



# Electrical Transmission Workforce Study

2025 report fulfilling requirements in [2024 Senate Bill 5950 Sec, 129. 40](#)

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Report to the Legislature

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## Executive summary

In 2024, the Legislature (SB 5950, Sec. 129[40]) directed Commerce to bring together a utility and labor work group and study Washington’s electrical transmission workforce. Refer to [Appendix A](#) for guidance on proviso requirements. The study focuses on three jobs: line workers, line-clearance tree trimmers and substation technicians. It looks at how many workers Washington has, how many will be needed, how people get trained, what the barriers are and what actions the state, agencies, utilities and partners can take to increase the number of qualified workers to address the identified shortage.

Transmission moves bulk power from where it’s generated to substations that feed energy to communities. Washington’s electricity demand is growing as we electrify cars, buildings and industry and older grid equipment needs replacement. If Washington doesn’t have enough skilled workers to build and maintain high-voltage lines and substations, the state will fall behind and fail to meet its goals for reliability, affordability and the 2045 clean energy targets.

Washington’s current electrical transmission workforce includes about 2,350 line workers, 280 substation technicians and 370 line-clearance tree trimmers. Most of these jobs are unionized, and the pay for line workers and substation techs typically meets or exceeds living-wage standards. However, wages for tree trimmers often fall short – especially for workers supporting larger households.

Looking ahead, we examined two possible futures. If the state maintains the current level of transmission investments, the workforce needs increase slightly: 150 additional line workers, 20 more substation technicians, and 50 more tree trimmers. For Washington state to meet its clean-energy goals, the demand surges to a workforce need of approximately 1,550 additional line workers, 320 more substation technicians and 240 more tree trimmers. The takeaway is clear: building a clean-energy future will require development and investment for training and hiring competent and qualified workers. The current approach simply is not going to meet the anticipated demand.

## Challenges and barriers

- Retirements will limit the current workforce's ability to train the next generation of workers.
- Early-career line workers and tree trimmers in outside construction travel regionally and across the country for work that offers high overtime pay, hazard pay and per diems. This can limit the available workforce.
- There is a lack of interest and retention in the tree trimmer occupation, in part due to lower pay and fewer benefits.
- Substation technician requirements vary employer-to-employer and technology upgrades drive new training needs. The skills required of substation technicians vary greatly depending on the system they’re working on.
- Systemic barriers limit entrance into the electrical transmission workforce, especially for individuals from overburdened communities, women and people of color.

## Summary of Recommendations

The summary includes the nine recommendation categories with a selection of specific examples. The Electrical Transmission Work Group developed the recommendations through collaborative effort with Commerce and Kinetic West, calling on a variety of state organizations to respond to key challenges. Please read the full report for a complete list of recommendations and their intended audiences.

## Increase the number of line worker apprenticeship opportunities

- The State should follow [recommendations](#) of the Clean Energy Siting Council to advance transmission projects.<sup>1</sup> Currently, large transmission projects can take up to 10 years to obtain permits, constraining our ability to meet climate goals and train the next generation of workers.<sup>2</sup>
- The State should invest in larger transmission projects with significant line mileage and higher voltage capacity to enhance our ability to bring renewable energy across the state. This would attract more workers to Washington and enable us to “grow our own” through project labor agreements that require the utilization of apprentices.

## Increase accessibility, affordability and relevance of pre-apprenticeship programs

- The State should allocate funds to subsidize a Commercial Driver's License (CDL) training program that is designed to meet the needs of electrical utilities (rather than long-haul truck drivers).
- Increase funding, ideally through public-private partnership, to enable students to compete and prepare for apprenticeship programs. This could include: 1. Funding more scholarships for pre-apprenticeship programs (i.e., VOLTA); 2. Provide a stipend to address non-educational cost barriers.

## Expand career awareness and engagement in K-12 and postsecondary

- The State should adopt the Advance CTE Career Clusters for energy (a national model for career exploration that includes the electrical transmission workforce) into K-12 public schools.<sup>3</sup>
- The state should maintain the Center of Excellence (COE). The Center of Excellence for Clean Energy serves as a crucial convener and is highly valued by industry and education partners. As these occupations modernize and Washington's need for these jobs increases, coordination across stakeholders will be crucial. As the State considers future budgetary challenges, funding for the COE should be prioritized.

## Diversify the workforce

- Provide targeted scholarships for pre-apprenticeship programs to candidates from marginalized or overburdened communities, paired with a marketing campaign designed to reach the target audience.
- Develop a program that connects competitive women and people of color who apply but are not accepted into apprenticeship programs. Provide scholarships and other support to help them attend line school as a cohort.

## Reduce the impact of retirements by allowing flexibility

- Utilities should allow for flexibility with retirements – for example, allowing someone to transition to part-time work, enabling retirement-age workers to continue training the next generation. This would require flexibility through the Washington State Department of Retirement Services. The IBEW already allows journey-level workers to return to work without impacting their retirement plan.

## Continually clarify safety standards unique to Washington

- The Washington State Department of Labor & Industries (L&I) continually updates safety regulatory information. Stakeholders recommend that L&I supplement current information with user-friendly information about Washington's unique safety requirements (WAC 296-45). This would help small contractors train out-of-state line workers and tree trimmers on Washington's safety standards. This could include videos and visuals.

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<sup>1</sup> Washington Department of Ecology, “[Clean Energy Workforce Development Needs Assessment.](#)” Publication No. 25-06-011.”

<sup>2</sup> The Washington State Department of Ecology and Commerce convene the [Clean Energy Siting Council](#), which meets monthly to identify policy-level issues, coordinate among agencies and discuss options for improving the permitting process. Their 2025 annual report includes recommendations to address permitting and siting challenges in Washington.

<sup>3</sup> Career Tech. [Advanced CTE Cluster Definitions.](#)

## **Increase capacity to uphold safety standards for line clearance tree trimmers**

- Review recent safety incidents and issues in the field to identify the root causes of these incidents and consider potential improvements to regulations. Reviewing “near misses” and issues brought up in safety meetings and safety walk-around. We would also recommend conducting thorough accident investigations as part of this process. This review should include an exploration of the current inspection and enforcement capacity to determine if it is adequate.

## **Leverage opportunities to further support the workforce**

- Workforce Pell: The Washington Legislature and governor's office should work together on a proactive approach to ensure that pre-apprenticeship programs can count toward either the state's newly funded Workforce Pell program or existing financial aid.

# Key terms and concepts to know

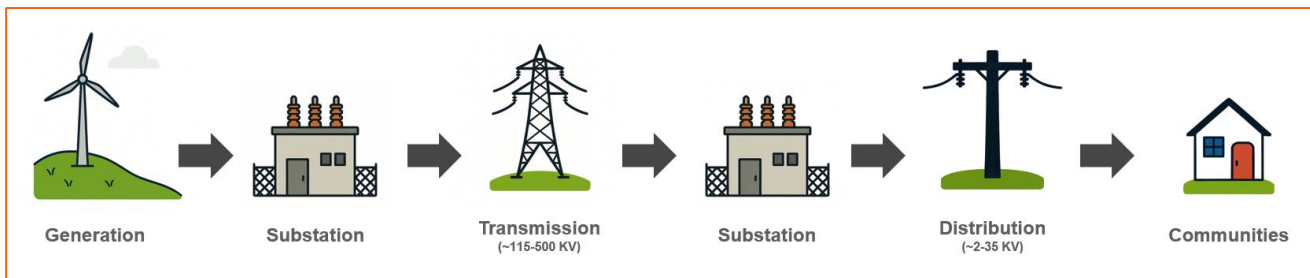
## Occupations

The occupations studied in this research include line workers, line clearance tree trimmers and substation technicians.

- **Line workers** (also known as linemen) build and repair power lines to keep electricity flowing safely to homes, schools and businesses. In Washington, this term can refer to individuals who perform both low-voltage work and high-voltage work, or to those who specialize in either type of work. These workers are qualified to work on substations, but they must undergo additional certifications or training to work on them on a full-time basis.
- **Line clearance tree trimmers** use climbing and rigging techniques to cut dead or excess tree branches from power lines to prevent outages and keep people safe. We will refer to this occupation as tree trimmers for the remainder of the report.
- **Substation technicians** operate, maintain and troubleshoot electrical substations that control and deliver electricity across the power grid.

## Transmission versus distribution

Transmission lines bring electricity from where it is generated (i.e., power plants) to where it can be transformed for use in homes and businesses (i.e., substations). These lines move electricity over long distances using high-voltage (~115-500 KV) power lines. Distribution lines bring electricity from substations to where the energy is needed (i.e., homes, schools, businesses, etc.). They move electricity over shorter distances using lower-voltage (~2-35 KV) lines.



## Employer types

The electrical transmission workforce in Washington has two main employer types – utilities and outside construction contractors. Both employer types employ a highly unionized workforce in Washington.

- 1) **Utilities:** Utilities hire line workers and substation technicians to operate and maintain their energy infrastructure. Many utilities in Washington contract out their tree trimmer workforce rather than hire them in-house. Utility workers focus on power lines in their district. They have steady hours but may be on call for emergencies or storm responses, and they tend to have longer-term job security and substantial benefits. When utilities want to build new infrastructure or perform extensive upgrades, they hire outside construction contractors. There are two main utility types, both of which are funded primarily through customer rates:
  - a) **Private Utilities:** Private utilities are for-profit, investor-owned utilities (IOUs) that are responsible to their shareholders. In Washington, they are governed by the Washington Utilities and Transportation Commission. This commission ensures that these companies "provide safe, reliable and equitable service to customers at reasonable rates, while allowing them the opportunity to earn a fair profit." The three largest IOUs in Washington are Puget Sound Energy, Avista and PacifiCorp.

- b) **Public Utilities:** Public utilities are not-for-profit, consumer-owned utilities (COUs) that are governed by elected commissioners (e.g., Snohomish County PUD) or city councils (e.g., Seattle City Light). Most utilities in Washington are publicly owned. This category includes Public Utility Districts (PUDs), municipal utilities, rural electric cooperatives and tribal utilities.
- 2) **Outside Construction Contractors:** The outside construction contractor workforce works on transmission and distribution construction projects that utilities contract out, typically to upgrade or build new lines. That means workers often follow the work wherever construction projects are located. Due to this dynamic, the outside construction workforce is transient and usually relocates to new states or regions to work on projects. In general, these workers earn higher wages through overtime, per diems and hazard pay – however, their work can be seasonal or project-based.

## Compensation

In addition to base salary, several factors impact overall compensation for the electrical transmission workforce. These include:

- **Per diems:** A daily allowance provided by an employer that helps pay for an employee's lodging, meals and incidental expenses that occur due to travel required for a project.
- **Overtime pay:** When a non-exempt employee works overtime, those hours are paid to employees at a higher rate. Overtime could include work on weekends or holidays, hours worked beyond a certain threshold or responding to emergency response dispatches.
- **Hazard pay:** Hazard pay compensates people for the additional risks that they face on the job.
- **Relocation assistance:** One-time funds paid to an employee to help cover the costs they may incur when moving from one location to another for a job.
- **Signing bonuses:** One-time payment offered to recruits as an incentive to accept a job offer.

## Training and workforce terminology

The following terms help understand the training and workforce landscape in Washington. Refer to [Appendix B](#) for additional information on training pathways.

- **Registered Apprenticeship Programs**

A state-approved training program as defined by [Chapter 49.04 RCW](#) that includes both Related Supplemental Instruction (RSI, also known as classroom hours) and on-the-job training under the supervision of an experienced worker who has completed their apprenticeship (i.e., a "journey-level worker").<sup>4</sup> Apprentices are paid a living wage for their on-the-job training hours. The Washington State Apprenticeship and Training Council regulates registered apprenticeship programs in Washington. The Department of Labor & Industries maintains a [list of registered apprenticeship programs](#).<sup>5</sup>

- **Recognized Pre-Apprenticeship Programs**

A program approved by the Washington State Apprenticeship and Training Council that helps prepare people with the skills, knowledge and experience needed to enter and complete apprenticeship programs successfully. The Department of Labor & Industries maintains a list of [recognized pre-apprenticeship programs](#).<sup>6</sup>

- **Camp Rilea is a military installation and Armed Forces Training Center**

Located in Warrenton, Oregon, **Camp Rilea** is used for both military and civilian training purposes. The NW Line Joint Apprenticeship Training Committee (JATC) utilizes Camp Rilea as a multi-day training intensive, enabling

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<sup>4</sup>Washington State Legislature, "[Revised Code of Washington Chapter 49.04](#),"

<sup>5</sup> Washington Department of Labor, "[Register apprenticeship programs](#),"

<sup>6</sup> Washington Department of Labor, "[Pre-apprenticeship programs](#),"

apprentices to apply their classroom knowledge to practical, real-world applications. Training includes climbing, distribution, transmission, hot sticking, as well as safety protocols and guidelines for everyday life in the field.

- **Hot sticking**

Hot sticking involves the use of specialized, insulated long tools (also known as hot sticks) that enable a line worker to complete their work while maintaining a physical distance from an electrified line. They are critical in rainy climates. Outside of the Pacific Northwest, the use of hot sticks is less common and many line workers use specialized, insulated rubber gloves instead.

- **Advanced Career Technical Education (CTE) Career Clusters**

A national model for career exploration that includes the electrical transmission workforce.

- **Northwest Line Joint Apprenticeship Training Committee (NW Line JATC)**

NW Line JATC manages apprenticeships for the outside construction industry in the Northwest region (Washington, Oregon and parts of Idaho and California). They have line worker and tree trimmer apprenticeship programs. They offer a substation certification program designed for journey-level line workers and are in the process of building a substation technician apprenticeship program. Offerings include:

- NW Line JATC: When someone wants to become an apprentice in the outside construction industry, they apply through the NW Line JATC. If they are accepted as an apprentice, the NW Line JATC coordinates their required on-the-job training hours by placing them at a "training agent", which is an outside construction contractor. Additionally, the NW Line JATC ensures that they receive their required Related Supplemental Instruction (also known as RSI or classroom hours). As part of required RSI hours, the NW Line JATC hosts "Saturday School" at schools throughout their geographic area and first-year apprentices travel to Camp Rilea for a week or more of consecutive training days. While the NW Line JATC coordinates apprenticeships for the outside construction industry, many utilities in Washington work with them for their apprentices' RSI. This means utilities are using the NW Line JATC's curriculum, sending their own apprentices to Camp Rilea or using both options.
- VOLTA pre-apprenticeship program: NW Line JATC also administers the VOLTA pre-apprenticeship line school program. This program has two locations: one in Northwestern Oregon (Warrenton) and one in Eastern Idaho (Rathdrum, just outside of Spokane). The current tuition for Volta is \$8,500 and the program lasts 10 weeks. Completing a pre-apprenticeship program does not guarantee a spot in an apprenticeship. However, many apprenticeship programs prioritize interested applicants who have completed a pre-apprenticeship, as it demonstrates the candidates' understanding of the field.

