Washington
Green Transportation Program

Workforce Challenges of Public Fleet Employers Scaling Up Transportation Electrification

Phase 2

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Energy Program
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Washington
Green Transportation Program
Moving forward with Washington's public fleets

The Washington State legislature passed legislation in 2019 directing the **WSU Energy Program** to establish and administer a technical assistance and education program for public agencies on the use of alternative fuels and vehicles. The **Green Transportation Program** provides education and assistance about alternative fuels and vehicles to all public agencies in the state, including cities, counties, tribes, transit agencies, ports, school districts, colleges and universities, utilities and PUDs, and other political subdivision.

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About the Washington Green Transportation Program

The Washington Green Transportation Program (GTP) provides technical assistance and education to public agencies on the use of alternative fuels and vehicles. GTP supports:

- Adopting passenger electric vehicles (EVs) and installing more EV charging infrastructure by municipal, county, school district, utility and other public agencies.
- Adding medium- and heavy-duty EVs to public fleets.
- Innovations in green transportation that are relevant to Washington communities.

Resources available on the GTP website include educational opportunities, funding opportunities, news about technology advances, access to the Alternative Fuels and Vehicles Technical Assistance Group (AFV-TAG), highlights of successful public fleet projects, and policy and research updates.

Introduction

The Green Transportation Program (GTP), established by the Washington State Legislature, is housed within the Washington State University Energy Program. The GTP provides unbiased, up-to-date education and technical assistance to support the transition of public fleets to cleaner fuels. Information about the GTP can be found on the GTP website.

As part of the GTP work, we conducted an initial scan of research and information relevant to ensuring our state has a workforce prepared to meet Washington's green transportation goals. The findings were published in *Washington State's Green Transportation Program: Initial Research Review for Workforce Development, Phase 1.*[1] This work revealed a lack of timely information adequate for projecting changes in skills, occupations and labor demands. Given the rapidly changing transportation electrification (TE) sector, and the evolving knowledge and skills needed to do this work, we reached out directly to employers and managers of public fleets and staff at electric utilities working on TE implementation with their customers to gather information that can inform workforce development efforts.

Our interviews document their perspectives on changes in knowledge and skills, job demand and access to training, as well their efforts to recruit and retain diverse and underrepresented workers in this sector.

The organizations selected for interviews were chosen because they are public agencies that have taken steps to electrify their fleets. Within these organizations, we focused the interviews primarily on fleet managers or operators who have direct experience supervising and hiring workers involved in TE-related operations.

Interviews were conducted with people representing the following organizations:

Energy Northwest
Seattle City Light
Twin Transit
City of Seattle Economic Development
City of Seattle TE Advisor
Everett Transit
Pierce Transit
City of Auburn - Transit
City of Kirkland
City of Seattle - Fleet Maintenance
Washington Dept. of Enterprise Services, Business Resources Division
Cadeo Group
Tacoma Power

Fleet Electrification Plans

The TE actions were largely driven by organizational policy directives. Larger organizations had formal TE plans while mid-sized organizations were driven by more generalized sustainability plans. Appendix A contains links to the organization's TE or sustainability plans, or press releases related to their electrification activities. Some of the smaller organizations did not have formal plans, but were taking action in response to the financial benefits of EVS or to show leadership on community environmental priorities.

Many of the stated EV goals were fairly ambitious: from electrifying 30% or 50% of their fleet by 2030, to 100% of their fleet by 2035. The larger organizations had the most aggressive targets and saw themselves as leaders in pushing the market. These organizations are looking to electrify everything they can and are watching for all new vehicle and charging options that come to market. Others are taking action at a measured pace, learning and adapting as they are able. Several mentioned watching for regional opportunities to connect to fast-charging corridors or more advancement in hydrogen refueling capabilities.

[1] *Washington State's Green Transportation Program: Initial Research Review for Workforce Development, Phase 1*. WSU Energy Program, April 2021.

The smaller organizations are finding success by beginning their transition with passenger vehicles. This market is fairly mature and represents low-hanging fruit for reducing maintenance and fuel costs, and reducing emissions.

In contrast, the market for heavy-duty and transit vehicles is younger and, while there are likely benefits in the total cost of ownership (TCO), the new technology for this class of vehicle can pose significant upfront costs and potential reliability risks. One smaller municipal fleet found significant savings on fuel costs after electrifying some of their police vehicles, while another found savings after electrifying municipal administrative and inspector vehicles. Most of the employers mentioned they are closing watching the market for electrification of heavy-duty vehicles such as waste haulers, fire trucks, buses and other work vehicles.

> *Demand for people is growing. We used to hire planners, now we are planning less and implementing more. It's time for action. We need to get everything electrified now. The demand for technical skills will increase dramatically. We are the front of a wave. If we wait, we will miss opportunities, people will be frustrated and we will have to import workers from other areas.*

Changes in Skills and Occupations as Fleets Electrify

Much of the TE-related employment shifts currently underway are taking place in the private sector with businesses focused on manufacturing, installing and servicing TE-related equipment. These businesses are responding to demand expressed in TE-related goals across the private and public sectors for equipment and services. This report includes the perspective of public fleet employers who represent a portion of the demand driving growth in this industry. As the TE industry develops, the public sector will need to plan for the ongoing maintenance and replacement of their infrastructure investments by either developing those skills in-house or relying on ongoing contracted services of the private sector.

