's annual employment projections.

A subsequent report delivered to CETWAC in June 2025, incorporated feedback from the committee, provided updated employment snapshots with additional data, and demographic detail by industry from the Longitudinal Employer-Household Dynamics (LEHD) data set.

In addition, ESD's expertise has been indispensable as CETWAC grapples with the fact that "clean energy" is not well defined at the industry level nor the occupation level. While the North American Industrial Classification System (NAICS) and the Standard Occupational Classification System (SOC) definitions have adapted to emerging employment trends over the years, there is no current federal statistical standard for measuring clean energy employment.

ESD analysis is helpful to track consistent estimates over time. The Department of Energy annual Energy and Employment Report, USEER and the Clean Energy Transition Institute, NZNW data use U.S. Bureau of Labor Statistics (BLS) data as a basis for their estimates. They both use additional data and/or

[6] Appendix J

modeling to further refine the definition of clean energy employment. While ESD's industry and "occupation-first" approach lacks some of the clean energy specificity of the USEER and NZNW reports, it gains reliability by using a replicable and transparent process. This provides a valuable baseline for policy going forward.

It is also worth considering how Washington's clean energy sectors may differ from the national makeup. For example, neither USEER nor NZNW's transportation sectors include the aerospace or marine industries – both are major employers in Washington. While USEER provides excellent national estimates, state estimates are limited due to sample size and may not capture the nuance of local data.

ESD's research is critical to make sure the state is addressing the labor market impact on traditional energy and fossil fuel industries in Washington, as well as the aerospace and marine sectors. To fully address the state's climate change mitigation policies, this work also needs to evaluate the impact on the traditional energy workforce as the state transitions to cleaner energy sources. ESD's data allows CETWAC to verify employment projections by using data specific to Washington.

State Board for Community and Technical Colleges

SBCTC is a significant player in the implementation of HB 1176, the Climate-Ready Communities legislation. These efforts merit inclusion in this report, as cooperation and coordination with CETWAC has been significant. A recently released analysis[7] of the current capacity of our community college system in meeting our workforce needs is an important tool in understanding the post-secondary training and education landscape. The SBCTC recommendations[8] for development of the clean energy technology sector are a helpful distillation of the findings of their recent report.

The Pacific Northwest Center of Excellence for Clean Energy (COE), located at Centralia College, has become a significant player in our state clean energy technology landscape. The Clean Energy COE maintains a website which offers students, job seekers and educators energy education pathways and career maps that clearly show pathways of opportunities within clean energy, steps to reach those opportunities, and average salaries of workers in those careers.[9] The website is meticulously maintained and is an excellent supplement to Career Bridge , the popular, public-facing career and education platform operated by the Workforce Board. Because of the work by the COE for Clean Energy, CETWAC determined that setting up a separate Clean Energy career path and training website would be redundant with the Career Bridge site and the COE's current work.

State Workforce Plan Alignment

Ongoing CETWAC efforts directly align with the goals and priorities outlined in Washington State's four-year workforce development plan, Talent and Prosperity for All (TAP). By identifying critical skill gaps and workforce needs in the clean energy sector, this report supports the plan's objective of developing a skilled workforce that can drive economic growth and innovation. Moreover, it helps

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[7] Appendix H
[8] Appendix H
[9] https://cleanenergyexcellence.org

ensure that Washingtonians from all backgrounds have access to high-quality job training and education opportunities in this emerging industry, thereby promoting equity and inclusivity in the workforce.

TAP is guided by six strategic priorities designed to promote equity and success in the workforce. Each of these priorities, including youth, industry, systems integration, credential transparency, job quality, and performance accountability relate directly to the current and future work of CETWAC. These strategic priorities are in turn guided by three guiding principles: close economic disparities for marginalized populations, deliver comprehensive support for individuals with barriers to employment, and provide systemwide performance metrics and accountability.

CETWAC Activity

CETWAC meets approximately every other month throughout the year, and directs and analyzes research, identifying programs or policy needs. In addition, CETWAC staff engage in outreach activities throughout the year with committee members or their affiliates gathering updated information regarding clean energy technology workforce issues relevant to the task assigned by the Climate Ready Communities legislation.[10] CETWAC staff members also routinely research programs and best practices in other states to analyze other state efforts in clean energy workforce development and learn from those efforts. To that end, data and reports from partner groups including input from tribal nations,[11] NGOs, labor groups, industry and academia inform this work.

What is a Clean Energy Technology Job?

There does not seem to be a statewide definition of clean energy, or clean energy technology, and CETWAC members sometimes discuss whether energy activities, technology or dependent sectors are within the scope of our legislative charge. For the sake of coordination, and to avoid duplication of programs or activities, the committee and staff participate as much as possible in meetings or activities which touch or concern the Washington clean energy technology workforce.

In the annual Energy and Employment Report (USEER) the DOE defines clean energy jobs as those associated with "net-zero emissions aligned technologies," which include renewable energy, nuclear, non-fossil energy efficiency, zero emission vehicles, and carbon capture, utilization, and storage. In the state-level report, clean energy jobs have a more expansive definition that includes all energy efficiency and all traditional transmission and distribution (including that associated with fossil fuels) due to the statistical significance of data at the more detailed geographic levels.[12]

For the research described below, and to avoid double counting of energy jobs, the USEER counts a job in whichever technology category accounts for the majority of an employee's energy-related work time.

[10] Full meeting schedule can be found on the Workforce Board website: https://wtb.wa.gov/cleanenergy/
[11] Appendix D and K
[12] USEER full report, pg. xxvii (https://www.energy.gov/sites/default/files/2024-10/USEER%202024_COMPLETE_1002.pdf) and Appendix A, pg. A-1 (https://www.energy.gov/sites/default/files/2024-10/USEER%202024%20Appendices_1002_0.pdf).

Examples: 1) If a worker spends 60% of their time working in solar and 40% of their time working on electric vehicle charging infrastructure, that job would be considered in the solar technology area; 2) If a worker spends 60% of their time on a non-energy technology and 40% of their time on energy efficiency, that job would be counted as an energy efficiency job in USEER; 3) If a worker performs energy-related work for an employer who is not classified as an energy employer, their job would not be counted in the USEER (e.g., a city building code inspector or renewable energy procurement specialist for a software technology would not be counted under the DOE's current analysis).[13] An understanding of these parameters assists in the analysis of research in clean energy. Significant effort has been made to maintain a uniform system of identifying and categorizing the clean energy data at both the federal and state level for a true, apples-to-apples understanding.

[13] USEER full report, pg. xxvii (https://www.energy.gov/sites/default/files/2024-10/USEER%202024_COMPLETE_1002.pdf)

IV. CLEAN ENERGY WORKFORCE RESEARCH AND DATA GATHERING

Research Required by Climate Ready Communities Legislation

To effectively prepare new workers and help incumbent workers transition into clean energy jobs, Washington must first assess how well the state's existing education, training, and apprenticeship programs are adapting to emerging clean energy technologies and career paths. This assessment will help identify whether new programs are needed—or if appropriate programs are already in place. The legislative charge is as follows:

- Review workforce and business issues in direct employment in the energy sector, in its supply chain, and the impacts of the energy transition to dependent sectors.
- Recommend strategies to prevent workforce displacement, to support job creation in clean energy technology sectors, and to provide support for training in clean energy technology sectors, and to provide support for workforce-related changes to businesses and for adversely impacted workers.
- The biennial report will include an evaluation of the workforce impacts of Washington's climate policies including:
    - ✓ Labor market trends and current and projected workforce demand in both traditional and clean energy technology professions and restructuring of jobs and adjusted skillsets associated with climate change mitigation policies.
    - ✓ Wage and benefits range of jobs within the clean energy technology sector. Demographics of the traditional and clean energy technology sectors.
    - ✓ Inventory of skills needed in clean energy technology jobs; an analysis of how the skills and training of the existing workforce can fill those needs.
    - ✓ Identification of additional workforce development needs in this sector.
    - ✓ Key challenges that could emerge under multiple future decarbonization scenarios based on factors such as rates of adoption of various new energy technologies; growth in demand for clean electricity, and changes in energy production and availability from both in-state and out-of-state sources.

CETWAC members have been examining a range of data to better understand current workforce demographics and how the workforce is preparing for a predicted rise in clean energy job opportunities. To meet the requirements of the Healthy Environment for All (HEAL) Act (RCW 70A.02), Washington's workforce development system must also track age, gender, racial data, and more. This is essential to determine whether current programs are making a difference in effectively reaching communities overburdened by pollution and helping those individuals who may historically face barriers to good jobs. These insights will help ensure our state's policies incorporate equity into planning and implementation to ensure a balanced, accountable approach to workforce development.