- **Permitting and siting in Washington**

[RCW 19.28.010](#)<sup>7</sup>, [RCW 80.50.060](#)<sup>8</sup> and [RCW 80.50.045](#)<sup>9</sup> along with the Washington State Environmental Policy Act, these laws establish permitting and certification processes that are often complex, involve multiple agencies, and require detailed studies.

- **RCW 19.28.010 (Electrical licensing and permitting)**

Requires compliance with state electrical licensing and permitting standards. While the statute itself doesn't specify a timeline, projects requiring electrical approvals must coordinate with multiple local and state agencies, which adds steps and time to the permitting process.

- **RCW 80.50.060 (Energy facility site certification)**

Defines that large energy facilities must use the EFSEC process for permitting. The process brings all relevant agencies to the decision-making table to conduct the environmental review and develop a balanced recommendation for the governor, which may include a draft site certification agreement defining conditions for the construction, operation and decommissioning of a large energy facility. Given the size and nature of the

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<sup>7</sup> Washington State Legislature, "[RCW 19.28.010 - Electrical Writing Requirements](#),"

<sup>8</sup> Washington State Legislature, "[RCW 80.50.060 - Energy Facilities](#),"

<sup>9</sup> Washington State Legislature, "[RCW 80.50.045 - Siting electrical transmission corridors](#),"

facilities required to use the EFSEC process, it can be a lengthy, complex process that involves detailed studies and adjudicative processes.

○ **RCW 80.50.045 (Transmission facility coordination)**

Outlines the state's role in siting transmission facilities in relation to the federal role. EFSEC is designated as the agency to coordinate the participation of relevant state agencies in the federal NEPA reviews. EFSEC is directed to gather and convey to the federal lead agency state views regarding state-specific concerns or requirements in siting transmission corridors. The collection of state perspectives on the siting of transmission facilities may impact the timeline. Directs EFSEC to coordinate with state agencies and federal NEPA reviews. That coordination may extend the review timeline when combined with federal environmental review requirements.

○ **Washington State Environmental Policy Act (SEPA)**

Requires state and local agencies to assess the environmental impacts of proposed projects before making permitting decisions. If an Environmental Impact Statement (EIS) is required, the process, which includes scoping, drafting the EIS, receiving public comments and finalizing the EIS, can take several years for complex proposals.

In practice, these reviews can span several years, especially when an Environmental Impact Statement or EFSEC certification is required. These statutory processes directly influence when major transmission projects can break ground. As a result, workforce demand is inherently influenced by both the scale of projects and the pace at which regulatory approvals allow construction to proceed.

The most common issues currently slowing down projects are transmission interconnection, tribal review and opposition, litigation, conflicts with the Growth Management Act and agriculture, conflicts with wildlife and habitat and local opposition, primarily due to visual concerns. Resolving these issues is crucial to minimizing project delays. The 2025 Clean Energy Siting Council Report includes recommendations to:

- Establish a state entity to develop and finance transmission projects
- Develop transmission siting and permitting tools
- Improve the capacity and efficiency of existing transmission infrastructure
- Support clean energy development
- Support clean energy development that does not require transmission connections
- Incentivize existing energy infrastructure upgrades
- Promote Tribal clean energy projects
- Improve permitting through meaningful engagement and planning
- Provide long-term funding for Tribal project review

# Methodology

## Role of the electrical transmission work group

A cornerstone of this project was the Electrical Transmission Workforce Work Group, convened by the Department of Commerce. It was comprised of representatives from labor organizations and public and private utilities. The Work Group met quarterly to review interim findings, validate assumptions and guide the development of recommendations. The Work Group served three key functions:

- 1) **Advisory:** Drawing on their expertise and experience in the field to focus the study's research questions and provide context for the research that followed.
- 2) **Validation:** Pressure-testing interim findings to ensure accuracy and alignment with industry realities.
- 3) **Co-creation of Recommendations:** Providing practical input on workforce solutions and helping shape actionable strategies for the Legislature, state and local agencies and utilities.

This collaborative structure ensured that the study was grounded in real-world expertise and that its recommendations had buy-in across stakeholder groups

## General approach and guiding principles

This study was designed to provide Washington with a clear, evidence-based understanding of current and future workforce needs in the electrical transmission sector. This study used a mixed-methods approach, combining rigorous labor market analysis with qualitative engagement of stakeholders across public and private utilities, labor unions, training providers and community partners. A few simple principles guided this work:

- **Keep it grounded in Washington.** Whenever possible, we used regional data and trends to inform our modeling and recommendations were grounded in Washington's unique policy environment, energy mix and labor and training landscape.
- **Focus on equity.** The study applied an equity lens throughout, recognizing that overburdened communities, women and tribal members have historically faced barriers to entry in these trades. Recommendations aim to expand opportunities equitably while meeting workforce demand.
- **Build recommendations people can agree on.** We worked closely with utility, labor and training providers to test ideas and make sure our recommendations are realistic and broadly supported.

## Research methods

This study used a mixed-methods approach, combining quantitative labor market analysis with qualitative interviews and stakeholder engagement. Neither data type alone could have produced a complete picture of Washington's electrical transmission workforce.

- **Quantitative labor market analysis** (e.g., labor market, demographic, wage, etc.) helped establish the scale of current and future workforce needs, including job openings and projected demand.
- **Qualitative interviews** with utilities, labor representatives, training providers and other industry stakeholders added the lived experiences and practical realities to the quantitative analysis. These conversations also helped generate recommendations, which were tested with the work group.

Taken together, these methods allowed the team to diagnose challenges and design recommendations that are both evidence-based and feasible. This pairing ensured recommendations were grounded in Washington's unique labor, utility and training ecosystem.

## Labor market analysis

The quantitative component of this study included a comprehensive labor market assessment of Washington's electrical transmission workforce, with a focus on:

- **Occupations:** Line workers, tree trimmers and substation technicians.
- **Current employment:** Estimates of the existing workforce, apprentices in the pipeline and demographic profiles by gender, race, age and veteran status, where data is available.
- **Wages:** Statewide and regional wage data, including comparisons with neighboring states and incentives offered elsewhere.
- **Projections:** Anticipated workforce demand based on retirements, state and federal policy-driven investment and industry growth.
- **Migration analysis:** Flows of workers in and out of Washington, including apprentices trained in-state who leave and outside workers who enter the state for projects.
- **Gap analysis:** Comparing current supply with projected demand to quantify shortages.

This analysis utilized state-level data (e.g., WA Employment Security Department, WA Department of Labor and Industry) and federal datasets (e.g., U.S. Census Data, U.S. Bureau of Labor Statistics, Registered Apprenticeship Partners Information Database System). This analysis modeled the workforce required to meet the State's Clean Energy goals, considering Washington-specific policy and infrastructure investments. This portion of the analysis was informed by existing Washington workforce studies (e.g., Net-Zero Northwest<sup>10</sup>). The study also utilized data from the MIT Living Wage Calculator and lightcast.io, a labor market database, with regional analysis based on Washington State's Workforce Development Areas.<sup>11</sup>

To perform analyses across these data sources, the study's focused occupations were mapped to standardized occupational codes (SOC):

- **Line Workers:** Electrical Power-Line Installers and Repairers SOC 49-9051
- **Tree Trimmers:** Tree Trimmers and Pruners SOC 37-3013. To narrow to the line clearance tree trimmers, current employment estimates for this occupation were cross tabulated with employment estimates in the top electrical transmission industries using the North American Industry Classification System (NAICS) codes.
- **Substation Technicians:** Electrical & Electronics Repairers, Powerhouse, Substation and Relay SOC 49-2095

## Stakeholder interviews

Alongside the labor market work, the project conducted structured interviews and consultations with:

- **Public and private utilities** (e.g., Seattle City Light, Clallam County Public Utility District, Puget Sound Energy, Snohomish PUD, Inland Power)
- **Organized labor** (e.g., IBEW locals, Washington State Labor Council)
- **Training providers** (e.g., Northwest Line JATC, community colleges, pre-apprenticeship programs)
- **Industry experts** (e.g., The CleanTech Alliance, The Pacific Northwest Center of Excellence for Clean Energy)
- **State agencies and workforce intermediaries**

A complete list of partners who provided insights is included in the Acknowledgements section at the beginning of the report. These interviews served three key purposes:

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<sup>10</sup> Net Zero Northwest. [A Clean Energy Transition Institute Project.](#)

<sup>11</sup> [Washington State Workforce Development Areas.](#)

- **Assessment** – capturing stakeholders’ perspectives on current gaps and needs
- **Research integration** – filling holes in the quantitative data
- **Recommendation development** – using the Work Group and interviews to pressure-test draft strategies and build buy-in

Input from stakeholders helped validate findings, surface practical barriers and shape recommendations that are both technically sound and feasible. This analysis examined all interviews for common themes and recommendations that were brought to the work group for further review and final recommendation development.

## Recommendation development, testing and finalization

A central goal of this study is to identify challenges in Washington’s electrical transmission workforce and develop actionable recommendations that could address those challenges. Recommendations were developed through the following steps:

- **Identifying top challenges:** Through mixed-methods research, the team surfaced the most pressing barriers facing the workforce.
- **Developing recommendations:** For each major challenge, the research team drafted targeted recommendations. These recommendations drew on both the data and the lived experience of workers, training providers and employers.
- **Testing and refining with stakeholders:** Draft recommendations were then shared with interviewees and the Electrical Transmission Workforce Work Group via a survey. This pressure testing process allowed stakeholders to react to and refine the recommendations. Some proposed recommendations were refined to focus on the most feasible near-term actions, while others were expanded to capture additional opportunities raised during the discussion.
- **Finalizing recommendations with the Department of Commerce and the work group:** The iterative process culminated in collaborative sessions with the Department of Commerce and the Work Group. Together, the recommendations were refined into the final set, ensuring they were:
  - Grounded in evidence from both labor market data and stakeholder insights,
  - Practical and implementable for utilities, training providers and labor partners,
  - Equitable, with explicit attention to removing barriers for underrepresented populations and
  - Aligned with Washington’s clean energy and workforce policy goals.

The result is a set of strategic recommendations that have been vetted, supported and strengthened through collaboration, increasing the likelihood of their successful adoption by public and private utilities, labor unions, and workforce partners.

# Electrical transmission workforce background

The following section provides context on the electrical transmission workforce in Washington. It includes information on the number of people in the workforce, demographics and the number of workers required to meet clean-energy goals and achieve fair wages.

## Description of current and future workforce

### Current workforce and demographics

In 2024, it is estimated that 2,350 **line workers** were employed in Washington, with 97% reported as men and 85% white. Most of the workforce is concentrated in Seattle-King (24%), Tacoma-Pierce (18%) and North Central (11%) Workforce Development Areas. The North Central Workforce Development Area encompasses Adams, Chelan, Douglas, Grant and Okanogan counties. The other 47% of the workforce is distributed across Washington.

In 2024, it is estimated that 280 **substation technicians** were employed in Washington. Similar to line workers, the workforce is predominantly men (93%) and white (72%). More than half of the workforce is concentrated in Seattle-King Workforce Development Area (56%), the rest is distributed across Washington.

In 2024, it is estimated that 370 line clearance **tree trimmers** were employed in Washington. The current workforce is predominantly men (84%). Compared to other occupations, tree trimmers are the most racially diverse, with 53% of the workforce identifying as white. The workforce is concentrated in the Pacific Mountain (32%), Spokane (20%), Seattle-King (17%) and Tacoma-Pierce (15%) Workforce Development Areas. The Pacific Mountain Workforce Development Area encompasses the counties of Grays Harbor, Lewis, Mason, Pacific, and Thurston. The remaining 16% of the workforce is distributed across Washington.

### Projected workforce to meet Washington's climate goals

If the state makes no further investments in clean energy production, workforce projections indicate modest growth over the next decade for line workers (+6%), substation technicians (+7%) and tree trimmers (+14%; Figure 1). However, this projected growth does not consider the workforce that would be required to meet Washington's ambitious climate goals. Led by the Clean Energy Transition Institute, the Net-Zero Northwest Workforce (NZNW) Analysis<sup>12</sup> provides a comprehensive examination of how employment is projected to grow as the region pursues net-zero greenhouse gas emissions by 2050. This analysis utilizes insights from the NZNW study to model the additional number of line workers, tree trimmers and substation technicians Washington would need to achieve net-zero emissions. Under these climate-aligned projections, demand increases substantially: tree trimmers (+65%), substation technicians (+114%) and line workers (+66%; Figure 1). This highlights the significant workforce expansion needed to achieve Washington's clean energy targets.