Changes in specific job skills within public fleets are just beginning to surface. Employers were challenged to describe in detail how specific knowledge and skill requirements would change, often saying they know they are changing but they don't know precisely how yet. One reason for this uncertainty is that they are making extensive use of their vehicle warranties and relying on external support to maintain and repair their EVs in lieu of training or hiring new staff.

The slow adoption thus far of TE knowledge and skills within public fleets is a logical response to rapidly evolving technology, the increasing complexity of vehicle electronics, and the need for specialized and often-expensive diagnostic and repair equipment. The lack of TE knowledge and applied skills within the fleets' existing workforce combined with the lack of available training opportunities perpetuates the dependence on external service and support.

Fleet employers noted that TE will eventually cause job changes across their individual organizations. Some of these changes require significant new knowledge and skills; others require a change in process. The process changes, most apparent in vehicle procurement, billing and customer service, will require an investment by leadership and management to work through the organizations. Whether these changes require specific training or additional staff depends largely on the size of the organization and how rapidly they plan to meet their goals.

These impacts, described below, include specific new skills and training needs as well as process changes that organizations may encounter.

Vehicle Maintenance Workers

Many of the new vehicles purchased by these fleets are still being serviced under warranties, deferring the need to develop maintenance skills internally. In these cases, manufacturers and vendors are picking up most of the new work. Employers report they have not yet seen a significant change in in-house skills, and some have yet to initiate efforts to upskill existing maintenance workers. Employers recognize they are on the early side of the TE transition, as they are purchasing equipment that few, if any, current staff are able to maintain. They anticipate the need for training very soon.

The electrical-related components of EVs require a higher-level skill set than traditional mechanics have needed. There is broad agreement that the lower-skilled service tasks such as changing fluids, lights and tires will not change very much with EVs. However, more advanced maintenance skills are changing as workers are increasingly working on and around high voltages, electric drive trains, battery packs and regenerative braking systems. One fleet maintenance manager noted:

> *We have service workers (lubes, tires, lights) and mechanics (rebuild an engine). We may need less service workers since there are no belts and less fluids. We will have mechanics retire out and we will bump up the service workers to fill the mechanic work, and likely reduce the traditional service position.*

In addition to the electric components of EVs, over the past decade, all vehicles are expanding use of on-board electronics. The growth in electronics has resulted in all mechanics needing an ever-expanding range of computer diagnostic skills. This trend will increase significantly as EV adoption expands: EVs have much more sophisticated electronics, may require system networking, and typically include software analytical tools. As one employer noted:

> *When you move from ICE to EV, you move from mechanical engineering to electrical engineering and IT. Sometimes you don't even have to bring your car to a shop to repair them – it's done via a remote software update.*

Another employer observed that equipment manufacturers can collect a lot of data on their vehicles:

> *They [the manufacturer] collects data on the bus – they are learning as we learn. They might see notifications about problems perhaps even before us. I feel like we will need more training.*

One employer stated that the growing use of advanced computer and diagnostic tools could evolve to the point that a new, separate job class might be needed. The see technology evolving and the need to evolve with it. There was broad agreement that IT and network skills were increasingly critical. Following are several employer observations about the expanding use of technology.

> *Every car and bus has a computer now so at some level they already know how to work with the electronics. They see the change coming but they don't want to do it. They are resistant.*

> *You have to be an IT guy to fix cars these days. You have to stay on top of it. Nuts and bolts still keep it together, but everything else changes.*

Fleet employers have experienced the same challenges as manufacturers and vendors in securing technicians and maintenance workers with programming and digital tech skills. And this skills gap has meant that many manufacturers and suppliers are unable to provide high quality support to their fleet customers.

When employers were asked if it was more urgent to upskill existing workers or train new workers, they overwhelmingly reported that their highest priority was for their existing workers to have opportunities

to gain new skills. ICE automotive skills will continue to be needed during the transition to EVs, and upskilling existing technicians and maintenance workers is key to keeping their current fleet maintained while adding new technology.

Below two employers describe their experiences seeking workers with EV skills:

> *We are in the process of posting two EV positions now. We won't disqualify anyone if they don't have it as we plan to train them along with all our staff. These two positions are backfilling people who have left, not new positions. A big challenge will be finding skilled people on the equipment as well as the software. We need more support from the software developers.*

> *We just had a service worker job screening yesterday. The people applying for that job had zero experience with electronics at all. They only had experience working on their own cars, no training at all let alone EV.*

Workers with any relevant EV maintenance skills were seen as very valuable and hard to find. Municipal fleets feel constrained in their ability to attract workers when competing with utilities and private industries for these hard-to-find skills. As one employer stated:

> *The city doesn't pay enough to attract anyone with those skills. How do you attract a young person from auto school with that experience if you don't pay enough? The young people don't care about city's benefits. Skilled workers are going to private, independent companies, places that pay more money. Maybe the local utility. Right now those guys are going to work for Tesla.*

Manufacturer's use of proprietary equipment presents a major challenge to employers. The manufacturers may provide some initial training to get started, but it is not enough to diagnose problems or keep up with ongoing maintenance. This is especially important when manufacturers employ proprietary information limiting the opportunity for outside training vendors to fill the gap.

