

# Ava Community Energy: Zero-Emission Medium- and Heavy-Duty Goods Movement Blueprint

Attachment 4:

**Summary of Workforce Training and Needs**

**August 2022**

This document was submitted as a deliverable for California Energy Commission's Agreement Number ARV-21-003 under Task 4 - Assess Product Readiness. The goal of Task 4 is to understand zero-emission vehicle technology readiness across medium-and heavy-duty good movement vocations and applications, and the suitability of charging infrastructure technologies and types.

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## Workforce Development

Workforce development is one of the five strategic areas of opportunity for Ava’s Zero-Emission (ZE) Medium-and Heavy-duty (MDHD) Goods Movement Blueprint (Blueprint) planning effort. Through key stakeholder engagement, Ava aims to better understand workforce needs to develop value-driven strategies and actions that will support goods movement fleet electrification. This involves identification of processes, gaps, needs, and challenges related to workforce development from community colleges, high schools, regional occupational programs, labor unions, community-based organizations, and vehicle OEMs. Continued communication with listed stakeholders and understanding of gaps will result in actions and strategies to be integrated into the Blueprint.

## East Bay Job Growth

In April 2021, the BW Research Partnership<sup>1</sup> prepared a report for Advanced Energy Economy to identify companies, jobs, growth rates, and opportunities for electrification called “Electrifying California: Economic Potential of Growing Electric Transportation”. The report acknowledged California’s large market share in the deployment of electric vehicles in light-duty segments (5%) and as a primary player in the statewide implementation of charging infrastructure. California is projected to see TE-related<sup>2</sup> employment grow 79% between 2020 and 2024. The report also noted that in 2019, Alameda County had the highest TE-related employment figures in the state, with 16,400 jobs. Los Angeles County was the second highest at 5,600 jobs (about one third of Alameda County jobs).

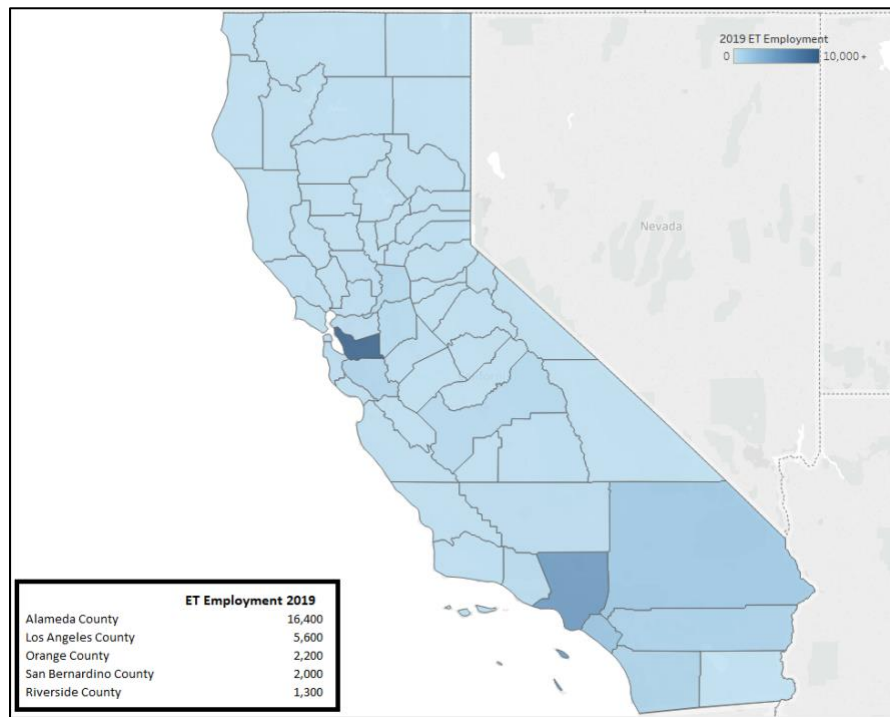


Figure 1. Electrifying California Report: TE-Related Jobs, 2019

<sup>1</sup> BW Research Partnership is an applied research firm supporting clients with economic & workforce research, customer & community analyses, as well as strategic planning and evaluation services.

<sup>2</sup> The report defined “TE-related” as a worker spending any time on electric transportation goods and services.

The report also identified specific transportation electrification related occupations (Table 1). Additionally, the Project Team has also begun working with the [San Francisco Bay Center of Excellence for Labor Market Research](#) to quantify historic trends and the current relevant workforce in the region, as well as to identify potential channels of opportunity and sources of constraint relative to these occupations.