*"If Washington has work, they'll come, but the problem here is that we're attracting workers who may not be trained to Washington standards."*

*- Stakeholder interview, 2025*

If Washington were to make significant investments in maintaining and expanding transmission infrastructure, it would require an influx of workers. Stakeholders interviewed for this research agree that if major projects were undertaken in Washington, the state could attract journey-level workers from other states who would play a critical role in scaling the apprenticeship system to train more apprentices based in Washington. The outside construction electrical transmission workforce travels to where the major projects are being undertaken. If Washington has

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<sup>12</sup> [Net-Zero Northwest Workforce \(NZNW\) Analysis](#)

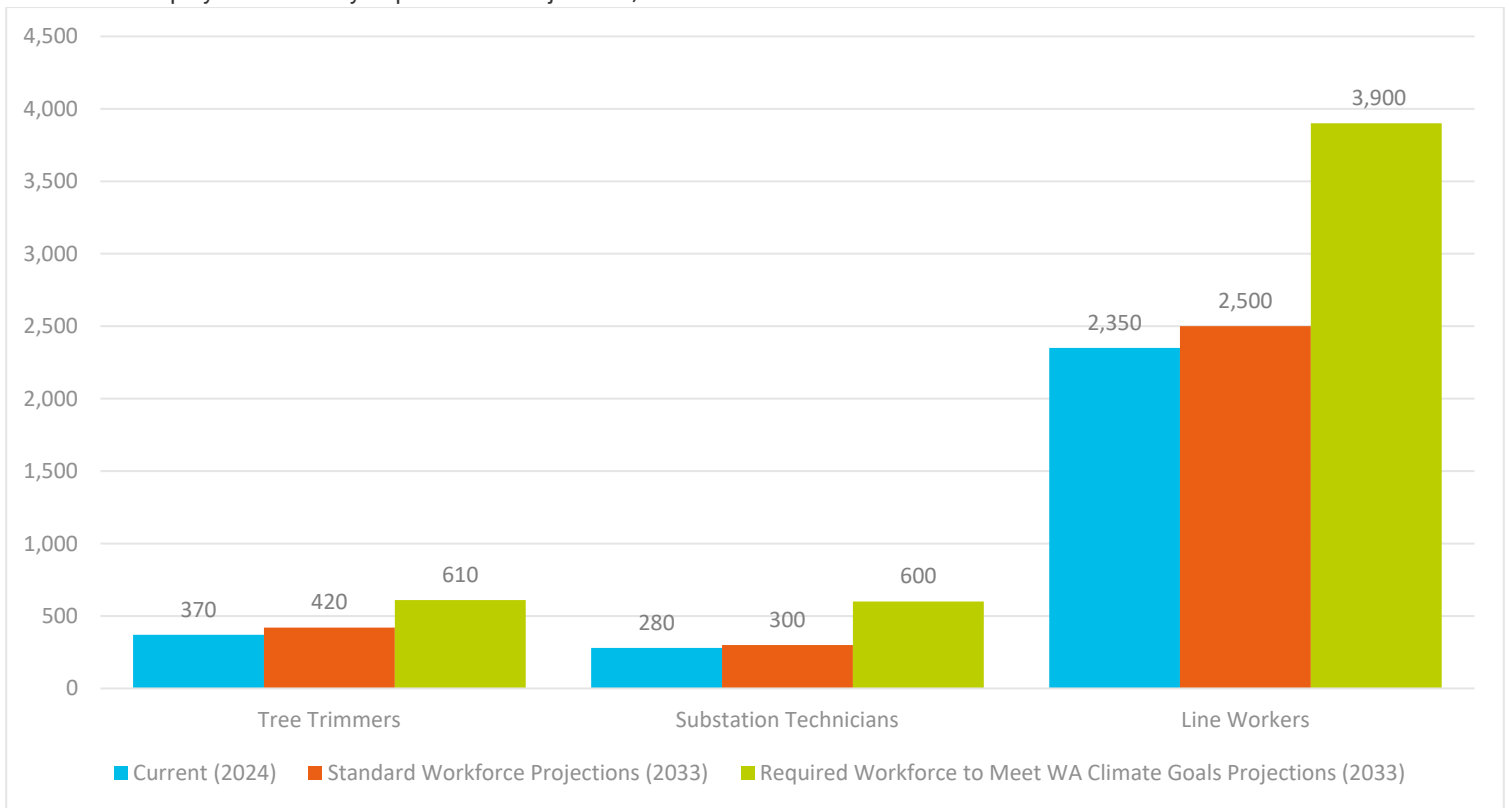
more active projects, the workers will come. In addition, stakeholders affirmed that the training system in Washington is ready to scale up quickly, if needed, to train more apprentices.

However, there are challenges with attracting a significant influx of journey-level workers from other states. Journey-level workers in other states may not be trained to the same safety standards as those maintained in Washington. For example, Washington requires the use of hot sticks rather than rubber gloves – a safer technique but one that must be learned. Safety standards are a matter of life and death for these occupations. Multiple stakeholders mentioned that they know someone who has been injured or killed on the job.

Ensuring that the workforce from other states meets our Washington standards is essential for today's workforce and for training the next generation. More work means more apprenticeship opportunities. It also means an influx of year-one apprentices. Apprentices must be trained in accordance with the requirements of Chapter 296-45. The training requirements outlined in Chapter 296-45 are specific and must be followed when apprentices work in Washington state. Apprentices should be trained by people who uphold Washington's safety and quality standards.

## Figure 1: Current and projected workforce demand

Source: WA Employment Security Department - Projections, NetZero Northwest



The graph above shows that if the State of Washington does nothing to improve workforce development across these occupations the state will not have the workforce necessary to meet the state's future clean energy goals.

## Wages

Wages are a crucial element of attracting and retaining workers. This is true for both training Washington's workforce and for attracting journey-level workers to the state. Washington offers competitive wages for these occupations compared to other states across the US (Figure 2). Washington ranks first in wages for line workers (approximately \$117,000 USD), fifth for tree trimmers (\$66,000 USD) and 17th for substation technicians (\$103,000 USD). Relative to Washington's neighboring states, Washington leads California, Oregon, Alaska and Hawaii in line worker pay, is mid-range for tree trimmers and lags all four for substation technicians.

In addition to the wage comparison by role the work group also requested a breakdown of wages compared to a living wage by region. When the estimated annual wages for these occupations are compared to annual living wages for Washington State Workforce Development Area regions, line workers and substation technicians consistently earn wages that meet or exceed living wage standards, even for larger households. By contrast, tree trimmer wages fall short in many regions for households with more than one working adult and no children. Appendix F illustrates this data, where shaded boxes indicate that the regional mean annual wage (row) for the occupation is equal to or greater than the living wage for the corresponding family composition (column).

Stakeholders noted that the state's public utility districts (PUDs) offer competitive wages and substantial benefits. This is especially true for the PUDs in the populated areas along the I-5 corridor. These forms of compensation attract workers who seek the stability of working in a specific region for an extended period.

Per diems, relocation assistance, signing bonuses, travel stipends, extended overtime and hazard pay are common benefits in neighboring states and can significantly enhance overall compensation packages. This is particularly true for outside construction work, and many stakeholders pointed to work in California as a prime example where this is happening. Pacific Gas and Electric Company (PG&E), which serves a significant portion of Northern and Central California, offers a competitive salary of \$77.47/hour with an additional 10-15% pay premium for select locations for electric transmission maintenance. In addition to wages, PG&E offers a \$30,000 sign-on bonus and relocation services for journey-level line workers. San Diego Gas and Electric (SDGE) is offering \$78.15/hour and a \$20,000 sign-on bonus or relocation package, with the potential for an additional \$10,000 bonus if a successful candidate can start within 45 days of the interview. Additionally, they offer 5 weeks of temporary housing for out-of-town candidates. These non-wage incentives can outweigh base pay differences and influence where line workers and tree trimmers choose to work, particularly those in the early stages of their careers who may be more mobile and willing to travel.

## Figure 2. Mean annual wages by occupation in the top 20 states, 2024

Source: US Bureau of Labor Statistics - Occupational Employment and Wage Statistics<sup>13</sup>

### Line Workers

State	Mean Annual Wage
Washington	117,000
California	116,000
Alaska	109,000
Hawaii	109,000
New Jersey	108,000
Oregon	107,000
Idaho	107,000
Massachusetts	107,000
New York	106,000
Rhode Island	106,000
New Hampshire	104,000
Vermont	104,000
Illinois	102,000
Montana	101,000
Michigan	101,000
District of Columbia	100,000
Minnesota	99,000
Connecticut	99,000
Pennsylvania	95,000
Wisconsin	95,000

### Tree Trimmers

State	Mean Annual Wage
Alaska	74,000
Oregon	69,000
Maine	67,000
California	66,000
Washington	66,000
Minnesota	66,000
Illinois	65,000
New York	64,000
Massachusetts	63,000
Hawaii	61,000
Rhode Island	60,000
Vermont	60,000
New Jersey	59,000
New Hampshire	57,000
New Mexico	55,000
Utah	55,000
Montana	54,000
Pennsylvania	54,000
Arizona	53,000
Wyoming	53,000

### Substation Technicians

State	Mean Annual Wage
Massachusetts	118,000
Oregon	117,000
California	116,000
Hawaii	116,000
Rhode Island	112,000
North Dakota	111,000
Wisconsin	111,000
Minnesota	111,000
Alaska	110,000
Idaho	110,000
Illinois	109,000
Kansas	105,000
New Jersey	104,000
Connecticut	104,000
New York	103,000
Georgia	103,000
Washington	103,000
South Dakota	103,000
Montana	102,000
Arizona	102,000

<sup>13</sup> The wages for these occupations include jobs in both utilities and construction. Construction often pays more. However, the data cannot be separated within this data source. The data is collected the same way in each state; therefore, it is a reliable state-by-state comparison for these occupations.

## Workforce challenges

This section describes the challenges that limit Washington’s ability to recruit, train and retain enough workers to meet current and future transmission needs. These challenges differ between the two major employer types: utilities and outside construction contractors.

- Utility companies have a more stable and predictable workforce because they can accurately calculate the number of workers needed to maintain their distribution and transmission systems.
- When utilities invest in building new lines, new substations or make major upgrades, they contract that work to outside construction contractors.
- The outside construction contractors' workforce fluctuates more than the utility workforce because it is tied to the availability of work.

## Not enough line worker apprenticeship opportunities

More line worker apprenticeship opportunities are needed to grow the electrical transmission workforce. Most stakeholders agree that the lack of line worker apprenticeship opportunities is the most significant challenge to the workforce.<sup>14</sup>

According to apprentice data from the Washington State Department of Labor and Industries as of May 2025, there are an estimated 560 line workers, 52 substation technicians and 364 line clearance tree trimmer apprentices. There are 35 line worker apprenticeship programs in the state. Most line worker apprentices are enrolled in programs with the Northwest Line JATC (70%), the City of Seattle, Washington Apprenticeship Committee (12%) and the Snohomish County PUD Number 1 Apprenticeship Committee (5%). Nearly all line clearance tree trimmer apprentices are enrolled in the NW Line JATC Power Line Clearance and Tree Trimmers Apprenticeship Committee program. Only two other programs have active apprentices: PUD #1 Clallam County Apprenticeship Committee and Lewis County PUD Apprenticeship Committee. Among the nine substation technician apprenticeship programs in the state, nearly half of the active apprentices are enrolled with the Puget Sound Energy Apprenticeship Committee. A complete inventory of apprentice programs is listed in [Appendix E](#) and G.

Data from the Registered Apprenticeship Partners Information Database System (RAPIDS) provides insights into the demographic makeup of active apprentices for both line workers and substation technicians in Washington.<sup>15</sup> However, upwards of 63-85% of active apprentices in the substation technician program did not self-identify their sex, race, or ethnicity. This limits the ability to report on demographics for the substation technician active apprentices. Furthermore, demographic data on tree trimmer apprentices in Washington was not available. Among line worker active apprentices in Washington, 99% are men, 81% are white and non-Hispanic or Latino. According to RAPIDS data, 99.4% of line workers and 100% of active apprentices in substation technician roles are represented by a union.

An overwhelming number of people apply for a limited number of line worker apprentice positions. This is the primary training bottleneck in Washington. If the state wants to grow this workforce to meet climate goals and meet increasing energy

*“The last few years we’ve done recruitment every year and we get 1000 applicants for six positions.”*

*“We get hundreds upon hundreds of applications in a two-week window for 8-10 apprenticeship openings.”*

*“We don’t have trouble getting apprentices. People are lining up to be apprentices.”*

*- Line apprenticeship program interviews, 2025*

<sup>14</sup> Interviewees and Work Group members who took the survey were provided with six workforce challenges asked to "select the top 2 problem statements that most impact the electrical transmission workforce." The most frequently selected challenge was "Lack of Apprenticeship Opportunities", with more than half (58%) selecting it.

<sup>15</sup> [Registered Apprenticeship Partners Information Database System](#).

demand, we need to have more apprenticeship opportunities available. This means investing in state resources and starting projects now.

Many small or rural utilities try to hire journey-level workers instead of apprentices because they cannot afford the cost or administrative burden of starting an apprenticeship program. However, small utilities that can hire apprentices have more success with retention than those that cannot. This is because when small utilities can train their own workers, they are more likely to hire people from the area who are less likely to leave after a few years. When smaller utilities offer apprenticeship programs, it creates more apprenticeship positions and helps the utility with employee retention.

Outside construction contractors (via NW Line JATC) have limited visibility into the amount of work the utilities will contract out. This makes it difficult for the contractors to know how many apprentices they need. The lack of visibility into the work pipeline creates challenges and limits the number of openings. For example, at the time of our interview in the summer of 2025, the NW Line JATC had over 100 qualified, interviewed and ranked apprentices, but only four apprenticeship spots were available. However, due to the unpredictability of the future work pipeline, the number of apprenticeship openings could change rapidly over a period of months.

Ultimately, more work creates more opportunities for apprenticeships. One of the major barriers to electrical transmission work being done in Washington is regulatory and process delays that slow down projects.<sup>16</sup>

Stakeholders estimated that permitting can take up to 10 years in western states. If Washington's process to advance transmission and distribution line projects were faster, it would result in more construction contracts. More construction contracts would mean there is more work available to train a pool of apprentices to become line workers.

*"More consistent and predictable work would mean we could plan for a greater number of apprenticeship spots."*

*- Apprenticeship program interview, 2025*

## Retirements

Retirements will limit the current workforce's ability to train the next generation of electrical transmission workers.

The hazardous and physically demanding nature of electrical transmission work influences an individual's decision to retire, affecting the timing of their retirement. Unions like the International Brotherhood of Electrical Workers (IBEW) often offer a full pension after 30 years of service. For those who have 30,000 covered hours of employment, starting at age 55. Among the current workforce, 15% of line workers, 16% of substation technicians and 20% of tree trimmers are 55 years or older and could retire in the near future. See Figure 3 for retirement estimates over the next 5, 10 and 15 years.

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<sup>16</sup> The Washington State Department of Ecology and Commerce convene the [Clean Energy Siting Council](#), which meets monthly to identify policy-level issues, coordinate among agencies and discuss options for improving the permitting process. Their 2025 annual report includes recommendations to address permitting and siting challenges in Washington.