> *We don't like the situation with proprietary info. That's our biggest obstacle. When you run into proprietary software, you have to work with 3rd parties that build patches, but they have no training, no support. It can take weeks to fix one tiny problem. If something in one of the proprietary systems breaks, we can't touch them [because of the warranty]. There is one certified person in the state who can work on them.*

The employers feel in a bind regarding restrictions on proprietary equipment. It doesn't always work as expected and the support they receive from manufacturers has left many frustrated:

> *We met with [the vehicle manufacturer] to ask them for access to their diagnostic software – the manufactures won't let us in and we have to rig up a hack to get them to work. We have to keep sending our leased vehicles to them to work on.*

Dealership Sales Staff

Several employers mentioned the need for auto dealerships to do a better job of educating potential fleet and community buyers on how to select and operate EVs. They felt the dealerships lacked enthusiasm and support for EVs. This is important to public fleets because they rely on knowledgeable sales staff to help make purchasing decisions. Fleets are an important player in the EV market; they make large purchases and these purchases are linked to addressing community concerns. They would like to see these values reflected in the support they receive from the auto dealers. They also report a

lack of charging stations located at dealerships to show potential buyers how to use them, and a lack of maintenance workers trained to work on EVs. Below are some employer observations:

> *My sense is that in addition to technical and mechanical people, we need more skills in sales. The EV dealers don't know much about EVs and aren't helpful with purchasing and sales. The person you buy your car from needs to understand the infrastructure and maintenance needs. They need to educate you when you make that purchase. Dealerships themselves need to be retrofit. They need to modify their lots for chargers, solar storage systems.*
>
> *Tesla does a good job of telling people what they need before they drive home their EV, others not so much.*

Hydrogen Fuel-Cell Vehicles

Employers are watching closely for the evolution in hydrogen fueled infrastructure to support heavy vehicles. When the infrastructure comes, there will be a rapid need for maintenance worker training as public fleets are expecting to rapidly make use of this technology.

> *We don't see the heavy truck industry moving to electrification because of requirements for charging a fleet that size. The heavy trucks will be hydrogen-based fuel. Technology isn't quite there but it's coming soon. The city is trying to go fossil fuel free but there are technology restrictions. BEV will not be the thing for heavy vehicles. Hydrogen EVs are more promising.*
>
> *I see a need for hydrogen skills. Once there is a refueling infrastructure in place, the need will come fast. The next 5-10 years.*

Charging Station Installation and Maintenance

Charging station installation and maintenance require somewhat different skills. Charging station installation requires planning and site development, knowledge of working with high-voltage electrical systems, software deployment and set up digital networks. Charging station maintenance requires a similar emphasis on working on and around high-voltage electrical systems, but more emphasis on software and network diagnostics. Electrical and network system integration skills will also be important as public fleet projects may begin with a few charging station installations and build on to it over time.

At this time, much of the fleet vehicles remain under warranty, which means the manufacturers and contractors are covering most of the installation and maintenance. Employers, however, are seeking to upskill their workers to enable them to maintain equipment as well as lead expansion installations.

Employers are running into well-document shortages of highly skilled electrical workers.[2] They report that skills needed to install level 3 chargers are harder to find than for level 2 chargers.

Employers suggested lessons could be learned from the solar industry as skills required for pre-planning, site-design and installation are similar for both industries. The work is also similar in that installation contractors follow the work, relying on a stream of new projects to keep staff employed.

[2] *Workforce Challenges of Electric Sector Employers in Washington and Oregon*, January 2008, and other reports under the "Workforce Development" section here.

Other Alternative Fuel Specialists

During the transition from fossil fuels to alternative fuels, workers skilled in multiple technologies will be very useful. Employers see a need for people with broad understanding of renewable biodiesel, EVs and fuel cell - and how they all of these systems work with vehicles.

Administration, Finance and Other Organizational Staff Impacts

Larger public fleets as well as utilities working to support customer TE efforts are seeing an increased need for employee skills related to education, outreach and customer service for the EV system users. These skills are needed to support the EV users both internal to the organization and, in the case of public charging stations, the broader community. Employers also recognized the need for skills developing community partnerships, supporting project development, increased financial analysis, vehicle usage analytics, and reporting. Funding for TE projects may come from a variety of sources including grants and community partners, which impacts community relations staff. Many EVs have the capability to charge to various administrative accounts, and employers see an increase in support needed for processing charges.

One electric utility respondent describes the projecting significant growth in customer service and community outreach work within their organization:

> *We help customers write grants, discuss alternative designs and consider options. School districts and municipal fleets don't need to know where to place chargers. They can work with us to figure that out. We are going to need a lot more customer service skills. Building and maintaining relationships is critical. We work to stack benefits from the state, feds and the community to maximize community benefits. We need people who can reach out to all these partners and maintain relationships. We are doing a lot more customer relations work than we did in the past, and this will certainly grow.*

One large fleet describes a need for additional administration related to billing accounts for EV users and analyzing vehicles for procurement.