Transition to Retirement Feasibility Study

In addition to the research described above, in fulfilling the legislative charge related to the Climate Ready Communities legislation, the Workforce Board, with input from the drafters of the Climate Ready Communities legislation and other partner organizations, was tasked with exploring the feasibility of a program to ease the transition from career to retirement—for near retirement age workers displaced because of the state's climate policies. The Transition to Retirement Feasibility Study evaluated the Washington State Refinery Economic Impact Study for a sense of the number of workers potentially impacted by the state's climate policies specifically related to a decreased reliance on fossil fuels. In addition, the consultants hired by the Workforce Board, BERK Consulting, evaluated retraining expenses associated with typical dislocated worker programs, as well as the cost of providing medical insurance, pay and benefits for near retirement workers impacted by the state's climate policies. This feasibility study was completed in spring 2025 with the following conclusions.[14]

Potential Transition to Retirement Program Components: A key concern of Washington workforce stakeholders is the lack of options that older workers have when faced with job loss through no fault of their own. Retraining programs often take time, and older workers may see those programs as unhelpful given the length of re-training and their proximity to retirement. Access to health insurance and retirement benefits are a priority for workers close to retirement. As a result, the program design included options for individuals to seek reemployment through retraining or to pursue early retirement while preserving the income and benefits they expected to have at retirement age.

The feasibility study includes wage subsidies and healthcare premium subsidies to support eligible workers. It also supports eligible workers who seek reemployment or retraining by connecting them to existing programs that provide training cost assistance and job search services. Although federal laws protect retirement income benefits, such as Social Security and retirement savings, they may not be able to replace insurance benefits or pensions.

Number of Affected Workers Near Retirement: We estimate a net loss of approximately 13,000 direct jobs from 2021 to 2050, with 17% of the workforce in affected sectors between the ages of 55 and 64, and 6% age 65 or older. The number of workers near retirement age varies depending on workforce retirement age for a given sector and occupation.

For a workforce retirement age of 65 or under and a near retirement threshold of 18 months, approximately 330 total workers would be eligible for the program. For a workforce retirement age over 65, we estimate approximately 120 workers would be eligible.

Estimated Program Costs: The estimated costs of any transition to retirement program are sensitive to program design factors that impact the number of eligible workers and per-worker costs. Per-worker

[14] Appendix A

costs may vary for contract workers and unionized workers. There may also be additional administrative factors to consider, such as the potential costs of certifying workers for eligibility. To account for the variation in wages across affected sectors, legislative requirements for workforce pay in high-risk settings, and workforce tenure of eligible workers, we estimated eligible worker wages based on an employment-weighted 75th percentile wage. With 100% coverage of wage subsidies, the average annual cost to the program to provide wage subsidies is $76,648 per worker. Adding the cost for providing healthcare premium subsidies, we estimated that the annual program cost per worker ranges from $76,648, assuming Medicare eligibility (which incurs no additional cost to the program), to $93,784, assuming a family healthcare plan.

With 100% wage subsidies, the program costs for a workforce retirement age of 65 or under range from $1,177,980 per year, assuming job losses occur steadily every year, to $5,693,572 per period, assuming job losses occur periodically every five years. For a workforce retirement age over 65, the program costs range from $339,791 per year with a steady pattern of job losses to $1,652,324 per period assuming a periodic pattern of job losses.

The feasibility of implementing a Transition to Retirement program involves both policy and cost considerations. On the policy side, public interest, societal costs, and equity concerns are central. On the cost side, while per-participant costs may exceed those of other worker benefit programs, they reflect comprehensive benefits designed to support workers after job loss, ensuring no significant loss of income or benefits.

See the full Transition to Retirement Feasibility Study in Appendix A.

V. CLEAN ENERGY WORKFORCE DATA AND ANALYSIS

To effectively prepare new workers and help current workers transition into clean energy jobs, Washington must first assess how well the state's existing education, training, and apprenticeship programs can adapt to emerging clean energy technologies and career paths. This assessment will help identify whether new programs are needed—or if they simply duplicate what's already in place.

CETWAC members have been examining a range of data to better understand current workforce demographics and how the workforce is preparing for a predicted rise in clean energy job opportunities. Data presented by the U.S. Department of Energy and the Clean Energy Transition Institute, CETI, are often used to predict future workforce needs. To meet the requirements of the Healthy Environment for All (HEAL) Act (RCW 70A.02), Washington's workforce development system must also track age, gender, race, and more. This is essential to determine whether current programs are making a difference in effectively reaching communities overburdened by pollution and helping those individuals who may have historically faced barriers to quality jobs. These insights inform environmental justice into planning and implementation to ensure a balanced, equitable approach to workforce development.

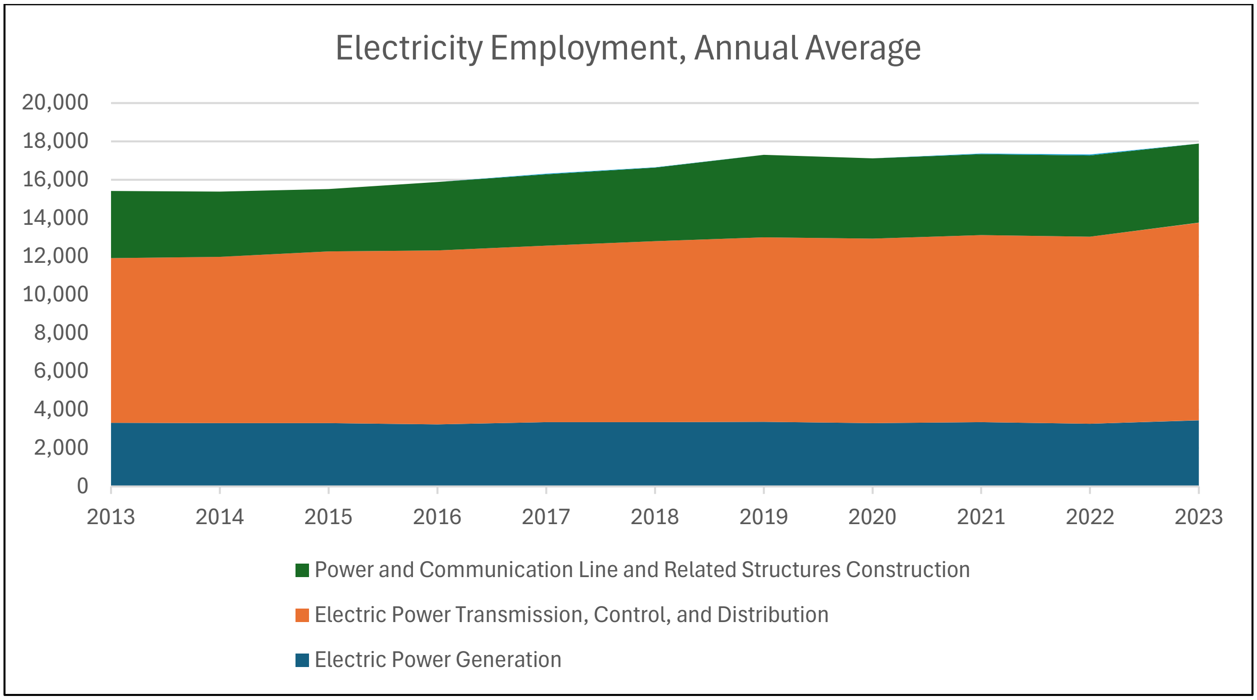
Washington's Clean Energy Data

To identify clean energy industry employment and wage trends, Washington's Employment Security Department (ESD) analyzed industry employment and wage data through the Quarterly Census of Employment and Wages (QCEW), which collects information from employers each quarter and provides detailed information on employment and wages across industries and regions within the state. QCEW uses standardized industry codes to track jobs and wages across the state and by county, but these codes don't clearly define clean energy industries. To address this, the report organizes clean energy employment into four major sectors based on frameworks from the U.S. Department of Energy and the Net Zero Northwest report.[15] The four major sectors analyzed are:

1. **Electricity**: electric power generation, distribution, transmission and control. Also included are power and communication line and related structures construction.
2. **Buildings**: residential and nonresidential construction, specialty residential and nonresidential construction, heavy and civil engineering construction, and steam and air-conditioning supply.
3. **Fuels**: natural gas extraction, distribution, transportation, coal mining, petroleum and petroleum product transportation, drilling oil and gas, support activities for oil and gas, and oil and gas related construction and manufacturing.
4. **Transportation**: manufacturing and repair of motor vehicles, motor vehicle parts, or motor vehicle body and trailers, and motor vehicle wholesalers.

[15] For a detailed analysis of the clean energy workforce by the state's Employment Security Department, including industry and occupation employment and wage trends, demographics, and employment projections, see Appendix J.

To reflect Washington's unique economic landscape, the report also includes aerospace and maritime industries as supplemental categories due to their energy intensity and workforce significance.