### Figure 3: Age distribution of the workforce

Sources: WA Employment Security Department, Lightcast.io. Data in columns titled "Under 24 years old", "24-54 years old" and "55 years old and older" include the total count and then the percentage of the total workforce in parentheses after the count.

Occupation	Current Workforce	Under 24 years old	24-54 years old	55 years old and older
Line Workers	2350	180 (8%)	1820 (77%)	350 (15%)
Substation Technicians	280	40 (14%)	190 (68%)	50 (18%)
Tree Trimmers	370	50 (13%)	240 (65%)	80 (22%)

### Figure 4: Projected retirement estimates

Sources: WA Employment Security Department, Lightcast.io.

Occupation	Current Workforce	5-year Retirement Estimates	10-year Retirement Estimates	15-year Retirement Estimates
Line Workers	2350	260 (11%)	660 (28%)	985 (42%)
Substation Technicians	280	30 (11%)	60 (21%)	90 (32%)
Tree Trimmers	370	35 (9%)	90 (24%)	130 (35%)

Retirements will limit the current workforce’s ability to train the next generation of electrical transmission workers. Despite the physical nature of these jobs, pay increases often encourage aging workers to remain in the workforce. However, eventually, utilities will not be able to afford to increase pay at the same rate. And, at a certain point, those who are holding out for higher salaries in their final years of work will retire.

*“Based on age, 1/3 of my workforce could retire today... Retirement age journey level workers are staying for good wages, but at some point, pay rates will level out and we will have another wave of retirees”*

*-Public Utility District interview, 2025*

While retirements are a workforce challenge, there are more than enough people interested in becoming apprentices in the line worker and substation trades to account for retirements. Given a strong pipeline of people, utilities are generally able to bring on apprentices based on the age of their workforce. In fact, many utilities have already experienced a “silver tsunami” in previous decades and are well-equipped to plan for future waves of retirements. This is not the case for the tree trimmer occupation, where there are fewer people interested in apprenticeships due to lower pay. Impending retirements pose a significant challenge for the tree trimmer workforce.

*“We had our ‘silver tsunami’ already and we are expecting another wave of retirements on 5 – 8 years, but we’re preparing for that now. We bring on between 2-8 new apprentices every year with 3-4 being ideal size... we are able to ramp up class sizes in anticipation of future workforce needs.”*

*-Public Utility District interview, 2025*

Outside construction has a less predictable workforce compared to the utilities sector. They tend to attract younger workers who are seeking ways to maximize overtime, hazard pay and per diem pay. After working in outside construction, these workers will sometimes look to utilities for more stable, less travel-intensive work. Related to this dynamic, we heard that Washington attracts the “older guys” to its workforce because of the high wages and substantial benefits offered

*“Some of the people who top out end up going to other states to make more money in their early years. We do see guys come back later once they’re no longer interested in chasing those jobs.”*

*- Stakeholder interview, 2025*

in our state. There is a pattern of people leaving Washington after completing their apprenticeship and then returning later in life.

## Worker migration

Early-career line workers and tree trimmers in outside construction follow work that offers high overtime pay, hazard pay and per diems. This is far less of an issue for utilities.

According to the [U.S. Census Bureau's 2023 American Community Survey 1-Year Data \(2005-2024\)](#) estimates, the top three states contributing new residents to Washington, regardless of occupation, are California, Oregon and Texas.<sup>17</sup> These same states also account for the largest share of Washington's outmigration. Among those who left Washington in 2023, an estimated 32,000 (15%) moved to California, 22,000 (10%) to Oregon and 20,000 (9%) to Texas.

States that are making investments in their transmission infrastructure are attracting transmission workers outside of construction with high per diems, hazard pay and overtime pay. According to stakeholders engaged in research for this report, this is especially true in states such as Texas and California. This is not surprising since Texas and California have seen the most clean energy-related investments in recent years compared to other states. Between 2022 and the first quarter of 2025, Texas' investment totaled \$62.3 billion and California's totaled \$34 billion. Another way to compare clean energy investments between states is to look at total reported clean energy investments per capita. Washington has invested an estimated \$126 per capita in clean energy. Per capita clean energy investment in California is approximately \$866 and in Texas, it is \$2,093.<sup>18</sup>

Some of these investments are being allocated to high-profile transmission projects in these states. Southern Spirit, located in Texas, is a massive transmission project that will serve as a "clean energy highway," transporting wind power from Texas through Louisiana to Mississippi.<sup>19</sup> Meanwhile, in some areas of California, they are rebuilding power lines after wildfires. More broadly, they are expanding their transmission infrastructure and investing in clean energy sources. California's grid operator CAISO has proposed investing \$6.1 billion in 26 grid improvements to connect new renewable energy projects by 2035. Approximately \$4.6 billion of the proposed \$6.1 billion investment will be used to build three major transmission lines that will deliver power from the first wave of floating wind turbines off the northern coast of Humboldt County.<sup>20</sup>

Financial investments and political and community buy-in result in transmission projects that attract journey-level workers. Migration data from the U.S. Census Bureau's 2023 American Community Survey, modeled with employment estimates from the WA Employment Security Department, show 10 to 15 line clearance tree trimmers, five to 10 substation technicians and 75 to 80 line workers migrated from Washington to other states in 2023. The primary driver of our migration is the availability of work, coupled with substantial financial incentives (e.g., per diem pay) that attract workers to other states. Washington's base wages are competitive with those of states like California and Texas; however, some stakeholders have noted that the high costs of housing and living make Washington less attractive to outside construction workers. One Washington-based contractor shared that some of his employees are not Washington residents despite a significant amount of their work being in Washington. These workers find it more cost-effective to stay in hotels for short-term jobs and retain residences elsewhere.

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<sup>17</sup> U.S. Census Bureau, "[American Community Survey: 1-Year Data](#),"

<sup>18</sup> Clean Air Task Force, "[The geography of clean energy investments in the U.S.](#)" (2025)

<sup>19</sup> Pattern, "[Southern Spirit Transmission](#)"

<sup>20</sup> Reuters Events, "[California set for solar, storage surge in zonal grid plan](#)" (2024)

Many interviewees stated that if Washington were to make significant investments in transmission lines, outside construction workers would likely come. Although California also has a high cost of living, the state is making significant investments in transmission and infrastructure updates and is attracting many workers. Additionally, California has the advantage of being able to perform work year-round. A Washington project may last for three months at a time due to weather conditions, while a similar project in California could span nine consecutive months, which can be more attractive to workers. Washington cannot control our climate, but the state could consider how to attract workers to our state to build the needed infrastructure.

*"[The outside construction workforce is] built for travel and if Washington were building a big transmission line, they'd come to us. If we want to attract people, we need to build infrastructure."*

*- Public Utility District interview, 2025*

Some stakeholders are concerned that Washington employers are investing in training a workforce that ultimately leaves the state for work on big transmission projects, as described above. To address this concern, some employers are proactively creating agreements with apprentices to see a return on their investment. These agreements require apprentices to commit to working for the employer for a set number of years after becoming journey-level workers. However, patterns of migration in these occupations are more complex than this initial assumption suggests. Even at the training stage, the nature of the work necessitates mobility across a broad geographic region. As an apprentice with the NW Line JATC, line worker apprentices must be able to report to work across a four-state area. This includes Washington, Oregon, parts of Idaho and parts of Northern California. Additionally, employers are required to report on their current workforce, but they sporadically and anecdotally monitor where their former employees go.

These gaps in tracking make it challenging to fully understand the scope of migration. What is clear is that the impact is felt more strongly in the outside construction industry than in the utilities sector. Utilities tend to attract workers who are seeking stability, often those who are older and have family ties to a region. Due to this and the high base wages and benefits offered in the state of Washington, most utilities are not losing their workforce to other states. Instead, utilities compete for talent within regions. For example, when Snohomish PUD raised its wages and benefits to compete with California, Tacoma Power and Seattle City Light followed suit. Utility workers tend to be more rooted in their home community, so moving to a new state is less of a concern. However, utility workers may be willing to drive to a bordering county if they can make a higher wage.

*"Utilities have been increasing wages to keep talent from moving to other states. Snohomish County was one of the first to raise their wages to retain talent. Since then, many utilities have been following suit – leading to big wage increases."*

*- Public Utility District interview, 2025*

## Lower interest in the tree trimmer occupation

Due to lower pay and fewer benefits, there is a lack of interest in the tree trimmer profession and Washington is struggling to attract enough people into apprenticeship opportunities.

Whereas line worker apprenticeship programs are overwhelmed with interest, tree trimmer apprenticeships have the opposite problem: more than enough openings and not enough interest. Most utilities contract out their tree trimming workforce rather than employ tree trimmers directly, meaning that entry into the trade in Washington is usually through contractors, not utilities.

*"People are not as interested in the tree trimmer career path and some go through the tree trimmer apprenticeship program to then start over as a line apprentice."*

*-Apprenticeship Program interview, 2025*

The NW Line JATC Tree Trimmer Apprenticeship Program is the primary apprenticeship program in Washington. Unlike their line program, the NW Line JATC struggles to recruit people interested in the tree trimming pathway. They have tried many things to make the path more attractive: using apprenticeship zones to reduce the amount of travel apprentices must do, changing application standards to no longer require CDLs as a prerequisite and expanding their recruitment efforts. However, there is still a lack of interest. This profession does not pay as well as the line worker profession. In fact, some people complete the tree trimmer program, then apply to be a line apprentice. Additionally, stakeholders expressed concern that safety standards and protections for tree trimmers are not consistently enforced. Some stakeholders view this concerning trend as related to consolidation among tree trimmer contractors in Washington. With so few tree trimming providers in Washington, there's a lack of competition. This lack of competition keeps wages low and makes working conditions less safe.

*"I think we really need to look at the safety rules for line clearance tree trimmers and clarify and strengthen them...I've seen damaged ropes used for climbing and expired hard hats used by crews."*

*-Stakeholder interview, 2025*

## Substation technician pathway

The skills required of substation technicians vary greatly depending on the system they're working on. In addition, new substation technology leads to system upgrades that require new or updated training. Utilities and outside construction are reconsidering their approaches to training and hiring substation technicians.

Hiring journey-level substation workers is challenging because each substation is different, and every utility has different sets of responsibilities that fall within the substation role. That means an experienced journey-level substation technician may not be able to pass the working test at a different utility than the one for which they work. As a result, more utilities are adopting a train-your-own approach to substation technicians. This could involve retraining an existing employee in substation work or focusing on apprenticeship programs. Most utilities report adequate to overwhelming interest in the substation technician pathway. To fill the need faster, some have explored accelerated apprenticeship pathways where someone with their 01-electrician license could start on step three rather than step one.

*"Substation technicians are some of the most difficult roles to hire for. It's hard to find people who have the skillsets to pass our working test. Because of this, we are building strategies to attract these workers – including nationwide searches, identifying other geographies with similar substation systems and offering relocation assistance. In addition, we are exploring an accelerated apprenticeship track where someone with a 01-electrician license could start as a 3rd year apprentice."*

*-Public Utility District interview, 2025*

The NW Line JATC is launching a substation technician apprenticeship program. Traditionally, they have had a certification program for journey-level line workers to train them in substation work. However, training journey-level line workers in substation technology will not meet the need for substation workers, given the state's climate goals and the evolving nature of substation technology. There is a lot of investment in updating substations right now, so Washington will need more workers over the next decade. A NW Line JATC apprenticeship program is an exciting opportunity to help support the substation technician occupation within the outside construction workforce. Many believe this is overdue.

*"In the past we filled the substation technician gap with a certification program for journey level line workers. But we didn't create a clear career path for them. Now we're starting a substation technician apprenticeship program, which is long overdue. I think the next 10 years will have exponential growth in substation work due to updates needed in transmission and distribution."*

*-Apprenticeship Program interview, 2025*

# Electrical transmission workforce lacks diversity

The current workforce is predominantly white men, which does not accurately reflect the statewide demographics.

The electrical transmission workforce is predominantly composed of white men. There are many possible reasons for this: the longstanding culture built by mostly white men, the physical demands of the job, the difficulty of balancing travel and non-standard work hours with childcare (a role that disproportionately impacts women) and the word-of-mouth nature through which many people find out about these jobs. Some employers are actively working to change this industry trend by prioritizing diversity and ensuring that a diverse hiring committee is involved in the evaluation of candidates. Others don't see diversity as a priority. Because the apprenticeship pipeline is so full, there is no external incentive for employers to do intensive outreach with new communities. For more details on what is driving this challenge, see the "Equity Analysis."

*"During the practical exam, we pay attention to how applicants interact with female journey workers. For example, if they don't shake their hand or make eye contact, that can be a red flag. We also make sure there is a diverse panel on the practical exams."*

*- Public Utility District interview, 2025*

## Equity analysis

In this engagement, some research participants have shared, "The makeup of our workforce aligns with the surrounding area's demographics." According to 2024 data from the Washington State Office of Financial Management, about 50% of Washingtonians are men. When you compare that 50% to the proportion of men who are line workers (97%), substation technicians (93%), and tree trimmers (84%), other factors affecting the diversity of this workforce become apparent. Similarly, the racial makeup of the workforce also is not reflective of Washington's demographics. White Washingtonians comprise approximately 71% of the population; meanwhile, 85% of line workers in the state are also White. While the tree trimmer workforce is more racially diverse, the mean annual wages for this occupation fall short of a living wage in many regions for households with more than one working adult and no children. This suggests that workforce demographics are shaped more by structural barriers within the sector than by the surrounding population.

The following barriers limit entrance into the electrical transmission workforce, especially for individuals from overburdened communities, women and people of color.

## Limited career awareness

According to stakeholder interviews, there is insufficient awareness of the electrical transmission workforce among middle and high school students. Many people who graduate from high school leave without awareness of the electrical trades or any information about what is needed to pursue this career pathway. People who learn about these trades regularly do so through word of mouth or family and community connections. This dynamic reinforces the current demographics of the pipeline.

While most apprenticeship programs have more than enough line worker applicants, many still believe in the importance of increased awareness to reach a more diverse candidate pool. This is an essential part of diversification, but awareness alone will not diversify the workforce.