> *Charge cards and billing aspect of EV admin work is a growth area. Up front analytical work to determine which vehicles are good. We have an analytic team that is ensuring we are getting the right vehicles to the right use. Need for financing.*

One municipal fleet manager described a serious shortfall of electrical technical skills that overlaps many economic sectors. They noted that the electrical permit review staff are overwhelmed with work right now, and their community has an existing shortage of power line workers which they expect to worsen.

Do Employers Expect Job Growth?

The overall impact of TE jobs on the public fleet workforce will be a function of how ambitious their goals are and how much they rely on contractors, especially over time. Short-term jobs associated with building out new systems are currently falling to contractors. Jobs associated with ongoing operation and maintenance of the system may remain primarily outsourced to contractors, especially while equipment is under warranty, but will likely shift the internal workforce of the fleet.

It is common practice at this time for contractors to bring in workers from around the country. Should they choose to do so, public fleets have the authority to use contracting to specify the use of local labor. This could result in improving the labor market for all TE employers.

Currently, federal Bureau of Labor Statistics and NAICS codes do not identify alternative fueled vehicle industries, occupations and workforce characteristics separately from all auto-industry data. Attempts have been made to project jobs in this industry, but all of these forecasts rely on extrapolating data from the auto industry in general. Improving federal data collection and reporting will allow for better employment forecasts, which in turn could aid training and education programs as well as other manufacturing and related services seeking to expand in this area.[3]

Fleet managers reported mixed job growth projections as a result of their TE plans. Public fleet managers work within government agencies that are typically constrained in adding staff. Some may find contracting out services to be easier than directly hiring new staff. Those employers who are projecting job growth have ambitious electrification targets and are planning to develop TE skills in-house, including charging station maintenance. They describe their position as being on the front edge of a wave. One employer describes the job growth they see:

> *Yes, we see job growth ahead. Adoption keeps growing. These charging stations we already have plus everything that's coming – it all needs to be maintained and eventually replaced. It all has computers and software. It all needs technicians. And the call centers for support. There will continue to be a need for techs to maintain them.*

Several transit agencies mentioned projecting TE-related job growth as a result of general service expansion unrelated to their TE goals. Transit systems are growing ridership above and beyond population growth, and TE jobs will grow along with it.

Employers noted that TE workforce challenges will become increasingly apparent in the next couple years when they begin doubling or tripling the size of their alternate-fueled fleet, and their current fleet begins to age, while simultaneously the warranty services maintaining their current fleets begin to expire. There will likely push fleets to rapidly shift to internalize maintenance of their current fleet and charging stations.

Other employers noted that the lower maintenance requirements for EVs may actually reduce workforce demand for fleet mechanics and technicians, yet there remains considerable uncertainty what the impact of TE will be on these workers. As one employer noted:

> *The lower maintenance is looking like we may actually reduce workers. However, our fleet hasn't kept EVs in service as long as they have kept ICE in service. We turn them over after about 6 or 7 years. If we keep the cars longer, we may see a need for more maintenance. They are turning over due to expanding range of newer vehicles. We have a few more years till we decide when to cycle those out. Some may just need a battery swap. We haven't run into that yet. I don't anticipate much of a maintenance need in the future.*

Fleet managers noted that it has been hard enough finding and retaining experienced ICE mechanics, much less looking ahead to the changes that the transition to TE will bring. One large fleet employer noted:

> *We don't have enough mechanics as it is. We are understaffed by 55%. We outsource regular maintenance work.*

Another employer's comments highlight how they are building in TE skills as they hire new employees.

[3] A more detailed discussion of federal data issues is included in the *Washington State's Green Transportation Program: Initial Research Review for Workforce Development, Phase 1*. WSU Energy Program, April 2021.

We probably won't see additional jobs, just a different skill set. We need more electrical skills, hydrogen skills, maybe less diesel engine. We haven't had to hire anyone with these skills, we are using our current workforce. Our newest employees are two students from the community college diesel program. They have knowledge and skills to catch on quickly to this technology. The college offers a basic electrical theory class. Probably not as in-depth as what is needed for our new e-buses. We are talking with the college about adding curriculum to their diesel tech program.

TE-Related Training Curriculum

Fleet employers report broad dissatisfaction with the lack of training opportunities available to them. Their primary concerns include: a lack of options, lack of proximity to training and prohibitive cost. The most common response from fleet employers was:

Training is entirely missing. Spent hours trying to find someone to offer training.

Employers who are able to find and fund training report spending significant public funds to do so, often sending workers out of state. One employer reported sending a single employee to a one-week training at a cost of $15k. Another found training available, but at a cost of $40k. These are unaffordable for most public fleets, and one of their greatest obstacles to EV adoption.

Auto manufacturers may offer training, but it is extremely expensive, as one employer described:

Most of our EVs are with Ford and GM. We are ok right now because they are doing most of the maintenance. The next wave might be hard to meet. The training is super expensive - $40k. The biggest obstacle is access to affordable training.