Table 1. Electrifying California Report: Key Occupations

<b>Key Occupations</b>	<b>2019 TE Jobs</b>	<b>Projected 2024 TE Jobs</b>	<b>Median Hourly Wage</b>
<i>Miscellaneous Assemblers and Fabricators</i>	10,380	19,547	\$15.59
<i>Laborers and Freight, Stock, and Material Movers, Hand</i>	1,475	3,014	\$14.98
<i>Automotive Service Technicians and Mechanics</i>	1,467	2,814	\$22.60
<i>Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products</i>	970	1,856	\$29.86
<i>First-Line Supervisors of Production and Operating Workers</i>	663	1,299	\$30.84
<i>Parts Salespersons</i>	578	1,117	\$16.29
<i>Electricians</i>	466	991	\$31.06
<i>Industrial Engineers</i>	417	855	\$48.52

## Medium- and Heavy-Duty Goods Movement Needs

### *Listening Session Overview*

CALSTART’s 2019 listening tour identified high level industry needs from MDHD truck fleets, community colleges, and utility companies. Stakeholders shared their perspectives and shed light on potential pathways to match new and incumbent technicians with the proper training programs and skill sets. Based on input received, vehicle technicians, charging infrastructure technicians, and first responders—who must effectively aid during accidents involving ZE MDHD vehicles—must receive training and certification in electrical safety skills and electrical safety standards. Fleets shared they had difficulties finding workers proficient in high voltage electricity and educational institutions shared that the industry demands more electrical proficiency than community colleges can currently provide. Maintenance technicians in training at community colleges often lack access to ZE vehicles and other training aids to gain hands-on experience. Additionally, community colleges must either find employer partners to fund “not for credit” courses or enter a lengthy approval process with the state to establish “for credit” classes to gain state funding. Utilities, on the other hand, identified a larger need for more construction managers proficient in reading construction plans and managing teams, calling on community colleges to ramp up their construction management programs. Furthermore, as utilities typically only engage in infrastructure installation and utility-side upgrades, they identified a need for more skilled vehicle maintenance technicians to accelerate the commercialization of ZE MDHD trucks and vans.

### *Technical Skills Needed*

The future roles within the ZE MDHD goods movement industry can be divided into two groups: vehicle maintenance and charger installation/maintenance. This distinction is made to identify workforce representation that does not include upstream sourcing, manufacturing, sales, or other roles. Later in the

report, different stakeholders are identified that provide training or have the capacity to train the two workstreams. This section will initially identify the high-level skill sets required to train the workforce.

When identifying the difference between electric truck technician training and electric vehicle supply equipment (EVSE) technician training, there are some overlaps including electrical safety skills and electrical safety standards. Additional training and certification necessary for vehicle technicians includes batteries, electronics, management systems, and basic mechanical systems (Table 2). Charging infrastructure technicians must also be skilled in Direct Current Fast Charging (DCFC) installation and servicing.

For new and incumbent MDHD vehicle technicians, there are several pathways to acquiring proper training and certification. Community colleges train technicians in the basics—electrical skills, vehicle systems, safety, and customer service—while truck fleets focus on upskilling recruits by providing hands-on learning experience maintaining the vehicles the fleets operate. OEMs may also provide training to fleets that purchase their ZE MDHD vehicles, sending field representatives to fleet facilities to teach mechanics how to maintain vehicles. New and incumbent charging infrastructure technicians, however, often receive training through labor union apprenticeships with the International Brotherhood of Electrical Workers (IBEW). Once a certified electrician, they can add to their skill set through the Electric Vehicle Infrastructure Training Program (EVITP). EVITP is the highest standard in training and certification for installation of charging infrastructure in North America and was created by a collaboration of industry stakeholders including automakers, charging infrastructure OEMs, educational institutions, utilities, electrical industry professionals and other key EV industry stakeholders. In the East Bay, the IBEW Local 595 provides EVITP training to members, though it also offers testing to anyone eligible, regardless of where they pursued the training component.

Table 2. Skill Set Needs

Infrastructure Installation and Maintenance	Vehicle Maintenance and Upkeep <sup>3</sup>
Electrical Safety Skills	Electrical Safety Skills
Electrical Safety Standards	Electrical Safety Standards
DCFC Installation	Batteries
DCFC Servicing	Basic Mechanical Systems
Wiring and Conduits	High Voltage Awareness
	Electrical Code Training
	Computer Network Training
	Diagnostic Tool Training
	Electric Meter Training

Community colleges in partnership with labor unions like IBEW will be fundamental to closing the skill set gaps found in the ZE MDHD vehicle and charging infrastructure sectors. Through CALSTART’s listening sessions, Long Beach City College (LBCC) identified four colleges<sup>4</sup> in California offering advanced transportation programs and electrical programs that integrate ZE technology into their curriculum and

<sup>3</sup> For the purposes of this Blueprint, focus is placed on the ongoing maintenance of vehicles rather than operation and driver experience.