*"If we want to support this workforce, the state should be investing in early career talent and awareness. Most of our applicants have a 4-year degree and this likely reinforces a predominantly white and less diverse applicant pool. We want to frame apprenticeship as the alternative 4-year degree and capture more diverse talent coming out of high school. But high schoolers aren't taught about electrical systems or that this is a viable career path."*

*-Public Utility District interview, 2025*

## Inaccessible pre-apprenticeships

Electrical pre-apprenticeship programs (i.e., “line school”) are often expensive, time-intensive and can require participants to move. For example, VOLTA costs \$8,500 and Northwest Linemen’s College costs \$23,500.<sup>2122</sup> Because apprenticeship opportunities are highly competitive, attending a line school can be a crucial step in securing a hiring as an apprentice. Not only are these programs expensive, but they also require individuals to relocate, pause or quit their other jobs, and purchase necessary gear and tools. In addition, most of these programs are unaccredited – meaning students can’t currently access federal financial aid programs and they aren’t working towards a credit-bearing degree.<sup>23</sup> While a line school can be a worthwhile investment that leads to a high-wage career, it is inaccessible to those who can’t afford to pay tuition, relocate, or take time off work to attend.

## Commercial driver’s license requirements

CDLs are a prerequisite for many line worker apprenticeship programs; however, they are costly to obtain, which limits accessibility. For example, National Standard Trucking School’s Class A CDL program costs \$4,500 and includes 160 hours, while Driving Academy’s Class A CDL program costs \$5,000.<sup>2425</sup> Additionally, many CDL training courses are designed for long-haul truck drivers and do not focus on the skills required for the electrical trades.

## Childcare

Irregular work hours, long shifts and travel-required multiday projects pose issues for parents and caregivers. Work hours can include overtime, emergency dispatches and shifts that extend beyond the standard 9-to-5 schedule. This poses challenges; securing childcare can prevent people from pursuing this trade in the first place. This disproportionately impacts women and those who are already unable to afford childcare.

## Transportation

This industry requires extensive travel to work sites, requiring workers to relocate or travel long distances to work locations. This is also true during the apprenticeship period; NW Line JATC line worker apprentices must be able to report to work across a four-state area. Even those who work at utilities often need to cover an extensive service area.

## Competitive apprenticeships reduce incentives for diversity

With so few line worker apprenticeship spots available, there is a disincentive to prioritize recruiting diverse candidates to an already full pipeline. Programs can only admit a small number of candidates from large applicant pools. This limits opportunities for those with the highest qualifications, such as individuals who can attend pre-apprenticeship programs, possess prior industry knowledge and have other systemic advantages. The challenge of diversifying the workforce is exacerbated by the fact that competition for apprenticeship spots is fierce. This creates a disincentive to prioritize diversity. It also disincentivizes efforts

*“Diversification is not necessary for their workforce. Because there is so much competition for apprenticeships and because they’re focused on taking the cream of the crop, they aren’t motivated to diversify.”*

*-Stakeholder interview, 2025*

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<sup>21</sup> [VOLTA Line School](#).

<sup>22</sup> [Northwest Linemen’s College](#).

<sup>23</sup> See appendix for more information on current and past partnerships in Washington to start accredited pre-apprenticeship programs.

<sup>24</sup> [National Standard Trucking School’s Class A CDL](#)

<sup>25</sup> [160 Driving Academy’s Class A CDL program](#)

to increase career awareness at the high school level and to invest in more centrally located and affordable pre-apprenticeship programs.

## Workplace culture

Culture plays a role in maintaining a homogenous workforce. Because the workforce is predominantly white and male, the culture reflects the values and perspectives of individuals who identify with these identities. The workplace can be hard to navigate for those who aren't white and aren't men. This isn't just about making the work environment pleasant. Complacency and hostility towards individuals who hold different identities can increase the hazards faced in an already dangerous work environment.

There are positive examples of workplaces emphasizing diversity. Some believe a generational shift is occurring and that the newer generation is more inclusive. Additionally, there are examples of women who have advanced through the ranks and hold leadership roles. Some leaders emphasize diversity as a work-site strength. One example of this is ensuring that apprentice candidates interact with diverse people during their working tests — prioritizing candidates who respect men, women and people of color equally.

There are also examples of workplaces that do not prioritize diversity. We heard people say that women don't want these kinds of jobs, which is why they're not in the workforce. Others said that women must figure out how to survive in a culture not built for them. Some people think that the physical nature of the job is a barrier for women. Everyone acknowledges that a baseline level of strength is required in these roles, but some think the industry is now focused on working “smarter, not harder”. Younger workers, regardless of gender, don't want to see their bodies sustain so much wear and tear. Further mechanization of the trade and an emphasis on working smarter, not harder, can help make the trade more inclusive for women and those with smaller frames. However, there are still some who believe most women are not strong enough for the work.

We also received a variety of responses regarding racial diversity. Some said that their population is predominantly white, so it makes sense that they don't have a diverse workforce. Others shared harmful, racial stereotypes that they hear, which introduces bias in who will and will not be suitable applicants for these jobs. While many people we spoke to cite their compliance with required good faith efforts to diversify, it was clear that stereotypes about people who are non-white and women still exist. These stereotypes reinforce a culture that is not welcoming to those of non-majoritarian identities.

*“[To be successful in these trades] Women need to fit into the pre-existing culture by having thick skin, strong backbone, ability to speak up and stand up for yourself. It requires a certain kind of woman who can adapt to that. Men are more accepting than they used to be, but there is still a long way to go.”*

*-Stakeholder interview, 2025*

*“It doesn't take much to find yourself in a dangerous situation. Now, imagine being in a bucket, high above the ground, working on a live wire, with someone who doesn't want you there.”*

*-Stakeholder interview, 2025*

# Recommendations

A central goal of this study is to identify challenges in Washington’s electrical transmission workforce and develop actionable recommendations that could address those challenges. In collaboration with Commerce and the Electrical Transmission Work Group, recommendations were developed by identifying key challenges, drafting initial proposals, testing them, refining them with stakeholders, and finalizing the recommendations.

## Recommendations are organized into nine categories:

- 1) Increase the number of line worker apprenticeship opportunities
- 2) Increase accessibility, affordability and relevance of pre-apprenticeship programs
- 3) Expand career awareness and engagement in K-12 and postsecondary
- 4) Diversify the workforce
- 5) Reduce the impact of retirements by allowing flexibility
- 6) Continually clarify safety standards unique to Washington
- 7) Increase capacity to uphold safety standards for line clearance tree trimmers
- 8) Leverage opportunities to support the workforce further
- 9) Attract electrical transmission workers to Washington

## Increase the number of line worker apprenticeship opportunities

The biggest challenge facing the electrical transmission workforce is that there are not enough line worker apprenticeship opportunities. Employers cannot increase apprenticeship opportunities unless there is more work available. This challenge is driven by the following:

- Burdensome regulatory and process delays that slow down work
- Lack of visibility in upcoming construction projects for outside construction apprenticeship programs
- Cost and administrative burden of running apprenticeship programs for small and rural utilities

Without a greater number of active projects in Washington or greater project predictability, more apprenticeship spots will not be available. Currently, large transmission projects can take up to 20 years to obtain permits, constraining our ability to meet climate goals and train the next generation of workers. Recommendations include:

**Washington should follow the recommendations outlined in the [2025 annual report of the Interagency Clean Energy Siting Coordinating Council on advanced transmission projects](#).<sup>26</sup> New apprenticeship spots will not be available until projects are secured and permitted.**

**Audience:** Washington State Legislature; Governor's Office; Washington Clean Energy Siting Council

**The State should invest in larger transmission projects with significant line mileage and higher voltage capacity to enhance our ability to bring renewable energy across the state.** Utilities in Washington consistently invest in small and medium-sized projects with a few miles of line. This would attract more workers to Washington and enable us to “grow our own” through project labor agreements that require the utilization of apprentices.

**Audience:** Public and private utilities; Washington State Legislature

**The State should establish a pool of funds to enable smaller utilities to start in-house registered apprenticeship programs.** These funds could be used to help with the upfront costs of starting an apprenticeship program. Additionally, the state should permit small utilities to serve as the “reporting agency” for a neighboring utility. This

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<sup>26</sup> Washington State Department of Ecology and Department of Commerce, [“Improving Clean Energy Project Siting and Permitting,”](#)

would mean they have separate apprenticeships but with a shared or reduced administrative burden. This would enable them to grow their own talent rather than recruiting journey-level workers from outside the construction industry.

**Audience:** Washington State Legislature; Washington Department of Labor and Industries; Washington State Apprenticeship and Training Council; public and private utilities

**The state should continue to include apprenticeship utilization requirements (AURs) on public works projects (RCW 39.04.320) to ensure investment in the future workforce.**

**Audience:** Washington State Labor Council; public and private utilities; Washington State Legislature; Washington State Apprenticeship and Training Council

### **Increase accessibility, affordability and relevance of pre-apprenticeship programs**

Electrical transmission pre-apprenticeship programs (i.e., “line school”) are often expensive, time-intensive and can require participants to move temporarily. General construction pre-apprenticeship programs usually fail to provide targeted exposure to the electrical transmission trades. Recommendations include:

**The State should allocate funds to subsidize a Commercial Driver's License (CDL) training program that is designed to meet the needs of electrical utilities** (rather than long-haul truck drivers). Funds should help subsidize the program so that CDL training can be offered at an affordable price.

**Audience:** Washington State Legislature; Washington State Department of Labor and Industries; Washington State Department of Licensing

**Increase funding, ideally through a public-private partnership, to enable students to compete and prepare for apprenticeship programs.** This could include:

- Funding more scholarships for pre-apprenticeship programs (i.e., VOLTA).
- Provide stipend to address barriers, such as the cost of relocation, cost of living, housing, work clothes, CDL courses, childcare, basic needs, etc.

**Audience:** Washington State Legislature; public and private utilities, Washington Department of Labor and Industries; Washington State Apprenticeship and Training Council; Washington Student Achievement Council

**Develop a centralized system that streamlines the accreditation and financial aid staffing for electrical transmission accredited pre-apprenticeship programs.** This would make it easier for entities that want to start pre-apprenticeship programs and community colleges to partner. Within the current system, these partnerships are administratively cumbersome. However, these partnerships can unlock access to federal financial aid and credit-bearing credentials for program participants.

**Audience:** Washington State Legislature; Washington Student Achievement Council; Washington State Workforce and Training Coordinating Board; Washington State Board for Community and Technical Colleges

**Increase capacity and capability at general construction pre-apprenticeship programs to do more career exploration on electrical transmission jobs.** This should include exposure to heights or climbing to help individuals discern their aptitude for jobs that require working at heights.

**Audience:** Washington Department of Labor and Industries; Washington State Apprenticeship and Training Council; Washington State Building and Construction Trades Council; Washington State Labor Council

**Support advocacy to the federal government for the removal of the Federal Highway Administration CDL restrictions that prohibit those under 21 from crossing state lines.** There have been ongoing efforts on this issue for many years now. Recommendations to further these efforts should continue.

**Audience:** Washington State Board for Community and Technical Colleges; Washington State Department of Licensing; Washington Congressional Delegation

### **Expand career awareness and engagement in K-12 and postsecondary**

There is a lack of broad awareness of the electrical transmission workforce, particularly among middle and high school students. While most stakeholders have more than enough apprenticeship applicants, many still believe in the importance of expanding the pipeline to help diversify the pool of people aware of the industry. Some of the recommendations below are occurring in pockets across the state. Still, more outreach, awareness and engagement are needed to reach new populations. Recommendations include:

**The State should adopt the Advance CTE Career Clusters for energy (a national model for career exploration that includes the electrical transmission workforce) into K-12 public schools in Washington.**

**Audience:** Washington State Training and Education Coordinating Board; Office of the Superintendent of Public Instruction; State Board for Career and Technical Colleges; Washington Employment Security Department; Washington State Legislature

**Maintain the Pacific Northwest Center of Excellence for Clean Energy (COE).** The COE serves as a crucial convener and is highly valued by industry and education partners. For example, when labor unions and educators update training requirements, the COE plays a central role in aligning industry, trainers, educators and employers on skills needed as occupational requirements evolve. As these occupations modernize and Washington's need for these jobs increases, coordination across stakeholders will be crucial. As the State considers future budgetary challenges, funding for the COE should be prioritized.

**Audience:** The Washington State Legislature; Washington State Board for Community and Technical Colleges

**Schools should increase broad career exploration and new marketing of energy jobs in middle school and high school, including with school counselors.** For example, include a line worker's "day in the life" video in the ninth-grade basic science curriculum to expose students to jobs they may not have previously considered.

**Audience:** Office of the Superintendent of Public Instruction; Washington Employment Security Department; School Districts across Washington

**Schools should incorporate career counseling into their decision-making process for high school students to inform their post-high school plans and career choices.** For example, some schools hold college and apprenticeship application support as a part of the school day.

**Audience:** Office of the Superintendent of Public Instruction; Washington Employment Security Department; School Districts across Washington

**Utilities should leverage partnerships with regional skill centers to encourage and support them in developing training and curriculum related to the electrical transmission workforce.** For example, local utilities could offer "ride-a-longs" to middle & high schoolers, where they get to experience a day in the life of a line crew.

**Audience:** Public and private utilities; CTE Skill Centers

**Form partnerships with the Pacific Northwest Center of Excellence for Clean Energy (COE) on advocating for greater inclusion of the energy sector in K-12 and postsecondary education.** The COE is a voice in Washington for greater inclusion of the energy sector in K-12 and postsecondary education. For example, the COE is partnering with national organizations, such as the Center for Energy Workforce Development (CEWD) and the National Center for Construction Education and Research (NCCER), to increase the use of strategic curriculum in addressing workforce development needs in the energy sector. This type of collaboration brings together the combined expertise of national organizations to create a shared approach to meeting the growing demand for skilled energy professionals. From this partnership, aspiring energy professionals will be equipped with industry-specific skills and knowledge to ensure their success.

**Audience:** Labor unions; State Board of Career and Technical Colleges; Pacific Northwest Center of Excellence for Clean Energy

## **Diversify the workforce**

The current workforce is predominantly white and male, which does not accurately reflect the statewide demographics. The industry has grappled with this challenge for many years, and some of the recommendations below are already being implemented in various areas across the state. Still, these efforts should continue and expand across the state. Efforts to increase career awareness and make pre-apprenticeships more accessible should be viewed as part of addressing this challenge.