Employers are learning on the job by working side-by-side with contractors on installations. This knowledge transfer is helping workers, though employers would prefer a more structured training program:

We had a contractor oversee the whole install for us. We learned from that process and are ready to do that in-house now. We are learning on the job but training would be ideal.

It's lacking. We pay a lot for tech support. We didn't pay for extended warranty, but we buy training, special tools, annual certifications…we pay $6k per year and it's not enough.

It is worth investigating the potential for the state to be part of the training solution. States are able to negotiate training services into their sizeable purchasing contracts. Opening access to other public fleets, or perhaps all fleets, would be one way to quickly respond to training needs.

Connections to Community and Technical College Programs

All of the employers reported a need for state or regional support to assist efforts to collaborate. The need was felt to be greater than their separate organizations could adequately address. Several employers voiced concern about the quality of training programs if they were not designed in close collaboration with industry employers. However, it is state law in Washington that technical college programs be initiated and overseen by a committee that includes relevant industry employers, therefore, this should not be an ongoing concern.

Several fleet employers reported connections had been initiated with automotive programs in local community and technical colleges. They see this as a logical collaboration for developing these skills in the workforce. These experiences have been constructive, but they see their collaborative efforts as just the beginning of what is needed.

Table 1 is a list of training organizations provided by employers as resources they have either taken advantage of, or had collaborated with to some degree. Additional training programs are listed in *Washington State's Green Transportation Program: Initial Research Review for Workforce Development, Phase 1*.

Table 1. Community College Programs mentioned by Fleet Employers

Name of Training Organization	Websites and Contacts
Advanced Vehicle Training Group NW	https://www.avtgnw.org/ Washington State members include: Walla Walla Community College, Centralia College Diesel Tech Program, Peninsula College
Central Oregon Community College, Automotive Program	Ken Mays, Professor Emeritus https://www.cocc.edu/programs/automotive/default.aspx
Lake Washington Tech, Diesel Mechanic Program	Michael Ridgemond
Automotive Service Excellence (ASE) certification programs	https://www.ase.com/
Linn-Benton Community College Automotive Programs	https://www.linnbenton.edu/educational-options/applied-industrial-tech-and-transportation/index.php This college has an EV program that is mostly online with some hands-on components.
Tacoma Community College	Rebecca Sliger, Electrical engineering faculty working closely with Tacoma Power and working with students on TE.

Employers expressed interest in on-demand, virtual training for the convenience and low cost such training options provide, though they also recognized the critical importance of hands-on learning as well. One employer noted:

> *If I had magic wand, I'd want a virtual, on-demand training system. When there is a gap in work, someone could go online and get training. Most mechanics are kinetic learners – they don't want to open a book. They need hands on experience. A web-based program could be a great intro, but they will need hands on opportunities too. Hands-on goes far.*

Safety Training for Workers and First Responders

EVs and hydrogen fueled vehicles, along with charging and refueling stations come with life-threatening safety risks. The battery packs of all EVs, but especially heavy duty EVs, carry deadly levels of electrical charge. Charging stations are connected to high voltage electrical grids. Carrying and storing hydrogen fuel comes with combustion risks. These are a new aspects of vehicle maintenance that were not a consideration with traditional ICE vehicles:

> *We will see more changes in skill requirements – mostly around safety. The tech working on the bus can't be disturbed and needs clearance around their workspace. This is different from how diesel has been. The [manufacturer's] trainers want to be involved when we interact with the buses' electrical system.*

Additional training will be needed for first responders who will increasingly encounter EV and charging stations in accidents:

> *First responders need to know what to do if there is an accident with alt fueled vehicles, or a charging station.*

Additional Training Ideas

Employers would like to see a coordinated effort to reach out to high school students, including to students beyond automotive programs. They see potential for this work to attract students interested in technology.

Seattle's Lighting Design Lab is shifting focus and investigating becoming a regional training hub for clean technologies. They seek to build partnerships with community organizations and resources to support TE expansion:

> *Across technology sectors, the Lighting Design Lab could be a model. We can provide hands on training, be a technical resource, a literature library and an experiential learning space. We could bring in subject matter expertise to develop a similar program for EVs. We can connect to community organizations on the ground already working with target populations.*

Employers are eager for hydrogen technology to develop further; some are interested in obtaining training incorporated into existing diesel programs right now:

> *I would like to see electrical training added to diesel training, and add hydrogen too. This is all really new to us and we all need training on that. That would be a great need.*

Efforts to Recruit and Retain a Diverse Workforce

TE presents an important opportunity to advance social equity both in the jobs created and the communities where mobility investments are made. The City of Seattle deserves recognition for being a leader in laying the groundwork to help achieve these goals. Appendix B shares a section of the city's Transportation Electrification Blueprint which describes their goal to address workforce issues in this sector. Additionally, the Seattle Jobs Initiative conducted two studies which looked at workforce diversity within the TE sector. [4] *Amping Up Electric Vehicle Manufacturing in the PNW* is a supply chain analysis for the EV manufacturing workforce in the Pacific Northwest.[5] This report determined that workers from racial and ethnic minority communities are more at risk for losing jobs to automation than predominantly white communities. *Connecting Disadvantaged Communities to Quality Jobs in the Transportation Electrification Sector: An Initial Assessment*[6] looks beyond the environmental benefits of electrification to additional social benefits in the form of job creation for marginalized communities. This report identifies what kind of jobs are expected, which have the greatest accessibility for marginalized communities, and what actions the city government can take to support job quality and access to marginalized communities. Although it is written to address Seattle's goals, the findings of this report contain useful guidance which could benefit many local governments.