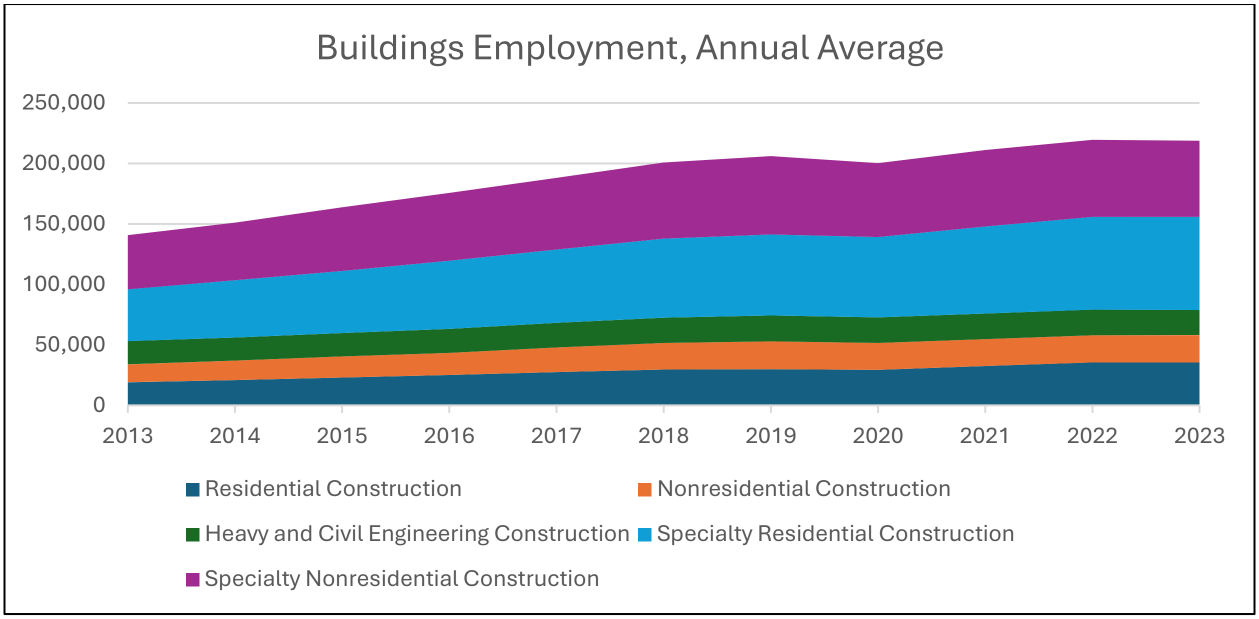
Source: ESD (Quarterly Census of Employment and Wages) *note: no data disclosed for Battery Manufacturing

<u>Electricity:</u> In 2023, Washington's electricity sector employed 17,887 workers, reflecting a 3.3% increase over 2022 and a 16% growth since 2013. The largest subsector—electric power transmission, control, and distribution—accounted for 10,308 jobs, underscoring its central role in grid operations and reliability. Power and communication line construction supported 4,132 positions, while electric power generation employed 3,447 workers, highlighting continued demand for skilled labor across the state's energy infrastructure. This upward trend signals sustained momentum in the sector's workforce development and its critical contribution to Washington's clean energy transition.

Washington's top posted electricity industry occupations from October 2024- September 2025 were project management with 190 unique postings, electrical engineers (177), sales representatives (122) and construction managers (85), according to Lightcast data.[16] *Lightcast is a data scrubbing company that provides global labor market data and analytics, including aggregating and analyzing large datasets including job postings, worker profiles, skills, and compensation information*. Of these jobs, nearly half (48%) required at least a bachelor's degree and 11% required an associate's degree, while 25% required a high school diploma or equivalent and 30% had no listed educational requirements. Project management skills were the most in-demand skills in these job postings, requested in 31% of total

[16] Workforce Board staff monitored Lightcast data for clean energy workforce job postings from October 2024-September 2025.

postings followed by regulatory compliance (20%), accounting (15%), construction (13%), and finance (13%). Each of these skills are projected as growing or rapidly growing relative to the market.

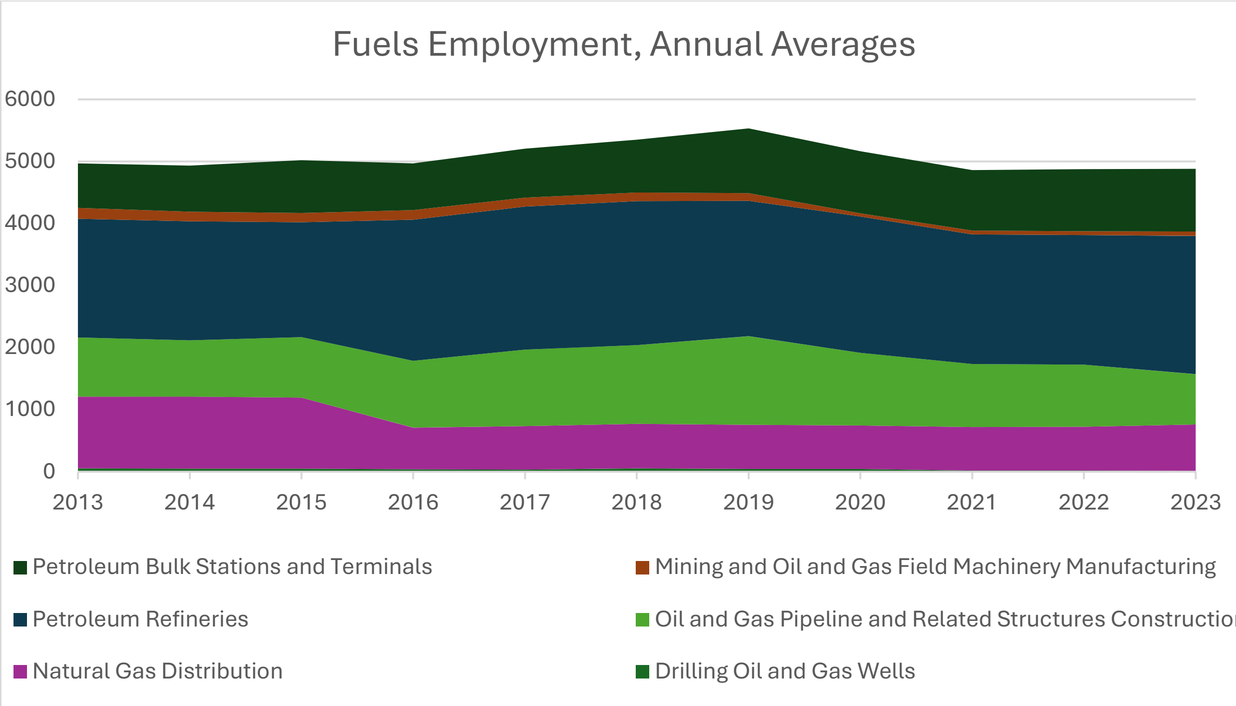


Source: ESD (Quarterly Census of Employment and Wages) *note: data not disclosed for Steam and Air-Conditioning Supply

<u>Buildings:</u> Washington's buildings sector continues to play a pivotal role in clean energy workforce development. The sector employed 218,882 workers—representing a slight 0.3% decline from the previous year but a robust 56% increase compared to 2013. Specialty residential construction led employment with 77,062 jobs, followed by specialty nonresidential construction (63,073), residential construction (35,336), nonresidential construction (22,744), and heavy and civil engineering construction (20,667). These subsectors reflect the scale and diversity of labor supporting energy-efficient building practices, advanced systems integration, and sustainable infrastructure across the state.

Construction managers were the most sought-after role in the industry with 614 unique postings from October 2024 through September 2025.[17] This was followed by project management specialists (493), carpenters (357), construction laborers (3354), and civil engineers (326). More than half of all building job postings (55%) listed no educational requirements, while 29% required a bachelor's degree and 15% called for a high school diploma or GED. The frequently requested specialized job skill was for construction skills, occurring in 37% of total postings, followed by project management (25%), subcontracting (22%), construction management (16%), and carpentry (9%).

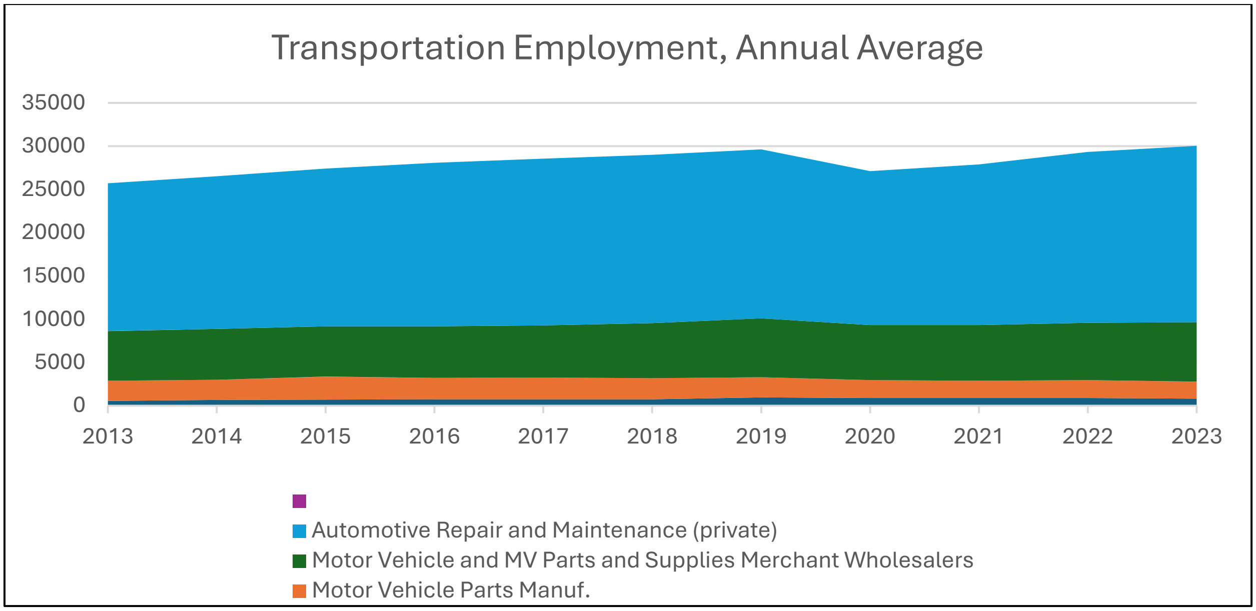
[17] Workforce Board staff monitored Lightcast data for clean energy workforce job postings from October 2024-September 2025.