<sup>4</sup> East Los Angeles College, Los Angeles Trade Tech College, Rio Hondo College, and Long Beach City College

has even begun its own partnership with IBEW to provide apprenticeship credits for students earning an LBCC degree (Associate in Science, Advanced Transportation Technology – Alternative Fuels or Electric Vehicles).<sup>5</sup>

Table 3. Existing Certifications

Infrastructure Installation and Maintenance	Vehicle Maintenance and Upkeep <sup>6</sup>
Electric Vehicle Infrastructure Training Program (EVITP)	Advanced Transportation degrees and/or certificates (including ZEV content)
	Electrical Technology degrees and/or certificates

Employers in the ZE MDHD vehicle and charging infrastructure sector will also be responsible for helping community colleges provide robust and competent training programs to incumbent workers, i.e. upskill training. “Not for credit” classes at community colleges are often fee-based and can be offered during the evening and on weekends for increased accessibility to incumbent workers. Employers can also utilize the Employment Training Panel (ETP), funded by California employers through a payroll tax, to subsidize these course fees for their incumbent workers.

ZE MDHD OEMs that may have partnerships with community colleges could be in a position to potentially provide vehicles as training aids, offering students insight and hands-on experience working with new technologies. Finally, both community colleges and employers must continue to engage K-12 Linked Learning School Districts to immerse students in ZE MDHD goods movement related careers early in their education. In the Bay Area, the community colleges have run an ad campaign and hosted an associated website – [Next Gen Auto](#) – to communicate the opportunities and pathways available to high school students and parents, as well as displaced and returning workers.

### The Role of Transit as Workforce Development Leaders

Transit agencies also play a fundamental role in training and upskilling technicians that may be engaged in transit today but could be workers in the ZE goods movement economy tomorrow. The Southern California Regional Transit Training Consortium (SCR TTC) consists of multiple transit agencies and community colleges that bring high-standard training resources to transit operation teams. The SCR TTC, who has broadened its scope to other regions in California, offers classes focusing on: Volt Ohm meter usage, general concepts like brakes, doors, bodies, and electrical systems, advanced concepts like HVAC and hybrid vehicle training, safety, and diagnostics, and more specific advanced training in safety courses, zero-emission buses (ZEB), and leadership skills. In their Gap and Needs Assessment report, the SCR TTC identified electrical code training, computer network training, diagnostic tool training, electric meter training, and electric and hydrogen fuel-cell training as fundamental course offerings. SCR TTC also found that technicians require soft skills like communication, leadership, and development of good judgment, while instructors require pedagogical skills such as creating pre/post assessments, lesson plans and objectives, and creating content that incorporates modern instructional practices like videos, PowerPoint presentations and 3-D modeling. Apprenticeships and mentorships also play a vital role in SCR TTC curricula and successful technician training overall. With certain relevant curriculum overlaps, the Bay

<sup>5</sup> [Port of Long Beach. Zero-Emission Port Equipment Workforce Assessment - Final Report.](#)

<sup>6</sup> For the purposes of this Blueprint, focus is placed on the ongoing maintenance of vehicles rather than operation and driver experience.

Area community colleges with existing Diesel Mechanics degree programs are connected with SCRRTC in open dialogue to enable more efficient program and curriculum development as certain community college programs look to expand their offerings to include ZE MDHD training, as well.

While organizations like SCRRTC provide upskill training to current transit agency workers, transit agencies like Alameda-Contra Costa Transit District (AC Transit), among others, are developing full-fledged programming complete with learning management systems in-house through the support of grant funding. The skills workers gain through either of these pathways are likely transferrable to the ZE MDHD goods movement economy and were in turn reviewed for Ava’s Blueprint.

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### *Case Study 1: AC Transit a Regional Workforce Lead*

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AC Transit is California’s largest public bus-only transit agency and is internationally recognized as a leader in ZEBs. AC Transit has improved its deployment process over 20 years by continuously advancing their practices in procurement, project delivery, operations, and ZEB technology performance. AC Transit’s Maintenance Training Plan (Plan) is a robust training program that allows staff and employees to develop higher competencies with the ZE technologies they integrate into their fleet and maintain/operate long term. The Plan invites OEMs and internal stakeholders to instruct staff in basic and advanced bus component and safety courses. AC Transit’s current training includes awareness of high-voltage systems, dash controls and indicator lights, specific start-up and shut-down procedures, and defensive driving safety. Additionally, AC Transit immerses their employees in mixed reality training programs, allowing hands-on experience while receiving virtual instruction. Leveraging the build-it-yourself model AC Transit has developed may help ZE MDHD goods movement workforce development stakeholders leapfrog to where AC Transit is today.

### Key Stakeholders

Ava partnered with the [East Bay Economic Development Alliance](#) to support in gathering the relevant stakeholders impacting future workforce development and growth in the region. This effort identified three (3) stakeholder subgroups: 1. Community Colleges, 2. High Schools and Regional Occupational Programs, and 3. Labor Unions and Community-Based organizations (CBOs). Figure 2 shows the roles identified by Ava as impacting workforce development for ZE MDHD goods movement in the region.