The TE employers we interviewed struggled to find success in attracting marginalized workers. Even the largest employers who have made significant efforts to recruit and retain marginalized workers are finding challenges. Many employers reported that they have gone into the community college and high school vocational classes and have found a lack of gender and racial/ethnic diversity in these classrooms.

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[4] Seattle Jobs Initiative: https://www.seattlejobsinitiative.com/

[5] *Amping Up Electric Vehicle Manufacturing in the PNW*. https://webuildgreencities.com/wp-content/uploads/2020/05/READ-THE-EV-REPORT-HERE.pdf

[6] *Connecting Disadvantaged Communities to Quality Jobs in the Transportation Electrification Sector: An Initial Assessment.* https://www.seattle.gov/Documents/Departments/OSE/ClimateDocs/TE/Drive%20Clean%20Seattle%20EV%20Jobs%20Report%20Final.pdf

They have tried diversifying the locations for posting job announcements and reaching out to community stakeholders for guidance. They feel like this issue is larger than they can address on their own. The following were typical comments by employers:

> *My assumption is that most people are going about this in a traditional way…going into the community colleges and high schools but we really need to solicit people that may have a base skill set and interest and then we will train them ourselves. We need to be more diligent.*

There have been broad attempts by many of the employers to look closely at their recruitment and hiring practices and to reduce hiring barriers for marginalized workers. However, employers still report very few candidates are applying for these jobs. This employer comment was echoed by many others:

> *We have an active DEI (Diversity, Equity, and Inclusion) committee. They are looking at strategies for inclusion everywhere in the agency, including the maintenance shop. They have looked at the application process: Are these fair skills sets to ask for when we hire this position? Are we excluding someone because of the way we hire? We need to recruit more people into these trades, specifically people of color and women. We need to reach them at a much, much younger age. Let kids know this is a career opportunity. That outreach is needed.*

Employers recognized that the cost of paying for training can present a significant roadblock for students and job seekers. Pre apprenticeship jobs can require people to work for a long time -years even- without getting paid. These two comments emphasize this point:

> *Any paid education will present a barrier.*

> *People need to get paid during training – that's how you get diversity.*

Gender diversity in the auto maintenance sector is very rare. Only one employer said they had a female-identifying employee. This employee was hard working, smart and well-liked by co-workers. The employer had been encouraging her to apply for a supervisor position but she was reluctant to advance, stating she preferred the work she was doing. Employers feel at a loss for solutions:

> *I go out to classrooms to recruit workers and it is rare there is even one girl in the auto shop class. We don't know why that is or what to do.*

> *We have seen zero woman apply for any job ever. All the hiring I've seen, I've seen zero applicants. We can't force people to apply . . . how do we get them to apply?*

Not related to diversity, but related to recruitment, employers lamented the lack of young people entering this field. They recognized that in the past, auto maintenance workers often gained early work experience at home with their families. This experience was once enough to qualify for entry level positions. As vehicles become increasingly complex, fewer people are working on their own vehicles at home. One employer observed:

> *You need a code-reader to do anything on your own, people don't have that at home and aren't maintaining their own cars.*

Another employer noted increased educational requirements in this field has changed its appeal to at-risk youth. This employer would like to see an effort to provide training in lieu of sending troubled youth to jail.

Employers have been working on their own solutions to address the training needs of their workforce while simultaneously supporting diversity goals. They shared stories of some successful activities. One described a new journey level mechanic apprenticeship program. The program just started last year with three participants: one female, one minority male and one white male. The participants received on-the-job-training and a pay increase. They started with low-skilled labor such as sweeping floors and moving cars around, then they move to service attendant duties that include light-skills such as oil changes. After four years they will be eligible to become a journey level mechanic. This employer was very intentional about building a career ladder for these employees. They said additional funding could support expanding this program.

A relatively-easy and effective solution shared by one employer is to leverage contracting power through large public works projects.