Source: ESD (Quarterly Census of Employment and Wages)
*Note: data not disclosed for pipeline transportation of natural gas, support activities for oil and gas operations, refined petroleum product pipeline transport, coal mining, and natural gas extraction

Fuels**:** Washington's fuels sector employed 4,997 workers in 2023, reflecting a slight decline of 0.36% from 2022 and a 2.65% decrease compared to 2013. Petroleum refineries represented the largest share of employment within the sector, accounting for 2,228 jobs, followed by petroleum bulk stations and terminals with 1,012 positions. These figures highlight the sector's gradual contraction amid broader shifts toward low-carbon energy sources and underscore the importance of workforce transition strategies as clean energy technologies reshape traditional fuel industries.

The fuels sector is the smallest clean energy sector in Washington in terms of total employment. Job postings are dominated by one role: heavy and tractor-trailer truck drivers, with 366 unique postings—far outpacing other occupations. The next most common were customer service representatives (144), cashiers (58), project management specialists (38), and automotive and watercraft service attendants (35). This limited range of specialized roles reflects Washington's minimal fuel extraction activity and relatively small refining workforce. Unlike other clean energy sectors, job postings in the fuels sector featured fewer specialized technical skills. Instead, the most in-demand skills focused on customer service and support roles—with food service appearing in 15% of postings, followed by (cash handling (14%), cash register operations (13%) and loss prevention (12%). Demand for workers with more technical skills was smaller, with 11% of job postings needing truck driving skills, along with flatbed truck operation (10%), refinery experience (7%), and machinery (6%). The sector required the least amount of postsecondary education of the four clean energy sectors with about a quarter of positions requiring a bachelor's degree (27%) and 6% for an associate's degree. Nearly half of the positions (48%) had no education requirements listed, with 26% calling for a high school diploma or equivalent.



Source: ESD (Quarterly Census of Employment and Wages) *note: data not disclosed for motor vehicle manufacturing

Motor Vehicle Transportation: Washington's transportation sector employed 30,043 workers in 2023, marking a 2.4% increase over 2022 and a 16.8% rise since 2013. Automotive repair and maintenance led the sector with 20,380 jobs, reflecting strong demand for skilled labor in vehicle servicing and efficiency upgrades. Merchant wholesalers of motor vehicles and parts followed with 6,878 positions, while motor vehicle parts manufacturing supported 1,951 jobs and motor vehicle body and trailer manufacturing accounted for 834. These subsectors represent key components of the clean energy transition, particularly as electrification and advanced vehicle technologies reshape transportation workforce needs.

Aerospace: In 2023, the aerospace sector—including aircraft manufacturing—employed 79,676 workers. Of these, 77,420 worked in aerospace products and parts manufacturing, while 2,256 were employed in support activities for air transportation. Over the past decade, employment in this sector declined gradually, with a sharp contraction during the 2020–2021 period, which reflected the start of the pandemic. The industry began to recover in 2023, posting an 8.4% increase in total employment compared to 2022, although employment remained 18.6% below 2013 levels.

Excluding aircraft manufacturing, aerospace employment totaled 12,057 in 2023. The largest contributor was the manufacturing of other aircraft parts and auxiliary equipment, which accounted for 9,429 jobs. Support activities for air transportation followed with 2,256 jobs, and aircraft engine and engine parts manufacturing contributed 372 jobs. These industries experienced steady employment growth throughout the last decade, peaking in 2019, before suffering significant losses during 2020–2021, reflecting the start of the pandemic. Employment rebounded modestly in 2023, rising 3.4% from the previous year, but again remained well below the 2019 peak.

Maritime: Comprised of four key industries of transportation equipment and supplies (excluding motor vehicles) merchant wholesalers, ship building and repairing, boat building, and other support activities for water transportation, the maritime transportation sector employed 20,025 workers in 2023, marking a 1.6% increase from the previous year. Ship building and repairing represented the largest share of employment, accounting for 16,389 jobs.

Washington's clean energy transportation sector - including motor, aerospace, and maritime industries - continues to generate strong workforce demand across a range of technical and professional roles. Between October 2024 and September 2025, the most frequently posted occupation was Automotive Service Technicians and Mechanics, with 1,280 unique job postings, followed by software developers (728), customer service representatives (659), mechanical engineers (518), other computer-related roles (511), and industrial engineers (425). Education requirements varied widely: 42% of postings required a bachelor's degree, 21% required a high school diploma or GED, 17% called for a master's degree—driven in part by the presence of major aerospace employers such as Boeing, SpaceX, Blue Origin, and GE Aerospace—and 38% listed no formal education requirement. Specialized skills in high demand included export control (23% of postings), project management (12%), computer science (9%), continuous improvement (8%), Python programming (8%), and space flight (8%), reflecting the sector's advanced technical profile. This data highlights the need for targeted training pathways and industry-aligned education to meet evolving labor market demands in clean energy transportation.

Salaries Associated with Energy Technology Occupations

The Occupational Employment and Wage Statistics (OEWS) survey, conducted by ESD in partnership with the U.S. Bureau of Labor Statistics, surveys employers across Washington and provides job and wage estimates for hundreds of occupations across the state, using data collected over three years. While past clean energy reports have focused on industries and technologies, they've paid less attention to specific occupations. The data in this report compiled by ESD shifts the focus to jobs themselves, identifying likely clean energy roles based on stakeholder input and alignment with previous studies. The occupations selected for analysis reflect both community priorities and broader industry trends and are split into four groups for clarity as follows:

1) **Clean energy generation and energy grid occupations:** nuclear engineers and technicians, power plant operators, wind turbine service technicians, power distributors and dispatchers, and electrical power-line installers and repairers.
2) **Energy efficiency occupations:** construction trades involved with energy efficiency or weatherization including electricians, insulation workers, plumbers, pipefitters and steamfitters, roofers, and miscellaneous construction and related workers.
3) **Engine maintenance and repair occupations:** mechanics and service technicians who focus on engine-based transportation.
4) **Fossil fuel occupations:** petroleum engineers and petroleum pump system operators.

According to the most recent (2023) OEWS survey, Washington employed 78,180 workers in clean energy-related occupations. The largest share - 46,340 jobs - was in energy efficiency roles. This was followed by engine maintenance and repair (25,730), clean energy generation and grid occupations (5,470), and fossil fuel roles (640). Electricians represented the largest single occupation with18,820 jobs, followed by automotive service technicians and mechanics (12,390), plumbers, pipefitters and steamfitters (10,860), HVAC mechanics and installers (8,140), and diesel engine specialists (6,590). Wages varied widely, with petroleum engineers earning the highest average annual salary at $149,237, followed by power distributors and dispatchers $143,562, power plant operators $125,485, nuclear engineers $121,810, and electrical power-line installers and repairers $113,145.

Clean Energy Generation and Energy Grid: In 2023, Washington had 5,470 jobs in clean energy generation and energy grid occupations. Electrical powerline installers and repairers made up the largest group, with 2,830 positions. Power distributors and dispatchers earned the highest average annual wage at $143,562, while wind turbine service technicians earned the lowest at $72,057. These roles highlight the range of skills and pay levels within the state's energy infrastructure workforce.

Energy Efficiency: Washington's energy efficiency sector supported 46,340 jobs across a range of skilled occupations. Electricians made up the largest share, with 18,820 positions and the highest average annual wage at $91,883. Roofing helpers earned the lowest average wage among these roles, at $44,895 per year.

Engine Maintenance and Repair: Engine maintenance and repair occupations accounted for 25,730 jobs across Washington in 2023. Automotive service technicians and mechanics represented the largest share of this workforce, with 12,390 positions. Aircraft mechanics and service technicians earned the highest average annual wage at $84,714, while motorcycle mechanics received the lowest at $52,766. These roles reflect a broad range of technical skills and compensation levels within the transportation maintenance sector.

Fossil Fuels: There are limited, though specialized and relatively lucrative, opportunities in Washington for fossil fuel-related occupations, with 640 jobs across the state in 2023. Petroleum engineers earned the highest average annual wage within this group at $149,237, while petroleum pump system operators, refinery operators, and gaugers received an average wage at $92,252.

Demographics

Utilizing U.S. Census Bureau data, which combines federal and state data to track employment trends by industry, location, and worker characteristics, ESD compiled demographic analysis of Washington's clean energy workforce. This dataset reflects 2023 averages for sex, age, education, and race or ethnicity across clean energy industries. These industries are grouped into five categories: electricity, fuels, buildings, motor vehicle transportation, and aerospace and maritime transportation.[18]

[18] For a detailed analysis of the clean energy workforce by the state's Employment Security Department, including industry and occupation employment and wage trends, demographics, and employment projections, see Appendix J.