**Provide targeted scholarships for pre-apprenticeship programs to candidates from marginalized or overburdened communities, paired with a marketing campaign designed to reach the target audience.** There are examples of this already in place, such as the VOLTA Women's Scholarship. More opportunities like this, along with increased awareness of these opportunities, are essential.

**Audience:** Line Schools/Pre-Apprenticeship Programs; Washington State Legislature; Washington Student Achievement Council; Washington Department of Labor and Industries; Washington State Apprenticeship and Training Council

**Develop a program that connects qualified women and people of color who apply but are not accepted into highly competitive apprenticeship programs.** Provide scholarships and other support to help them attend line school as a cohort.

**Audience:** Community-based Organizations; Washington State Labor Council; Washington Department of Labor and Industries; Washington State Apprenticeship and Training Council; Apprenticeship Training Providers; Public and private utilities

**Improve worksite culture – work with leaders in the sector to change the culture to be more inclusive, to reduce hazing and to increase ownership for each other's safety.**

**Audience:** Employers; National Electrical Contractors Association; public and private utilities; Washington State Labor Council

**Share Washington State Labor Council (WSLC) training and racial justice toolkits with employers and trainers across the electrical transmission workforce**

**Audience:** Public and private utilities, Employers

**Form statewide employer childcare partnerships to reduce the cost and increase the availability of childcare for workers**

**Audience:** Washington Student Achievement Council; Washington State Labor Council]

**Establish a technical assistance network that offers support to employers in creating inclusive workplaces** (e.g., the Washington State Labor Council model).

**Audience:** Public and private utilities; employers

**Address the lack of advancement and leadership development opportunities through “future leader” training, focusing on workers of color and women in utilities and contracting.** Establish a statewide leadership academy for Black, Indigenous and other people of color, as well as women workers, to provide consistency and networking statewide.

**Audience:** Employers; public and private utilities

### **Reduce the impact of retirements by allowing for flexibility**

The ability to grow the future workforce depends on having enough journey-level workers to supervise trainees. However, the electrical transmission trades face a wave of retirements, which could constrain the ability to train future workers.

**Utilities should allow for flexibility with retirements** – for example, allowing someone to transition to part-time work, enabling retirement-age workers to continue training the next generation. This would require flexibility through the Washington State Department of Retirement Services. The IBEW already allows journey-level workers to return to work without impacting their retirement plan.

**Audience:** Public and private utilities; Washington State Department of Retirement Services

### **Continually clarify safety standards unique to Washington**

An influx of journey-level workers from other states could result in a workforce that has not received training specific to Washington’s safety standards, as outlined in WAC 296-45. This circumstance highlights the importance of ensuring that incoming workers receive appropriate orientation and compliance measures to meet state requirements.

**Provide user-friendly information about safety requirements.** The Washington State Department of Labor & Industries (L&I) continually updates safety regulatory information. Stakeholders recommend that L&I supplement current information with user-friendly information about Washington’s unique safety requirements (WAC 296-45). This would help small contractors train out-of-state line workers and tree trimmers on Washington’s safety standards. This could include videos and visuals.

**Audience:** Washington Department of Labor and Industries

### **Increase capacity to uphold safety standards for line clearance tree trimmers**

Stakeholders express concern about the state’s capacity to enforce safety standards in the industry.

**Review recent safety incidents and issues in the field to identify the root causes of these incidents and consider improving regulations accordingly.** This review should include an exploration of the current inspection and enforcement capacity to determine if it is adequate.

**Audience:** Washington Department of Labor and Industries

## Leverage opportunities to further support the workforce

There are state and federal efforts underway that present further opportunities to support the electrical transmission workforce in Washington. The state should capitalize on opportunities that can further strengthen the workforce. That includes the following:

**The Washington Legislature and the governor's office should collaborate on a proactive approach that ensures pre-apprenticeship programs can count towards either the state's newly funded Workforce Pell program or existing financial aid.** This would include bringing Workforce Pell funding to Washington state and assessing which pool of funding (state or federal) can and will cover pre-apprenticeship costs for students. This work is dependent upon a rule-making process at the federal level and will take time. There is currently uncertainty about the details of the program, which could impact eligibility for pre-apprenticeships.

**Audience:** Washington Legislature and Governor's Office; Washington Workforce Training and Education Coordinating Board; State Board for Community and Technical Colleges; Washington Student Achievement Council

## Attract electrical transmission workers to Washington

The Outside Construction Electrical Transmission Workforce is transitory. This means that people follow work to California, Texas and other states with numerous construction projects. If Washington were to have more construction projects, the necessary workers would come from other states. With more journey-level workers from other states, Washington would have greater capacity to train apprentices. This would help our overall workforce pipeline.

**The State should follow the recommendations of the Interagency Clean Energy Siting Coordinating Council to advance transmission projects.** New apprenticeship spots will not be available until projects are secured and permitted. Without a greater number of active projects in Washington or greater project predictability, more apprenticeship spots will not be available. Currently, large transmission projects can take up to 20 years to permit, which constrains our ability to meet climate goals and train the next generation of workers.

**Audience:** Washington State Legislature; Governor's Office; Washington Clean Energy Siting Council

## Topic considered but not recommended

For line worker programs, a one-to-one apprentice-to-journey-level worker ratio is required for on-the-job training. The research team presented the work group with the idea of allowing a higher ratio of apprentices to journey level workers during the "cold" phase of an apprenticeship (when apprentices are not yet working on electrified systems). In theory, this could create additional apprenticeship opportunities. The work group strongly opposed this idea. This comes down to two primary concerns:

- 1) There is a misconception that the cold apprenticeship phase is less dangerous than the hot phase. This is not true – given the heights that trainees must climb, there have been and can be fatalities during the cold phase.
- 2) Work Group members believe this would just create a bottleneck further down the line once the apprentices reached the "hot" phase. It would not address the core challenge.

## Conclusion

In 2024, the Legislature (SB 5950, Sec. 129[40]) directed the Department of Commerce to convene an industry work group to assess Washington’s electrical transmission workforce. To achieve the state’s clean-energy goals, Washington will need approximately 1,550 additional line workers, 320 substation technicians and 240 tree trimmers. The message is clear: building a clean-energy future requires significant investment in workforce development, training and hiring. Furthermore, new efforts to open more apprenticeship spots must include increased efforts to grow access to these professions for women and people of color. The current approach is insufficient to meet this challenge.

The work group reached consensus on a series of critical recommendations to address the growing demand for skilled electrical transmission professionals. Implementing these recommendations will require a coordinated effort across the state – engaging utilities, education institutions, labor organizations, state agencies and the Legislature –to ensure Washington is prepared for the electrical transmission workforce of the future.

# Appendix A: Guide to proviso requirements in this report

**Table A-1: Guide to proviso requirements in this report.**

Subsection	Excerpted reporting requirements	Location in report
2024 SB 5950 Sec, 129. 40 (b) (iv) (A)	Estimates of electrical transmission industry jobs needed to expand electrical transmission capacity to meet the state's clean energy and climate goals, inclusive of the workforce required to maintain existing infrastructure. These estimates should cover, at a minimum, the time periods necessary for the planning, including the construction, reconstruction, or enlargement, of new or existing electrical transmission facilities under RCW 19.28.010, 80.50.060, 19 and 80.50.045 and the state environmental policy act;	Electrical Transmission Workforce Background - "Projected Workforce to Meet Washington's Climate Goals"
2024 SB 5950 Sec, 129. 40 (b) (iv) (B)	The number of apprenticeships in the job classifications listed in (b)(i) of this subsection;	Workforce Challenges - "Not Enough Line Worker Apprenticeship Opportunities"
2024 SB 5950 Sec, 129. 40 (b) (iv) (C)	An inventory of existing apprentice programs and anticipated need for expansion of existing apprenticeships or supplemental training programs to meet current and future workforce needs;	Workforce Challenges - "Not Enough Line Worker Apprenticeship Opportunities"  Appendix G
2024 SB 5950 Sec, 129. 40 (b) (iv) (D)	Demographic data of the workforce, including age, gender, race, ethnicity and, where possible, other categories of identity;	Electrical Transmission Workforce Background - "Current Workforce and Demographics"  Workforce Challenges - "Retirements"
2024 SB 5950 Sec, 129. 40 (b) (iv) (E)	Identification of gaps and barriers to a full complete electrical transmission workforce pool, including, but not limited to, the loss of workers to retirement in the next five, 10 and 15 years and other current and anticipated retention issues;	Workforce Challenges  Workforce Challenges - "Retirements"
2024 SB 5950 Sec, 129. 40 (b) (iv) (F)	A comparison of wages between different jurisdictions in Washington state and between Washington and other neighboring states, including any incentives offered by other states;	Electrical Transmission Workforce Background - "Wages"
2024 SB 5950 Sec, 129. 40 (b) (iv) (G)	Data on the number of workers in the job classifications identified in (b)(i) of this subsection who completed training in Washington and left to work in a different state;	Workforce Challenges - "Migration"
2024 SB 5950 Sec, 129. 40 (b) (iv) (H)	Data on the number of out-of-state workers who enter Washington to meet workforce needs on large-scale electrical transmission projects in Washington; p. 130 ESSB 5950.SL 1	Workforce Challenges - "Migration"
2024 SB 5950 Sec, 129. 40 (b) (iv) (I)	Key challenges that could emerge in the foreseeable future, based on factors such as growth in demand for electricity and changes in energy production and availability; and	Electrical Transmission Workforce Background - Projected Workforce to Meet Washington's Climate Goals
2024 SB 5950 Sec, 129. 40 (b) (iv) (J)	Recommendations for the training, recruitment and retention of the current and anticipated electrical transmission workforce that supplement, enhance, or exceed current training requirements. This must include the identification of barriers to entry into the electrical transmission workforce and recommendations to attract and retain a more diverse workforce, such as members of federally recognized Indian tribes and individuals from overburdened communities, as defined in RCW 70A.02.010.	Equity Analysis  Recommendations

This table outlines how the report fulfills the requirements outlined in the proviso.<sup>27</sup>

## Appendix B: Pathway maps and descriptions

### Journey-level line workers pathway

Most line worker apprenticeship programs require applicants to be high school graduates, 18 years or older and hold a Class A Commercial Driver's License (CDL).<sup>28</sup> Competition for line apprenticeships is fierce, both for outside construction contractors and utilities. This means that competitive applicants typically have six months or more experience in construction or related fields, where they gain experience working outside, using tools and collaborating on a team. In addition, many go to line school – such as Volta or Northwest Linemen's College – before applying for an apprenticeship program. These programs are expensive, and most are unaccredited. Due to high wages and substantial benefits, there are examples of individuals who have transitioned into other fields (e.g., cable splicers, electricians) and are willing to start over as a Step 1 line worker apprentice. While there are opportunities for individuals from other construction or electrical trades to transition into linework, there are no established avenues for them to do so on an accelerated timeline.

Apprenticeship programs can vary but generally require a minimum of 144 hours of Related and supplemental instruction (RSI) per year and 7,000 hours of on-the-job training over a period of approximately 3.5 to 4 years. Every 1,000 hours represents a new step in the program (7 total). Apprentices start as “cold” apprentices – working on systems that are not energized. After working sufficient hours as a cold apprentice and receiving necessary training (i.e., hot stick training), apprentices move on to become “hot” apprentices – or those working on energized systems above 600 volts. There are requirements regarding the number of hours apprentices must have of hot distribution hours before advancing to the next steps. During the apprenticeship, there must be a 1:1 ratio of apprentices to journey-level line workers; this typically means one apprentice per crew. A maximum of two apprentices per two journey-level workers is allowed when working on energized conductors. In that circumstance, one apprentice must be required to perform groundman or equipment operator roles while the other apprentice is performing work around energized conductors.

Once line workers complete their apprenticeship program and journey out, there are no state-mandated continuing education requirements. Employers (utilities, contractors) coordinate ongoing training for line workers as needed to address specific needs (i.e., everything from asbestos training to helicopter training). Additionally, certain certifications – such as first aid/CPR, flagging, and crane training – must be renewed. The NW Line JATC offers training opportunities to obtain and maintain these required certifications.<sup>29</sup>

In the following data visualizations, RSI represents related and supplemental instruction, and OJT represents on-the-job training.

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<sup>27</sup> [Proviso](#) for the Energy Transmission Workforce Report.

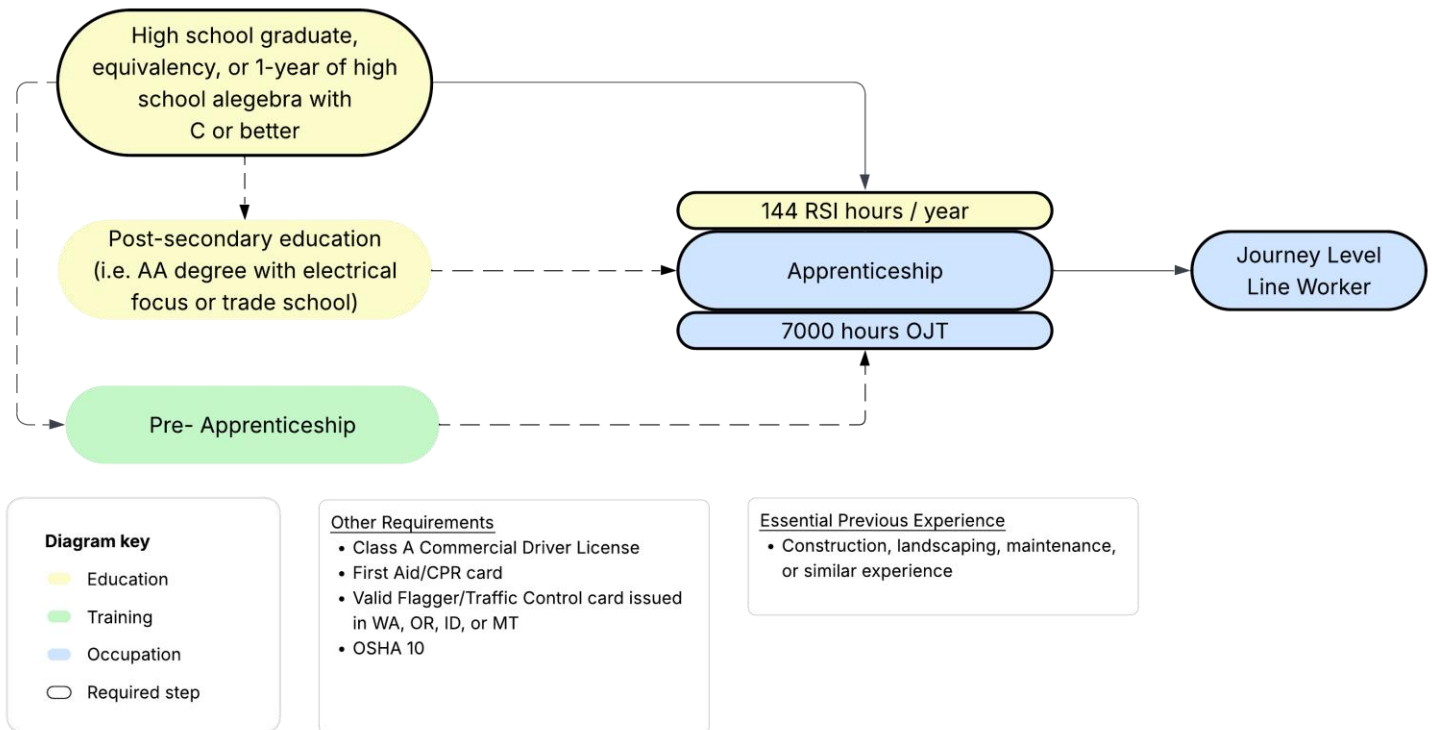
<sup>28</sup> CDL certificates are a common prerequisite but not required in all cases. Rural areas tend to support individuals through CDL training due to smaller applicant pools.