> *One of our priority hiring programs is that any large public works project over $5 million has to hire low income or diverse workers. If people want to get government money, they should be aligned with the outcome we want to see. Anyone with large contracts can do this right now. Large projects with contract incentives can force this issue.*

Employers, expressing the urgent need for state-wide support for the TE workforce, brainstormed ideas for how a coordinated state effort could help:

> *How can we make it easier for people to participate in workforce development programs? Stipends? Go into the high schools? What we've done hasn't worked. Is there money to support job retraining in these climate bills? Are the local workforce development boards able to focus on clean tech -right now? We need to get workers now. It's an all-hands-on-deck time.*

Another provided this example:

> *PACAR in Renton is manufacturing electric trucks right now. They are working as fast as they can. They don't have enough training right now. Then you have Duwamish Valley that needs electric trucks right now – the air quality is really bad there. You have South Seattle Community College automotive program. How can we get SSCC to adapt the diesel program right now? PACAR loves this idea but they can't get it done – they are too busy. We need to get the Duwamish folks these jobs ASAP. We need state leadership to get this done.*

Challenges for Equipment Manufacturers and Sales Staff

New vehicle and equipment manufacturers entering the TE market have many disadvantages compared with large existing auto-industry manufacturers: they often do not have physical locations to conduct repairs and instead rely on the fleet repair shops to service vehicles, they do not have large dealership infrastructure located across the state, and they may not have existing training and tech support infrastructure in place, or are building it as they grow. The quality of support from manufacturers was a near-unanimous source of frustration for the employers, summarized by these two comments:

> *The manufactures' tech support is spotty at best. It takes many attempts to resolve issues. Hard to get them to get a tech on site. Once they get there, the help is great, but it's hard to get them on site.*

> *I asked how they plan to do maintenance – does anyone know how to repair it? The manufacturers don't have any training to support their workforce at all.*

The only employer satisfied with the level of service from equipment suppliers and manufacturers is the state fleet operator. States have broad negotiating powers in their procurement contracts and can require EV and charging services training and support across the entire state. A statewide coordinated effort could investigate using this power to expand training opportunities to additional fleets as well.

The employers expressed another point of frustration which restricts in-house maintenance: manufacturer warranties. When repairs are needed, the slow service response time from manufacturers can create a crisis for some fleets, yet attempts to make repairs in-house can void the warranty. One transit agency stated that federal purchasing regulations exacerbate this problem by limiting how many back-up vehicles the agency can keep on hand in case of a malfunction.

> *We have noticed our charging infrastructure has created a weakness in our system. If a charging station goes down, we don't operate and it's a crisis. We rely on the manufacturer to service these, which can take 3 or 4 days. Federal purchasing rules restrict the number of back-up vehicles we can keep on hand so we don't have vehicles to trade out when one goes down. Manufacturers are not hustling to respond to these situations.*

Early adopters of new technology expressed challenges as equipment is more frequently out of service awaiting maintenance. They have also expressed frustration as better options become available before the end of the expected lifespan of their vehicles.

> *When we change an ICE with an EV we build in a charging station. There is little or no support for a charging station that's already installed. The first one we had, when it had a problem, no one – not a single person could repair it. The screen got damaged by the sun and we had to replace it. We couldn't get parts for it. We have an early charger that the manufacturer won't service anymore because they want us to upgrade to their newer model. Anything with a smart charger is easier. The ones that have to be unlocked, or enter an employee id breaks more and has no support. A charging station can be in place for 6 months, then scrapped for a new one.*

Rapidly evolving technology can cause issues when forward-acting fleets run into outdated state and federal procurement models. In the following example, an early adopter describes being penalized by regulations requiring they hold on to federally purchased vehicles for at least 10 years:

> *About 10 years ago the [a new EV model] came out, then there was a Gen 2, then Gen 3. We committed early to the Gen 1 technology, then several years later they become obsolete. The model we have from federal and state funding requires we use our federally purchased vehicles for at least 10 years of service. This is prohibitive in a rapidly changing environment. We would prefer a lease situation so we can keep up with tech. Rapid changes makes the training environment challenging as well.*

One small transit agency reported one positive example of manufacturer training support:

> *They have their own in-house trainer who comes on site when a new e-bus is delivered. They send him for typically 2 weeks but he can stay longer if needed. The trainer offered classes with our mechanics and drivers, helping drivers get a feel for how the bus responds. Driving is a learning curve. You want to accelerate slow and decelerate slow. Also, he has been training first responders on how to respond to vehicle fire for E-buses. We have worked with 4 different fire departments, including rural areas. These buses will serve rural areas so this was important. We've had a good response from the first responders – they appreciate the training. It's the same concept as personal vehicles – should be helpful for other EVs on the road that the emergency responders have training.*

The manufacturers' increasing reliance on proprietary and often expensive tools and diagnostic equipment limits who can repair vehicles. The employers were worried about the dependent relationship it is creating. This may have serious impacts on smaller repair shops who can least afford to invest in this equipment. As one employer explained:

> *The use of proprietary tools – there should be a change in federal or state law. Manufacturers are coming with proprietary equipment but they make it so consumers can't access them. The techs from [the manufacturer] were coming to our shop and doing the work. This is major problem. We are thinking a lot about a just transition, not wanting to leave workers behind. The mom-and-pop shops need to be able to work on these vehicles too. These diagnostic tools need to be accessible.*

Another employer comment highlights their frustration with manufactures who do not have training and technical support for new products:

> *The manufacturer sold us the bus before they had a training and service plan to match their warranty, and their parts are delayed. They don't have the capability to support us. The warranty doesn't include reimbursements for parts.*

Summary

This is a rapidly growing and fast changing environment. Many public fleets are setting ambitious targets and seeking to be leaders in electrifying their transportation systems. The rapid shift is compounding pre-existing labor issues and creating new ones. The employers we interviewed were uniformly interested in participating in a state or regional TE workforce development collaboration to focus on improving workforce conditions and assist actions to equitably transition away from fossil fuels. They believe state leadership is needed to bring industry, education, unions, employment agencies and economic development agencies together to rapidly address the issues.