Gender: Across all clean energy sectors, men make up a larger share of the workforce than the statewide average of 52%. Electricity jobs are 73% male, followed by aerospace and maritime transportation at 76%, buildings and motor vehicles together 78%, and fuels, 81%. While some industries are more balanced, none match the statewide gender split. The most balanced industries include support activities for air transportation at 65% male, electric power generation and distribution at 67%, and water, sewage, and other systems, 68%. The most male-dominated industries are other pipeline transportation 89% male, pipeline transportation of natural gas at 86%, and motor vehicle body and trailer manufacturing 85%.

From 2013 to 2023, the share of female workers grew in 19 clean energy-related industries, declined in four, and remained mostly unchanged in three (in some cases, data was not available for both years). The biggest gain was in support activities for air transportation, where the percentage of female workers rose from 25% to 35%. Building finishing contractors saw a 7% increase, and foundation, structure, and building exterior contractors rose by 6%.

Age: In 2023, 66% of Washington's workforce was in the prime working age group of 25 to 54, while 11% were 24 and younger, and 23% were 55 and older. Motor vehicle industries had the highest share of younger workers at 15%, while electricity, aerospace and maritime, and fuels had lower rates ranging from 5% to 6%. Older workers were more common in aerospace and maritime (29%), fuels (26%), and electricity (25%), with most of the variation driven by workers aged 55 to 64. Between 2013 and 2023, the workforce age distribution widened, with more young and older workers across sectors - especially in motor vehicle manufacturing and building finishing contractors, which saw notable increases in both age groups.

Education: Across Washington, 29% of workers hold a bachelor's degree or higher, followed by 27% with some college or an associate's degree, 21% with a high school diploma, and 11% with less than a high school education. Educational data isn't available for workers aged 24 and younger, who make up 11% of the workforce and may continue their education. Clean energy sectors tend to have fewer bachelor's degree holders than the statewide average—fuels (23%), motor vehicles (20%), and buildings (19%)—though some industries stand out, such as motor vehicle manufacturing (38%) and electric power generation (35%). Across all clean energy sectors, the most common education level is some college or an associate's degree, with fuels leading at 33%. Fuels and buildings have the highest share of workers with only a high school diploma, while buildings and motor vehicles show the highest rates of workers with less than a high school education, reflecting their younger workforce.

Race and Ethnicity: The clean energy workforce in Washington has a higher share of workers identifying as white alone compared to the statewide average of 76%. This is most evident in fuels (88%), electricity and buildings (both 86%), and motor vehicles (83%). Aerospace and maritime industries are more diverse, with 73% identifying as white alone and 15% as Asian alone—higher than the 12% statewide average. These sectors also have the highest share of Black or African American workers at 6%, driven by roles in air and water transportation support.

Workers identifying as American Indian or Native Alaskan, Native Hawaiian or Pacific Islander, or as two or more races appear in similar proportions to statewide averages. Hispanic or Latino workers make up 13% of the statewide workforce, with higher representation in the buildings sector (17%) and lower in aerospace and maritime (8%). Within specific industries, building finishing contractors (26%) and foundation and exterior contractors (24%) have the highest shares of Hispanic or Latino workers.

From 2013 to 2023, most industries saw a decline in the share of workers identifying as white alone. The largest increases in non-white representation occurred in motor vehicle manufacturing (up 10.6%), aerospace manufacturing (9.6%), and air transportation support (8.7%). One exception was electrical equipment manufacturing, where the share of white workers rose by 8% during a period of workforce contraction linked to the COVID-19 pandemic. Several industries also saw notable growth in Hispanic or Latino representation, especially in machinery manufacturing and building trades.

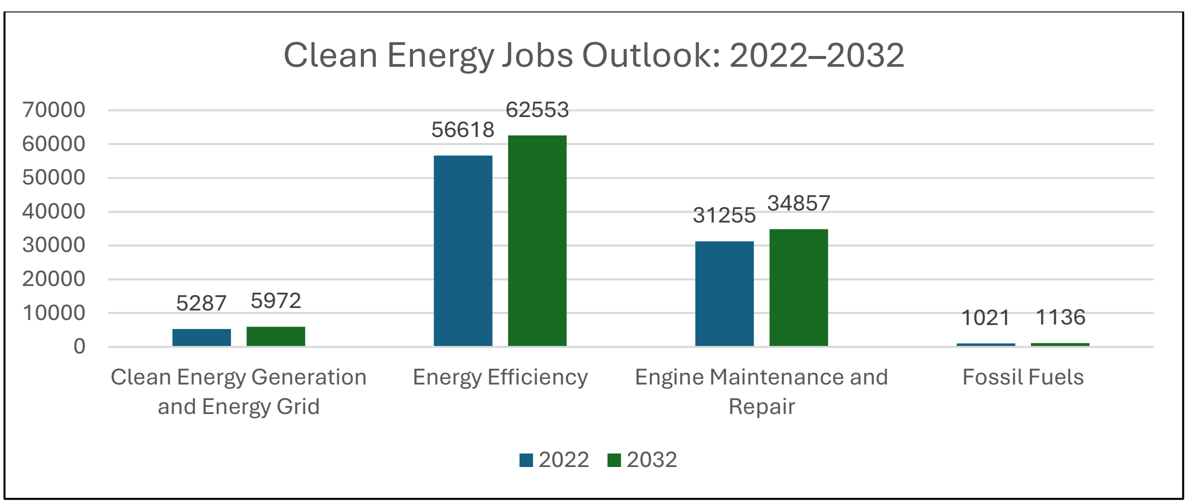
VI. CLEAN ENERGY WORKFORCE PROJECTIONS

Occupation: Clean energy occupations in Washington are projected to grow by 10,337 jobs between 2022 and 2032. Most of this growth will come from energy efficiency roles, which are expected to add 5,935 jobs, followed by engine maintenance and repair (3,602), clean energy generation and grid occupations (685), and fossil fuel-related roles (115). Electricians lead the growth with 2,506 new jobs expected, followed by automotive service technicians and mechanics (1,980), plumbers and pipefitters (1,206), HVAC mechanics (980), and diesel engine specialists (829). While most occupations show growth, motorboat mechanics and motorcycle mechanics are expected to see small declines.

Industry: Between 2022 and 2032, clean energy industries are expected to add 36,996 jobs—or 46,386 when including aerospace and maritime transportation. The buildings sector leads projected growth, with residential construction expected to add 10,154 jobs, followed by building equipment contractors (6,010), aerospace manufacturing (5,599), building finishing contractors (4,775), other specialty trades (4,196), and nonresidential construction (3,896).

Automotive repair and maintenance are projected to add 2,550 jobs, making it the fastest-growing transportation industry outside aerospace. In the electricity sector, power generation, transmission, and distribution are expected to grow by 829 jobs. Growth in the fuels industry remains limited, with petroleum and coal products manufacturing adding just 338 jobs. Three industries are expected to lose jobs: motor vehicle parts manufacturing (-185), motor vehicle body and trailer manufacturing (-138), and machinery manufacturing for agriculture, construction, and mining (-93).

Annual growth rates across energy industries range from -1.63% to 2.95%, with most sectors showing moderate gains. The fastest-growing industries include support activities for air transportation (3.96%), support activities for mining (2.95%), residential building construction (2.35%), other specialty trade contractors (1.97%), electric power generation and distribution (1.96%), and nonresidential building construction (1.57%). Motor vehicle body and trailer manufacturing are projected to shrink the fastest, declining by 1.63% per year.



Source: ESD (Occupational Employment and Wage Statistics)

VII. CLEAN ENERGY WORKFORCE AREAS OF IMPACT

Washington's clean energy workforce faces critical training and awareness gaps that limit access to high-demand careers and leave valuable CTE, registered apprenticeship, and degree programs underused—hindering both individual opportunity and the state's clean energy future. Regional energy demand will continue to increase in the coming decades, with electricity use expected to more than double from 2021 to 2050.[19] Across the northwest (Washington, Oregon, Idaho and Western Montana), average annual energy usage is projected to grow at 2.6% from 2027 – 2046.[20] In addition to electricity generation, clean energy transformation will require significant investments in other sectors such as construction, transmission, transportation, hydrogen, carbon capture, and other emerging technologies.

As job growth accelerates, employers will face increasing challenges in finding qualified candidates, underscoring the need for stronger alignment between education systems and workforce needs. Despite growing demand for skilled labor in clean energy occupations, existing Career and Technical Education (CTE) programs, registered apprenticeships, and four-year degree tracks remain underfunded and unevenly accessed. Without strategic investment and coordination, including flexible funding for 122 clean energy programs, targeted grants for pre-apprentices, and a statewide marketing strategy, many workers and students lack the support and information needed to pursue clean energy careers. Additionally, limited access to training records prevents workers from demonstrating transferable skills to employers. This disconnect threatens Washington's ability to meet its climate and economic goals and risks leaving underserved populations behind in the clean energy transition.

Beyond projected job growth, the state must also fill numerous positions due to workforce retirements.