<sup>29</sup> [NW Line JATC](#).

## Journey-level line worker pathway map

This graphic shows the pathways to becoming a line worker.<sup>30</sup> A person starts by having a high school diploma or its equivalent. Further education is optional, but it can make candidates more competitive applicants. The next step in education can be post-secondary (most commonly an AA degree with an electrical focus or trade school), participation in a pre-apprenticeship training program or both pursuing both programs at the same time. Additional requirements for entering an apprenticeship program include a Class A Commercial Driver's License, First Aid/CPR training, a valid flagger/traffic control card and completion of the OSHA 10-Hour Safety Course. Finally, the apprenticeship begins, encompassing 144 related and supplemental hours of instruction per year, as well as 7,000 total hours of on-the-job training, before the individual completes the apprenticeship and becomes a Journey-Level Line Worker.

Figure B-1: Line worker pathway map



<sup>30</sup> Source for this map: [Northwest Line Construction Industry JATC](#) Apprenticeship Program Standards

## Journey-level substation technician pathway

Substation technician pathways differ depending on whether an individual works at a utility or in outside construction. Not all, but several utilities have substation apprenticeship programs that train individuals to work on their systems. Typically, these individuals must be high school graduates and 18 years old. Similar to line workers, these apprenticeship spots can be competitive, and the most qualified candidates often have construction experience. Some are already licensed O1 electricians who are interested in applying their electrical knowledge within a new context. Unlike line worker apprenticeship programs, there are examples of people coming into substation work from trades on an accelerated timeline. For instance, Grant County PUD could start a licensed electrician at step 3, allowing them to skip basic electricity and related training. Seattle City Light is considering a similar approach.

Utilities have a strong preference to “grow their own” substation talent because substation equipment can be unique utility-to-utility, and it is much harder to recruit a journey-level substation technician who has worked on different systems. Apprenticeship programs vary but typically require 144 hours of related and supplemental instructional hours per year, along with 6,000 to 8,000 hours of on-the-job training over a period of approximately 3 to 4 years. During the apprenticeship, there must be a one-to-one ratio of apprentices to journey-level substation technicians.

In Washington state, outside construction has not had an apprenticeship program for substation technicians, but the NW Line JATC is currently in the process of launching one. The NW Line JATC already offers a substation technician certification program designed for journey-level line workers who wish to pursue additional substation training to qualify for work on substations.<sup>31</sup> While this program has met the need for some time, the JATC is now looking to start up an apprenticeship program because it anticipates increased demand for substation work as upgrades are needed and new technology is implemented.

There are no continuing education requirements for substation technicians in the state of Washington. However, there are regular advancements in substation technology that require workers to learn new skills and adapt to new technologies. For example, utilities are looking to implement automatic distribution systems, which can help minimize downtime for customers. However, to do so, they need to train their workforce on these newer technologies.

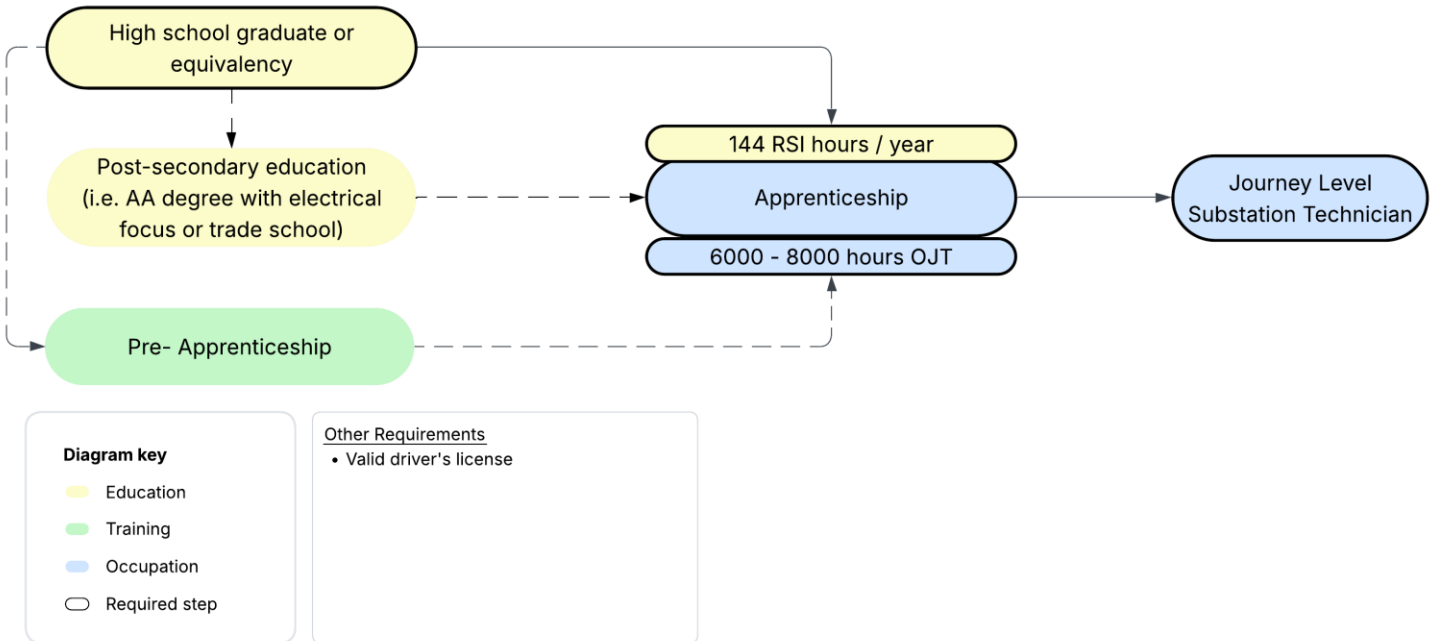
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<sup>31</sup> [NW Line JATC substation technician certification program](#).

## Journey-level substation technician pathway map

This graphic shows the pathways to becoming a substation technician.<sup>32</sup> A person typically starts by having a high school diploma or its equivalent. Further education is optional, but it can make candidates more competitive applicants. The next step in education can be post-secondary (most commonly an AA degree with an electrical focus or trade school), participation in a pre-apprenticeship training program or pursuing both programs at the same time. Another requirement for entering an apprenticeship program is a valid driver's license. Finally, the apprenticeship begins, encompassing 144 related and supplemental instructional hours per year, in addition to 6,000 to 8,000 total hours of on-the-job training, before the individual completes the apprenticeship and becomes a Journey-Level Substation Technician.

Figure B-2: Substation technician pathway map



<sup>32</sup> Source for this map. Sources: [Inland Power and Light Apprenticeship Committee](#) and [Franklin PUD - Local 77 IBEW Apprenticeship Committee](#) Apprenticeship Program Standards

## Journey-level line clearance and tree-trimmer pathway

Similar to line workers, journey-level line clearance tree trimmers must meet minimum high school requirements, be at least 18 years old and have a valid driver's license (it does not have to be commercial). While construction experience is preferred, the tree trimmer apprenticeship programs are less competitive than the line worker program. Therefore, it is easier to get in without prior construction or pre-apprenticeship experience – although these are still preferred.

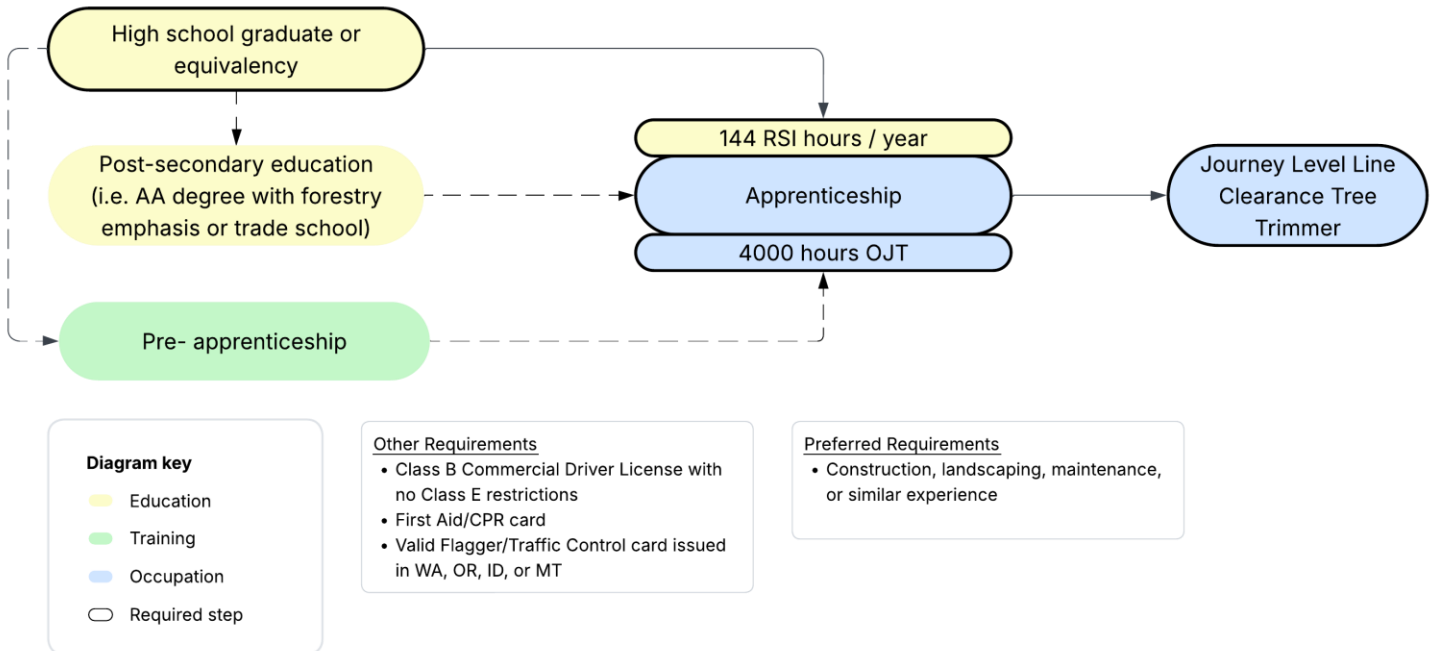
Apprenticeship programs can vary, but in general, they require a minimum of 144 hours of Related and supplemental instruction per year and 4,000 hours of on-the-job training over a period of approximately two years. Every 1,000 hours represents a new step in the program (four total). Most tree trimmers are employed by contracted companies that work on construction or utility contracts. Some utilities have their own in-house tree trimmers, while others rely solely on contractors. During the apprenticeship, there must be a one-to-one ratio of an apprentice to a journey-level tree clearance trimmer. Exceptions can be made to meet training agent labor demands, allowing a maximum of two apprentices (4th step and 1st step) per job site to one journey-level worker.

Due to wage disparities, some tree trimmers transition directly into the line worker apprenticeship after they have completed their journey as a tree trimmer. Advancement for tree trimmers can often involve transitioning to another occupation within the electrical transmission workforce.

## Journey-level tree trimmer pathway map

This graphic shows the pathways to becoming a tree trimmer.<sup>33</sup> A person typically starts by having a high school diploma or its equivalent. Further education is optional, but it can make candidates more competitive applicants. The next step in education can be post-secondary (most commonly an AA degree with a forestry focus or trade school) and/or participation in a pre-apprenticeship training program. Additional requirements for entering an apprenticeship program include a Class B Commercial Driver's License (with no Class E restriction), First Aid/CPR training and a valid flagger/traffic control card. Finally, the apprenticeship begins, including 144 related and supplemental instructional hours per year and 4,000 total hours of on-the-job training before a person completes the apprenticeship and becomes a Journey-Level Line Clearance Tree Trimmer.

Figure B-3: Tree trimmer pathway



<sup>33</sup> Source: [Power Line Clearance and Tree Trimmers Apprenticeship Committee](#) Apprenticeship Program Standards

## Appendix C: Bonneville Power Administration

The Bonneville Power Administration, a federal power marketing administration under the U.S. Department of Energy, distributes hydropower generated in the Columbia River Basin to communities across the Pacific Northwest. The Bonneville Power Administration operates approximately 75% of the Northwest's high-voltage transmission grid and maintains about 15,000 miles of high-voltage transmission lines.<sup>34</sup> To support this critical infrastructure, BPA employs over 3,000 individuals and offers registered apprenticeship programs for line workers and substation technicians, providing essential paid on-the-job training to develop the future workforce.<sup>35</sup>

In early 2025, the Trump administration implemented staffing reductions at the Bonneville Power Administration, eliminating an estimated 430 positions through buyouts, rescinded offers and probationary terminations.<sup>36</sup> Some of these positions were later reinstated in March 2025.<sup>37</sup> Among those affected were skilled trades central to this report, including line workers and substation technicians. The full impact of these workforce reductions, particularly on operations in Washington state, remains unclear.