They offered the following topic for such a group to discuss:

- Collaborations to plan shared training sessions. This also helps build cohorts across workers in different organizations doing similar work.
- Develop training and certification programs for charging station services and battery EV and hydrogen EV maintenance.
- Learn how to improve diversity, equity and inclusion actions.
- Support efforts to recruit young people to consider the related trades.
- Improve training and service response from EV and EVSE equipment manufacturers.
- Identify federal and state policy opportunities to support TE workforce development, including federal data reporting, barriers in federal contracting and opportunities to leverage state procurement for training and support.

The City of Seattle has been a leader on TE workforce development and has expressed interest in expanding their efforts and supporting a larger collaboration, including the formation of a statewide collaboration to address workforce issues. They have described working with industry partners in clean tech, manufacturing and digital/IT services to identify skills needed within these industries, all of which overlap with TE.

Appendix A: Links to Fleet Electrification Plans

Tacoma Power	Transportation Electrification Plan https://www.mytpu.org/tacoma-power-reveals-newly-adopted-transportation-electrification-plan-and-action-report/
Pierce Transit	https://www.piercetransit.org/electric-bus/
Energy Norwest	https://www.energy-northwest.com/doingbusinesswithus/Pages/EVITA.aspx
City of Seattle	City Fleet: https://www.seattle.gov/documents/Departments/FAS/FleetManagement/Fleet-Electrification.pdf City-wide: https://www.seattle.gov/environment/climate-change/transportation-electrification and https://www.seattle.gov/Documents/Departments/OSE/ClimateDocs/TE/Final%20Transportation%20Electrification%20Blueprint.pdf
Seattle City Light	https://powerlines.seattle.gov/wp-content/uploads/2020/09/SCL-Transportation-Electrification-Strategic-Investment-Plan-2021-2024-w-attachments.pdf
WA DES St ate Fleets	https://www.governor.wa.gov/sites/default/files/WashingtonStateEVFleetsInitiative_Jan2019update.pdf State EV mandate to stop sales of gasoline-fueled vehicles there beginning in 2030: https://app.leg.wa.gov/rcw/default.aspx?cite=43.19.648
Twin Transit	https://twintransit.org/wp-content/uploads/2020/10/Mellen-Street-e-Transit-Station.pdf SOUTHWEST WASHINGTON E-TRANSIT CORRIDOR https://twintransit.org/2020/12/01/twin-transit-prepares-to-welcome-two-new-electric-buses/
Everett Transit, City of Everett	https://everettwa.gov/DocumentCenter/View/23189/Climate-Action-Plan-Draft---2019?bidId= Goals: Electrify the transportation system through infrastructure development. Create a robust EV charging station network
City of Auburn	https://www.auburn-reporter.com/news/city-welcomes-four-chevy-bolts-the-first-step-toward-an-all-electric-fleet/
City of Kirkland	Sustainability Master Plan (no specific goal for transportation/fleets yet, but under development) https://www.kirklandwa.gov/Government/Departments/Sustainability-Center/Sustainability-Master-Plan

Appendix B: City of Seattle Electrification Blueprint, 2021

Challenge 4: The workforce in the EV-related occupations in our region is less diverse than it is nationally, and many of the more diverse occupations are projected to decline in the short-to-medium term.[7]

Current Gaps:

- There are negative growth projections due to offshoring and automation.
- There is a lack of training and training components that would meet the demand for highly-specialized workers in the field, nor are the training programs amenable to diverse populations.

To address these gaps, we will do the following in the next 2 years:

- Conduct an analysis of jobs and wages of those directly employed by the fossil fuel industry as well as related industries.
- Create a job forecast accounting for changes in jobs, taking into consideration automation and the future of work.
- Partner with labor unions and employers to track measurable outcome-based indicators of workforce diversity in recruitment, training, and retained employees.
- Interview regional businesses that manufacture zero emission vehicles or supply chain components to assess and support inclusive growth.
- Seek funding for training initiatives, and organize existing City capacity, directed to underserved populations.
- Create proposal to convene and innovate together with key partners in industry, public sector and education, to ensure a pipeline of qualified professionals for the rapidly changing industry.

What Success Looks Like

The transition to EVs will lead to thriving new industries and job opportunities, creating new small-and medium-sized companies that have been excluded from the existing supply chains, along with potential shifts in jobs for those working in fossil fuel vehicle industries. Federal, state, and local support through resources and policies that provide worker education and retraining, along with policies that encourage the growth of an EV market, can secure Seattle's foothold in these emerging industries while minimizing job disruptions.

[7] *City of Seattle Electrification Blueprint*. https://www.seattle.gov/Documents/Departments/OSE/ClimateDocs/TE/Final%20Transportation%20Electrification%20Blueprint.pdf