> *"80% of [Pacific County PUD] workforce is retiring in two years. Of the staff of 55, that's 44 who are scheduled to retire. I asked other PUDs and the average loss over the next two years is around 40 percent. Most middle to upper management is retiring and taking experience with them."*[21]

Many employers reported difficulty hiring qualified clean energy workers, with 89% of surveyed employers indicating they had job openings in the past 12 months. However, not all these employers were able to find a suitable hire. Some 17% of employers, despite having openings, did not hire within that same period. Overall, 46% of surveyed employers with job openings reported difficulty filling positions. The most common reason employers had difficulty hiring were applicants' lack of education, certification, training, or work experience necessary to do the job (65% of respondents), followed by lack of experience (61%), and low number of applicants (39%).[22]

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[19] Evolved Energy Research. Net-Zero Northwest Energy Pathways Analysis Technical Report, June 2023. https://www.nznw.org/files/energy-technical-report

[20] Northwest Power and Conservation Council, 9th Power Plan Demand Forecast, April 2025. 2025_0429_2.pdf

[21] Workforce Board 2025 CETWAC Clean Energy Workforce Survey Findings; Appendix L

[22] Note* The 2024 CETWAC Clean Energy Workforce Survey is conducted as a convenience survey, not a randomized scientific survey.

Of the 86% of surveyed employers who reported workforce challenges in the past 12 months, the largest share (46%) identified finding qualified candidates as their biggest challenge.

These small-scale survey results echoed those of a much larger, statewide Employer Needs and Practices Survey produced by the Workforce Board in June 2025. That survey included responses from nearly 3,000 employers and investigated workforce needs and engagement with the state workforce system, as well as hiring practices, incumbent worker training, and other workforce issues.[23] Meanwhile, nearly 60% of employers not using the state's public workforce system said they were unaware of these resources.[24]

To address these challenges, more than half of surveyed employers (52%) expressed interest in partnering with educational institutions to develop clean energy workforce training programs. Given that many registered apprenticeship pathways already exist in clean energy occupations, employers can support workforce development by participating in these established programs rather than creating new ones. This is reflected in another employer survey response to the question of where Washington state government could support workforce needs and practices as it pertains to transitioning to a carbon net-zero energy: "Expand apprenticeships and internships, make them paid opportunities, develop programs that help the workforce gain `soft skills,' and lastly, consider needs beyond the trades."[25]

It is worth highlighting that a recent white paper[26] authored by the Washington Building and Construction Trades paints a different picture of the workforce situation. They report that many workers, in all construction trades, are trained and available to work. This difference between employer perspectives and the availability of trained workers identified by Washington Building and Construction Trades leaders highlights an area which could benefit from further work in the years ahead. Continuing to explore ways to put these skilled tradespeople to work will be part of the ongoing effort to address the clean energy workforce needs in our state.

Clean energy occupations in Washington offer competitive wages, with many providing family-sustaining incomes well above state averages. These wage patterns underscore the economic value of clean energy careers and highlight the importance of expanding access to training and employment pathways for disadvantaged populations.

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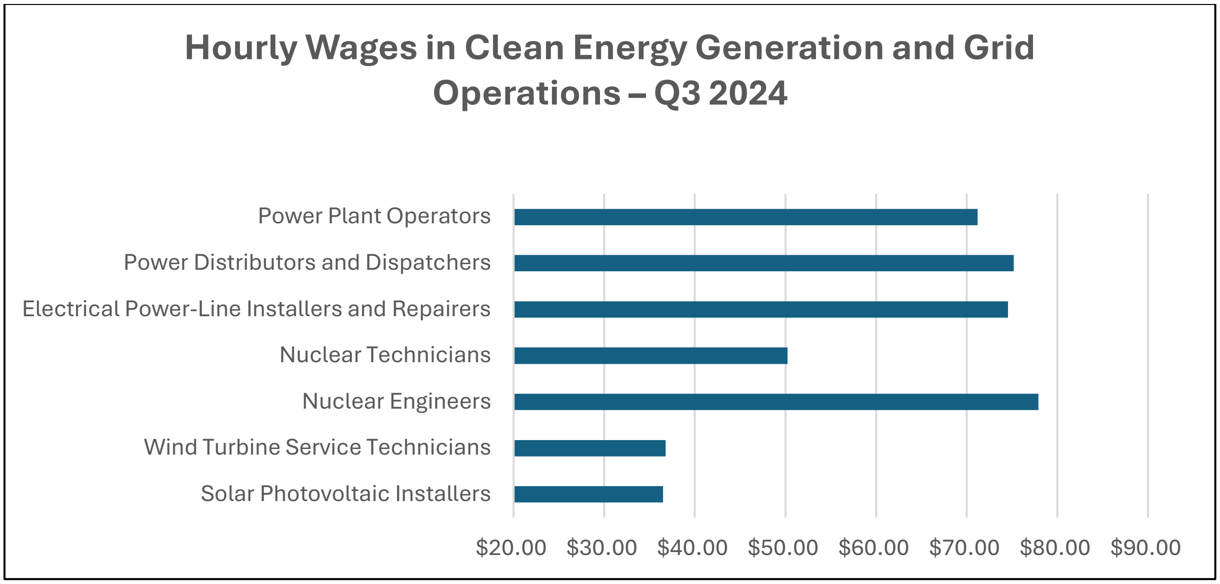
[23] Workforce Board Employer Needs & Practices Survey, https://wtb.wa.gov/employer-survey/

[24] State Workforce System means the employment and training programs provided through WorkSource offices, the Division of Vocational Rehabilitation, the Department of Services for the Blind, and Community and Technical Colleges, Private Career Schools, and Apprenticeship programs across the state, along with informational and other resources provided by the Workforce Training and Education Coordinating Board and the Employment Security Department.

[25] Workforce Board 2025 CETWAC Clean Energy Workforce Survey Findings; Appendix L

[26] Appendix C



Source: ESD (Quarterly Census of Employment and Wages)

Several existing programs offer strong foundations for scaling clean energy workforce development. The Pacific Northwest Center of Excellence for Clean Energy at Centralia College provides entry-level, certificate, apprenticeship, and degree pathways in hydroelectricity, wind, solar, and transmission careers. Career Connect Washington coordinates statewide partnerships among business, labor, education, and community leaders to deliver work-based learning and career exploration in clean energy and environmental fields. Registered apprenticeship programs through the Washington State Board for Community and Technical Colleges enable students to earn an Associate of Applied Science degree while completing on-the-job training in trades relevant to clean energy, such as electrical and HVAC systems.

In 2024–25, Washington's 34 community and technical colleges served over 307,000 students, more than half of whom were in enrolled in workforce training programs such as professional technical education, apprenticeship-related instruction, and worker retraining. In 2025, 32 of Washington's 34 community and technical colleges offered 122 clean energy-related programs, including four bachelor's degrees in fields like electrical vehicle maintenance and charging station repair, energy efficiency, engineering, and HVAC. A 2025 survey of 59 faculty, deans, and administrators from 25 colleges found that most had recently updated clean energy-related programs by adding courses, upgrading equipment, aligning with industry requirements, and more. The top need identified was flexible, ongoing funding to support continued improvements in clean energy-related workforce training including curriculum updates, new equipment and faculty professional development.[27]

[27] Clean Energy Report, 2025, SBCTC (Appendix H)

"Safety equipment maintenance costs [for clean energy related programs] are much higher. Each set of [EV] gloves needs to be sent off every 6 months for independent testing. Standalone lab equipment is very expensive but is designed to run at lower voltages which make the learning environment safer."

- Survey respondent

"The recent loss and overall lack of funding destabilize our long-term efforts towards growing these programs because what's happening in a lot of the clean energy sectors, like HVAC, is that the industry is changing rapidly right now. So, we really need more stable, long-term funding to address not only the equipment needs, but the training needs of the faculty.

- Community College Workforce Training Program Dean & Focus Group Participant

Some clean energy-related community college programs are in high demand—for example, a five-quarter electrician program at one technical college with 24-student cohorts has a waitlist of over 100 individuals—while others, like some in machining or manufacturing, struggle with enrollment. Despite low visibility, these under-enrolled programs are essential to the clean energy transition. Colleges identified the need for increased support and targeted partnership building, outreach and marketing to help grow and sustain these critical but often overlooked programs.

To maximize the investments in these workforce development programs, parallel efforts will need to be made to ensure students complete their training and enter the clean energy workforce. While Washington's residential energy sector presents strong potential for pre-apprentices and registered apprentices, many participants face barriers to completing workforce preparation and apprenticeship programs, particularly in rural communities. The resumption of a pilot grant program to assist clean energy apprentices and pre-apprentices including wrap-around and other support services (supplemental instruction, travel costs, tool and equipment purchases, and childcare) could increase completion rates. This would build on the success of an earlier two-year grant program run by the state's Department of Labor and Industries and would focus on in-demand occupations.

Clover Park Technical College

On August 26, 2025, Clover Park Technical College in Lakewood broke ground on its new Lineworker & Arboriculture Program, featuring a pole yard training facility designed to prepare students for careers in utility linework, vegetation management, and related trades. Launching in Fall 2025, the program was developed through strong collaboration between the college, IBEW Local 483, industry partners, and labor organizations. With stackable credentials and hands-on training, it aims to meet critical workforce needs while offering people a pathway to union-connected, living-wage careers. The program is being hailed as a model for labor, education, and industry partnerships in Pierce County.

"In this collaboration, unions, technical colleges, and management of construction companies are collectively establishing a viable pathway toward a sustainable, living-wage career," said Alice Phillips, PCCLC President, CPTC Trustee, and retired Business Manager of IBEW 483. Read more.

To fully utilize these clean energy education and training resources, Washington will also need to implement a statewide marketing strategy to promote clean energy career pathways. Currently, Washington's clean energy workforce development efforts are hindered by limited public awareness of existing career pathways, reducing participation in high-demand training and apprenticeship programs. A lack of awareness about clean energy careers was cited by employers as the second most common barrier in hiring workers with clean energy skills (39%).