Available public information suggests the Pacific Northwest has likely experienced a loss of experienced technical personnel, along with a reduction in apprenticeship opportunities. These disruptions pose a risk of long-term workforce shortages that could impact the regional workforce required to maintain the regional power grid.

Bonneville Power Administration declined an invitation to be interviewed to help inform this study. Additional data and engagement are necessary to fully understand the scope of recent workforce changes and inform future workforce development and infrastructure planning efforts.

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<sup>34</sup> [Who We Are - Bonneville Power Administration](#)

<sup>35</sup> [BPA Apprenticeship Program - Bonneville Power Administration](#)

<sup>36</sup> [Bonneville Power staff departures under President Trump raise concerns about Northwest electrical grid - OPB](#)

<sup>37</sup> [Bonneville Power Administration offers jobs back to staff fired by Trump administration - OPB](#)

## Appendix D: Tribal considerations

### Tribal utilities

Several tribes in Washington state operate their own electrical utility services to support energy sovereignty and economic development, including Kalispel Tribal Utilities and Yakama Power. These tribal utilities provide valuable jobs for tribal members, as well as essential training opportunities through apprenticeships. Yakama Power offers a registered apprenticeship program in partnership with the Northwest Line JATC, described under "Key concepts and terms to know." There are opportunities for the legislature to work directly with tribes to explore the expansion of apprenticeship and other job training initiatives for tribal utilities.

### Native American Apprenticeship Assistance Program (NAAAP)

The Native American Apprenticeship Assistance Program (NAAAP), established by HB 2019 in spring 2024, is a block grant program administered by the Washington Student Achievement Council. It provides funding directly to Federally Recognized Tribal Nations in Washington State to support Tribal members who are currently enrolled in state-registered apprenticeship programs under Chapter 49.04 RCW.<sup>383940</sup>

Tribes can use these funds to help participants pursue and complete any eligible apprenticeship program, including those for line workers, line clearance tree trimmers and future programs for substation technicians. Covered expenses include tuition, equipment and general supplies, union fees and living expenses such as travel costs and childcare.

For the fiscal year, the legislature allocated \$1,000,000 from the state operating budget provided to WSAC to support this program.

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<sup>38</sup> [Native American Apprenticeship Assistance Program \(NAAAP\) | WSAC](#)

<sup>39</sup> [HB 2019](#)

<sup>40</sup> [Chapter 49.04 RCW](#)

## Appendix E: Pre-apprenticeship programs and partnerships with the community college system

As described in the challenges section, pre-apprenticeships (i.e., "line school") can be inaccessible, mainly due to cost. One way to address this challenge is to form partnerships between community colleges and trainers that enable pre-apprenticeship participants to receive industry-aligned training at an accredited institution, allowing them to access federal financial aid. Routing pre-apprenticeships through an accredited institution also creates opportunities for trainees to earn credit-bearing degrees (such as an associate degree). Avista and Spokane Community College successfully ran a pre-apprenticeship program together for nearly thirty years before it was closed. Clover Park Technical College and VOLTA are in the final phases of launching a pre-apprenticeship program. More information about those two efforts is below. Additionally, the Pacific Northwest Center of Excellence for Clean Energy plays a crucial role in coordinating between industry and education in Washington. This appendix also includes a description of their role.

**Avista/Spokane Community College:** Avista previously operated a successful electrical transmission pre-apprenticeship program that served the eastern side of the state. It operated in partnership with Spokane Community College, which allowed participants to access state and federal financial aid, reduced administrative burdens for Avista and allowed program participants to earn credits at an accredited university. This program had a strong reputation, and approximately 80% of completers were hired within a few months of finishing the program. After nearly three decades in operation, it closed during the COVID-19 pandemic due to the high operating costs, which were approximately \$800,000 per year. A primary driver of this cost was paying instructors at a higher rate than typical community college instructors to match wages for journey-level work, which these instructors could choose to pursue.

**VOLTA/Clover Park Technical College:** Clover Park Technical College and VOLTA are currently partnering to launch an electrical transmission pre-apprenticeship program at Clover Park Technical College (located in Lakewood, WA). This program represents a strong partnership between a community college and a union. It is located in Puget Sound, where most of the state's population resides. It will allow students to access financial aid (i.e., Pell grants, GI bill), and it is structured so that students earn an associate's degree. This is an exciting program, but it has run into many roadblocks along the way: delays in permitting for the pole yard, limited system knowledge about how to effectively route pre-apprenticeship programs through community colleges and complex maneuvers required so Clover Park can use tuition to pay VOLTA instructors and have them count for full-time equivalency. Programs like these are administratively burdensome to run, and while some may assume they are windfalls for the college, Clover Park expects to break even on these programs.

**Pacific Northwest Center of Excellence for Clean Energy:** The Pacific Northwest Center of Excellence for Clean Energy (COE) is a statewide and regional resource. They represent the interests of the energy industry and labor partners within the Washington State Community and Technical College system.

The energy industry – both globally and nationally, and throughout Washington – is undergoing significant change. The future growth in clean energy depends on a well-qualified workforce to design, build, operate and maintain renewable energy plants and equipment. The Center of Excellence exists to narrow the gap between employers' demands for a highly skilled workforce and the colleges' ability to supply work-ready graduates. They convene industry and labor to help drive workforce development initiatives, and they coordinate education and training resources in accordance with the direction set by industry and labor.

## Appendix F: Mean wages and living wage comparison, 2024

The following visuals illustrate whether wages meet or do not meet living wage criteria across Washington. A living wage is a measure of the minimum amount of money someone would need to earn to maintain a basic standard of living. This means being able to afford essentials such as shelter, food, clothing, childcare, education and healthcare. The living wage varies based on the number of people in a household and the geographic location of the household. This is because a household with two working adults and one child typically requires more financial resources to meet basic needs than a household with just one working adult. In addition, the location of that household matters because a city like Seattle, WA, is a more expensive place to live than Longview, WA.

In the charts below, blue boxes indicate that the living wage criteria are met for both the household composition and the location. Rather than using cities, this analysis looks at workforce development areas. Household composition significantly impacts whether a wage meets living wage criteria, and it can be nuanced. For households with children, this model assumes that households with two working adults need higher wages than households with two adults where only one is working. This is because the model assumes that households with two working adults must pay for childcare, while households where one adult does not work do not need to pay for childcare.

### Figure F-1: Mean wages and living wage comparison for tree trimmers

For Tree Trimmers, households across the state with one working adult and no children meet living wage criteria. Aside from a few exceptions, this means that tree trimmers who live in households with more than one adult or with children are not earning a living wage.

#### Tree Trimmers

WDA	Mean Annual Wage	1 working adult				2 adults, 1 working				2 adults, both working			
		0 children	1 child	2 children	3 children	0 children	1 child	2 children	3 children	0 children	1 child	2 children	3 children
Olympic	\$ 61,000	Blue											
Pacific Mountain	\$ 61,000	Blue											
Northwest	\$ 71,000	Blue				Blue				Blue			
Snohomish	\$ 72,000	Blue											
Seattle-King	\$ 72,000	Blue											
Tacoma-Pierce	\$ 72,000	Blue											
Southwest	\$ 59,000	Blue											
North Central	\$ 55,000	Blue											
South Central	\$ 56,000	Blue											
Eastern	\$ 57,000	Blue											
Benton-Franklin	\$ 63,000	Blue											
Spokane	\$ 59,000	Blue											

## Figure F-2: Mean wages and living wage comparison for substation technicians

For substation technicians, most households across Washington with zero to two children meet living wage criteria. This means substation technicians are faring much better than tree trimmers across Washington. However, households with three or more children do not meet living wage criteria, even with two working adults.

### Substation Technicians

WDA	Mean Annual Wage	1 working adult				2 adults, 1 working				2 adults, both working			
		0 children	1 child	2 children	3 children	0 children	1 child	2 children	3 children	0 children	1 child	2 children	3 children
Olympic	\$ 123,000	■	■	■		■	■	■	■	■	■		
Pacific Mountain	\$ 123,000	■	■	■		■	■	■	■	■	■	■	
Northwest	\$ 116,000	■	■	■		■	■	■	■	■	■		
Snohomish	\$ 123,000	■	■	■		■	■	■	■	■	■	■	
Seattle-King	\$ 123,000	■	■	■		■	■	■	■	■	■	■	
Tacoma-Pierce	\$ 123,000	■	■	■		■	■	■	■	■	■	■	
Southwest	\$ 124,000	■	■	■		■	■	■	■	■	■	■	
North Central	\$ 97,000	■				■				■			
South Central	\$ 111,000	■	■			■	■	■	■	■	■		
Eastern	\$ 93,000	■	■			■	■	■	■	■	■		
Benton-Franklin	\$ 107,000	■	■	■		■	■	■	■	■	■	■	
Spokane	\$ 90,000	■	■			■	■	■	■	■	■		

## Figure F-3: Mean wages and living wage comparison for line workers

For line workers, most households across Washington with zero to two children meet living wage criteria. For households with two adults where one is working, living wage criteria are met in most areas for households with up to three children. This means line workers are faring a little better than substation technicians and much better than tree trimmers across Washington.

### Line Workers

WDA	Mean Annual Wage	1 working adult				2 adults, 1 working				2 adults, both working			
		0 children	1 child	2 children	3 children	0 children	1 child	2 children	3 children	0 children	1 child	2 children	3 children
Olympic	\$ 114,000	■	■	■		■	■	■	■	■	■		
Pacific Mountain	\$ 119,000	■	■	■		■	■	■	■	■	■	■	
Northwest	\$ 127,000	■	■	■		■	■	■	■	■	■	■	
Snohomish	\$ 113,000	■	■	■		■	■	■	■	■	■		
Seattle-King	\$ 113,000	■	■	■		■	■	■	■	■	■	■	
Tacoma-Pierce	\$ 113,000	■	■	■		■	■	■	■	■	■	■	
Southwest	\$ 115,000	■	■	■		■	■	■	■	■	■	■	
North Central	\$ 115,000	■				■				■			
South Central	\$ 112,000	■	■			■	■	■	■	■	■		
Eastern	\$ 111,000	■	■			■	■	■	■	■	■		
Benton-Franklin	\$ 118,000	■	■	■		■	■	■	■	■	■	■	
Spokane	\$ 111,000	■	■	■		■	■	■	■	■	■		

Sources: WA Employment Security Department - Occupational Employment and Wage Statistics, MIT Living Wage Calculator

# Appendix G. Registered apprenticeship program inventory

Apprenticeship programs are listed if an active apprentice was enrolled at the time of the data pull (May 2025).<sup>41,42</sup>

## Registered line worker apprenticeship programs

- 1) Benton Rural Electric Association Apprenticeship Committee
- 2) Centralia City Light Apprenticeship Committee
- 3) Chelan County Public Utility District No. 1 Apprenticeship Committee
- 4) City of Ellensburg Energy Services Department
- 5) City of Milton & IBEW Local 483 Joint Apprenticeship Training Committee
- 6) City of Richland Energy Services Department Local Union 77 IBEW Apprenticeship Committee
- 7) City of Seattle, Washington Apprenticeship Committee
- 8) City of Sumas Lineman Apprenticeship Committee
- 9) Clark County PUD No. 1 Apprenticeship Committee
- 10) Columbia Rural Electric Association Apprenticeship Committee
- 11) Cowlitz County PUD Apprenticeship Committee
- 12) Elmhurst Mutual Power & Light Company Apprenticeship Committee
- 13) Franklin PUD - Local 77 IBEW Apprenticeship Committee
- 14) Grant County PUD No. 2 Joint Apprenticeship & Training Committee
- 15) Grays Harbor PUD No. 1 Apprenticeship Committee
- 16) Inland Power and Light Co Apprenticeship Committee
- 17) Jefferson County PUD Apprenticeship Committee
- 18) Lakeview Light & Power and IBEW Local Union #483
- 19) Lewis County PUD Apprenticeship Committee
- 20) Mason County Public Utility District #3 Apprenticeship Committee
- 21) Mason County PUD No.1 Apprenticeship Committee
- 22) McCleary Light Power Lineman Apprenticeship
- 23) Northwest Line JATC
- 24) Okanogan PUD Apprenticeship
- 25) Orcas Power & Light Cooperative
- 26) PUD #1 Clallam County Apprenticeship Committee
- 27) Pacific County PUD No. 2 Apprenticeship Committee
- 28) Pacific Power & LU 125 JATC
- 29) Parkland Light And Water Company JATC
- 30) Peninsula Light Company Apprenticeship Committee
- 31) Public Utility District No. 1 of Benton County IBEW #77 Apprenticeship Committee
- 32) Skamania PUD NO.1 Apprenticeship Committee
- 33) Snohomish County PUD Number 1 Apprenticeship Committee
- 34) Tanner Electric Cooperative Lineman Apprenticeship Committee
- 35) Town of Eatonville

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41 Apprenticeship programs are listed if an active apprentice was enrolled at the time of the data pull (May 2025).

42 Source: Washington State Department of Labor and Industry

## Substation technician apprenticeship programs

- 1) Chelan County Public Utility District No. 1 Apprenticeship Committee
- 2) Grand Coulee Power Office Apprenticeship
- 3) Grant County PUD No. 2 Joint Apprenticeship & Training Committee
- 4) Grays Harbor P.U.D. No. 1 Apprenticeship Committee
- 5) Inland Power and Light Co Apprenticeship Committee
- 6) King County Metro Transit Joint Apprenticeship Committee
- 7) Peninsula Light Company Apprenticeship Committee
- 8) Puget Sound Energy Apprenticeship Committee
- 9) Snohomish County P.U.D. Number 1 Apprenticeship Committee

## Line clearance tree trimmer apprenticeship programs

- 1) Power Line Clearance and Tree Trimmers Apprenticeship Committee
- 2) PUD #1 Clallam County Apprenticeship Committee
- 3) Lewis County PUD Apprenticeship Committee