Research contained in a June 2025 Clean Tech Alliance sector strategy identified the concern. "To meet growing demand and diversify the sector, employers have identified their largest need is increasing awareness of clean energy and clean tech careers and pathways."[28]

These resources offer critical guidance on certifications, training programs, and employment opportunities but remain underutilized due to fragmented communication and limited public awareness. Aligning outreach with the 2024 Advance CTE career clusters—particularly the Energy & Natural Resources cluster—will ensure early exposure to relevant career options while students are in high school. Effective implementation requires digital campaigns, school-based career guidance, employer partnerships, and multilingual materials to reach diverse populations statewide.

Permitting delays and limited financing are slowing clean energy project development in Washington, limiting job growth and workforce mobilization in the sector.

Despite Washington's substantial clean energy potential, delays in project development continue to constrain workforce growth and deployment. Federal funding reductions and uncertainty around future investments have contributed to these challenges, but state-specific barriers—particularly permitting inefficiencies and limited access to financing—also impede progress.

Despite recent legislative changes and the presence of the Energy Facility Site Evaluation Council (EFSEC), which offers a consolidated permitting pathway, stakeholders report persistent unpredictability and prolonged review processes that hinder workforce planning and project execution.[29] The state's Department of Ecology acknowledges that improving the permitting process is essential to accelerating clean energy deployment and protecting overburdened communities.[30]

These efforts may benefit from coordination with other similar relevant agencies and initiatives, including the Department of Ecology's Clean Energy Siting Council, and Electrical Transmission Workforce Study. The siting council was established to streamline and coordinate the siting process for large clean energy projects, such as renewable energy facilities, energy storage, and transmission infrastructure. In October 2025, it identified the most common issues currently slowing down projects as transmission interconnection, tribal capacity for review, litigation, agricultural protection under the Growth Management Act, and conflicts with wildlife and habitat and local concerns.

[28] CleanTech Alliance, Sector Strategy Update, June 2025: Appendix D
[29] Commerce-Reports-2024-Energy-Permitting-Report-Final.pdf
[30] Clean energy - Washington State Department of Ecology

Some areas where CETWAC can support and align with the 2025 Clean Energy Siting Council Report recommendations include[31]:

- Improve the capacity and efficiency of existing transmission infrastructure.
- Support development options that do not require new transmission connections such as installing more efficient transmission cables.
- Incentivize existing energy infrastructure upgrades.
- Promote Tribal clean energy projects.[32]
- Support local governments in clean energy planning.
- Develop community engagement tools.
- Support local government response to emerging technologies.
- Identify and resolve obstacles to developing geothermal energy resources.

Financing: Simultaneously, limited access to low-cost financing, especially for smaller developers and community-based projects—prevents shovel-ready initiatives from moving forward. The Washington State Green Bank[33] remains underutilized due to insufficient outreach and lack of private-sector engagement, further compounding delays in job creation and economic development.

Optimizing EFSEC's "one-stop" siting process and coordinating across state agencies will reduce multi-year delays that currently stall grid modernization and renewable energy buildout. Expanding outreach and funding for the Washington State Green Bank will attract private-sector financing and enable broader project participation. Simplifying grant application procedures will lower entry costs for employers and communities, fostering equitable workforce development.

A coordinated policy response that streamlines permitting and expanded financing access will unlock stalled projects, catalyze workforce growth, and ensure that clean energy jobs reach both urban and rural communities statewide.

Washington's clean energy workforce lacks diversity, among women and other underrepresented groups. This leaves a critical labor pool untapped and restricts the sector's ability to reach its full potential.

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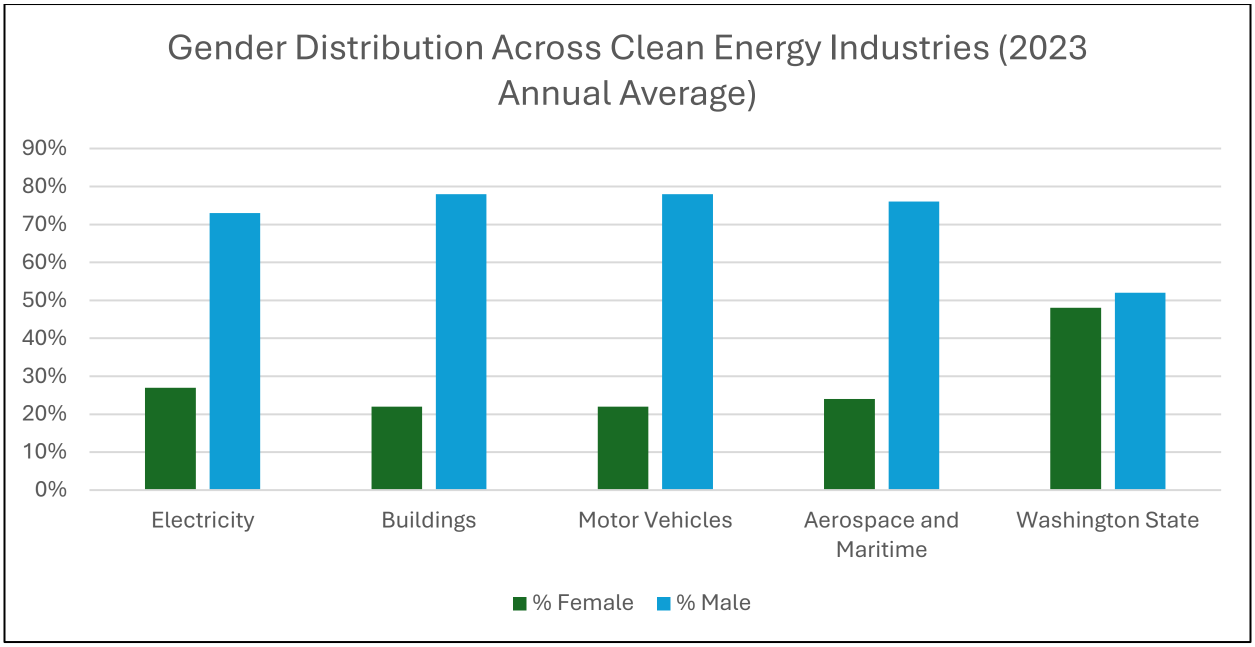
[31] Interagency Clean Energy Siting Coordinating Council, Improving Clean Energy Project Siting and Permitting, annual report October 2025.

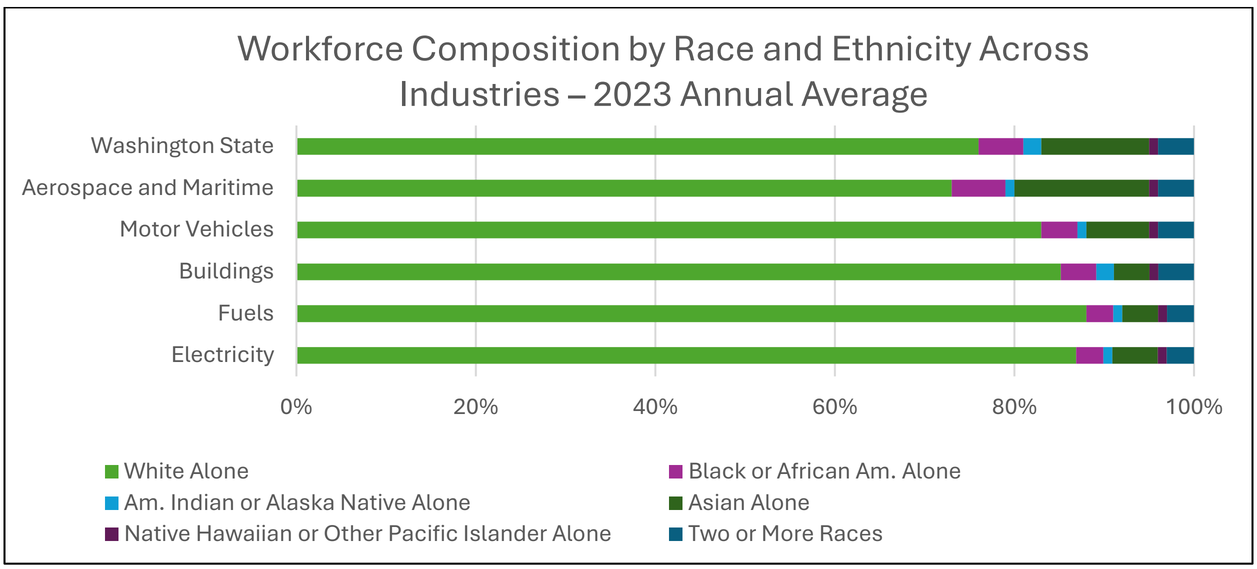
[32] Appendix K

[33] The Washington State Greenbank is a public financial institution created to accelerate clean energy and sustainability projects by providing affordable, accessible financing. It works by leveraging public funds to attract private investment in projects that reduce greenhouse gas emissions, promote energy efficiency, and support renewable energy development in Washington.

This lack of representation reflects systemic barriers to entry and advancement, including limited access to culturally responsive training, career navigation support, and wraparound services.



Source: ESD (Quarterly Census of Employment and Wages)



Source: ESD (Quarterly Census of Employment and Wages)

To address these disparities, targeted strategies are needed to promote clean energy careers to underrepresented groups, including communities of color, Tribal nations, rural residents, and individuals from low-income backgrounds. Leveraging existing infrastructure such as Career Connect Washington and the state's Office of Minority and Women's Business Enterprises are necessary. Including services such as subsidies for transportation, child-care and other support services have shown strong success in other states. Investments should prioritize communities disproportionately impacted by pollution and economic hardship, ensuring that training and job opportunities are distributed equitably across geographic and demographic lines. Employers will benefit from a broader, more diverse talent pool, while workers will gain access to high-wage, high-growth careers central to Washington's climate and economic goals.

Washington's clean energy technology sector--like healthcare and skilled trades--is held back by limited access to affordable, flexible childcare, especially during non-standard hours. This shortage creates barriers to participation, retention, and advancement for women, student parents, and low-income families. Without targeted investment, these barriers will continue to undermine workforce inclusivity and stall progress toward the state's clean energy and economic goals. Without intervention, Washington risks building a clean energy workforce that is neither inclusive nor resilient. Addressing childcare needs is a strategic investment in human capital and a prerequisite for a successful transition to a clean energy economy.

Washington could also consider investing in existing organizations that provide culturally responsive wraparound services, including mentorship, career navigation, and flexible training options. Advancing equity in the clean energy workforce requires intentional collaboration across community-based organizations, by-and-for groups, and career preparatory programs. Strengthening linkages between these entities and paid training providers—including registered apprenticeships and postsecondary institutions—ensures inclusive access to high-quality career pathways.

Policy support should prioritize integrated training ecosystems that elevate underserved communities and align with industry demand. Programs like Career Connect Washington and organizations such as the Office of Minority and Women's Business Enterprises offer established frameworks that could be scaled to meet growing demand. Additionally, encouraging employers to retain and promote diverse talent may help foster inclusive workplaces and support long-term career advancement. Research from the American Council on Renewable Energy and the National Skills Coalition highlights that employer-led partnerships and inclusive hiring practices are essential to building resilient, equitable clean energy economies. By pursuing these strategies, Washington could reduce structural inequities, diversify its talent pipeline, and align its climate goals with inclusive economic growth.

Washington's clean energy workforce development is constrained by limited public-private collaboration, and resources, leaving new and transitioning workers without critical pathways to paid, hands-on experience.

Expanding partnerships between employers, labor organizations, and educational institutions is essential to build a technically skilled labor pool, accelerate infrastructure deployment, and ensure equitable access to clean energy careers. Employers benefit from a more agile, technically skilled workforce and faster project delivery in critical sectors like solar, wind, hydrogen, battery manufacturing, and grid modernization. Washington could explore incentives such as tax credits, training grants, and streamlined credentialing to promote collaboration between industry and education.

Washington clean energy employers have already expressed interest is these programs, with survey results indicating that 68% of employer respondents provide on-the-job training as a means to address workforce challenges, and another 54% had trained or promoted current employees for more advanced positions.[34] However, the majority of this training was informal training (87%) or self-study or online training (61%), leaving significant room for growth for more formal sponsored pre-apprenticeship or apprenticeship (26%) and training though a college or vendor (26%).

Surveyed employers identified workforce policies and incentives that could help attract and retain skilled clean energy workers. The two most common opportunities cited were expanding apprenticeship and internship programs and strengthening public private partnerships. Employers responded that "incentivizing customers to get the work done will increase demand for workers."

Existing programs—including the Job Skills Program, Customized Training Program, Clean Energy Fund, and registered apprenticeships—offer a strong foundation for scalable workforce development. Washington's Job Skills Program (JSP) provides training to meet employers' specific needs. College instructors provide training to new and current employees at work or in a classroom. The JSP is complemented by the Customized Training Program (CTP), which provides interest-free training loan assistance to businesses that provide employment opportunities in the state. Administered by the State Board for Community and Technical Colleges (SBCTC), both programs are extremely popular in the business community, and are regularly oversubscribed due to high demand.

Leveraging these assets will expand access to clean energy careers, align training with industry needs, and accelerate workforce readiness. Without action, labor shortages and delayed infrastructure deployment may hinder Washington's clean energy transition and limit equitable economic outcomes.

[34] Workforce Board 2025 CETWAC Clean Energy Workforce Survey Findings; Appendix L

VIII. POLICY RECOMMENDATIONS

Strengthen Registered Apprenticeships and Career & Technical Education (CTE) for Clean Energy

- Leverage existing training programs and institutions to scale proven models and promote equitable access to training across regions and populations.
- Clean energy technology education and training programs and registered apprenticeships need ongoing, flexible funding to grow.
- Resume a pilot grant program to assist clean energy apprentices and pre-apprentices to increase completion rates, including wraparound and other support services.
- Market opportunities in clean energy through a coordinated strategy, leveraging existing platforms such as the Workforce Board's public-facing career and education portal CareerBridge and the PNW Center of Excellence for Clean Energy.
- Expand on-the-job training through public/private partnerships to address the growing demand and skillsets required for work in the clean energy sector.

Expand employment opportunities through supporting clean energy capital project acceleration

- Demonstrate the benefits of clean energy workforce opportunities in the community to support efforts that accelerate clean energy capital projects, including:
    - Continuing work to accelerate clean energy permitting.
    - Easing access to low cost private-sector financing.
    - Expanding access to capital through public-purpose financing such as the Washington State Green Bank.

Advance Equity in Clean Energy Workforce Development for Under-Represented Groups

- Investigate opportunities to provide subsidized childcare for clean energy workers, students, and registered apprentices.
- Explore ways to incentivize employers to employ and retain individuals from disadvantaged populations. This may include providing education and training opportunities and support for on-the-job training, registered apprenticeships, and other CTE opportunities.
- Support existing organizations and programs providing support services, including education, training and registered apprenticeship wrap-around services to underrepresented groups.

IX. THE TASK AHEAD

In addition to the efforts related to gathering data and conducting analysis, CETWAC expects future reports to include updated information depicting trends and verifying employment data by industry to document our progress not only in training new workers, but in reaching current workers.

Future recommendations are likely to include specific methods to achieve the recommendations identified by regional and statewide shifts in clean energy employment and workforce training needs.

Components of Future Biennial Reports

- Examine workforce and business challenges related to direct employment in the energy sector, its supply chain, and the effects of the energy transition on dependent industries.
- Recommend strategies to prevent workforce displacement, create jobs in clean energy technology sectors, support businesses adapting to workforce changes, and assist workers adversely affected by the clean energy transition.
- The biennial report will include an evaluation of the workforce impacts of Washington's climate policies including:
  - ✓ Labor market trends and current and projected workforce demand in both traditional and clean energy technology professions and restructuring of jobs and adjusted skillsets associated with climate change mitigation policies.
  - ✓ Wage and benefits range of jobs within the clean energy technology sector. Demographics of the traditional and clean energy technology sectors.
  - ✓ Inventory of skills needed in clean energy technology jobs; and an analysis of how the skills and training of the existing workforce can fill those needs.
  - ✓ Identification of additional workforce development needs in this sector.
  - ✓ Key challenges that could emerge under multiple future decarbonization scenarios based on factors such as rates of adoption of various new energy technologies; growth in demand for clean electricity, and changes in energy production and availability from both in-state and out-of-state sources.

X. CONCLUSION

Washington's clean energy sector is expanding, offering significant opportunities for economic growth, climate resilience, and social equity. To fully realize these benefits, policymakers must take action to address workforce shortages and make better use of the state's underutilized training infrastructure.

By collaborating with other state partners, CETWAC helps agencies avoid duplication, coordinate their efforts, and maximize the impact of clean energy projects and initiatives. CETWAC's policy recommendations provide a clear roadmap:

Strengthen Registered Apprenticeships and Career & Technical Education (CTE) for Clean Energy: Scale proven models, secure flexible funding, resume pilot grants, market career and training opportunities, and expand on-the-job training through partnerships.

Expand employment opportunities through supporting clean energy capital project acceleration: Continue efforts to accelerate permitting, ease access to private-sector financing, and expand public-purpose financing.

Advance Equity in Clean Energy Workforce Development for Under-Represented Groups: Subsidize childcare, incentivize inclusive hiring, support wraparound services, and explore digital solutions for worker mobility.

XI. APPENDICES

Appendix A - Transition to Retirement Feasibility Study 2025

Appendix B – Washington Climate Corps Network Report 2025

Appendix C – Washington Building and Construction Trades - Workforce Report 2025

Appendix D – Career Connect Washington – Clean Technology and Energy Sector Strategy 2025

Appendix E – The Economic and Community Benefits of Tribes in Washington

Appendix F – Washington State Refinery Economic Impact Study

Appendix G – Washington State Residential Energy Workforce Gap Analysis

Appendix H – State Board for Community and Technical Colleges Clean Energy Report 2025

Appendix I – Powering the 5th A Strategic Blueprint for Infrastructure and Energy in Eastern Washington Report 2025

Appendix J - Employment Security Department - Clean Energy Workforce Report – 2025

Appendix K – Supporting Native Workforce Development – 2023

Appendix L – Workforce Board Employer/Employee/Labor Partner Survey - 2025