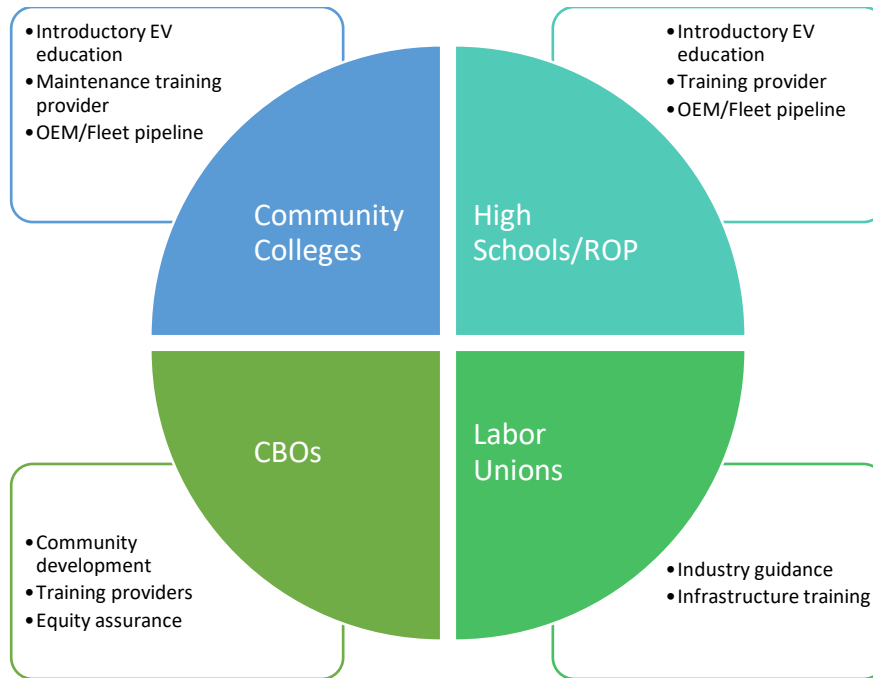


Figure 2 Workforce Development Stakeholder Roles

### Community Colleges

Ava and EBEDA held stakeholder sessions to understand how curriculum is developed for automotive programs and what challenges the institutions face in developing and maintaining training programs. Representatives from Peralta Community College District and Chabot-Las Positas Community College District were engaged (Table 4).

Table 4. Stakeholder Session 2: Community College Participants

Ava Service Area Stakeholders	Session Participants (Y/N)
<u>Peralta Community College District</u> , which includes: <ul style="list-style-type: none"> <li>- <u>College of Alameda</u></li> <li>- <u>Berkeley City College</u></li> <li>- <u>Laney College</u></li> <li>- <u>Merritt College</u></li> </ul>	Y
<u>Chabot Las Positas Community College District</u> , which includes: <ul style="list-style-type: none"> <li>- <u>Chabot College</u></li> <li>- <u>Las Positas College</u></li> </ul>	Y
<u>Bay Area Community College Consortium</u>	Y

Community colleges within both of the districts have already established automotive repair programs, the majority of which are focused on light duty vehicles. A subset however have developed MDHD diesel mechanics curriculum. Those with diesel training specifically may represent an opportunity to integrate relevant ZE MDHD vehicle curriculum near term (see Table 5 for all colleges with automotive program today). The leading driver for any new curriculum development is faculty engagement. Faculty



engagement was also identified as a barrier specifically for ZE MDHD workforce training for a few reasons. First, there are not enough knowledgeable trainers well-versed in ZE MDHD vehicles to train other instructors. Second, those who are considered technology experts are opting for higher wage opportunities with vehicle OEMs. In turn, a key gap in accelerating the market for ZE MDHD vehicles is boosting interest and motivation in professionals becoming training program faculty members. All of this is coupled with another key gap that is more of a macroeconomic issue but is affecting trainer availability and the workforce itself and that is the significant nationwide shortage of HD (diesel) technicians. There is simply a small talent pool.

Community college stakeholders identified various pathways to develop a course or training program for ZE MDHD vehicles, three of which stood out: 1. a for-credit program, 2. a not-for-credit program, and 3. apprenticeship programs.

CALSTART’s listening session also identified bureaucratic processes associated with curriculum development that led community college stakeholders interviewed to determine that not-for-credit programs have an easier approval process. For-credit curriculum may result in higher cost and extensive time commitments from faculty due to the required approval processes. These steps involve administration or board approval which can take multiple years even though actual time spent on development of curriculum materials is not a barrier itself if there is faculty willing to work on it. Stakeholders also shared that should a college pursue a new on-campus program, they would need a new facility to accommodate, construction may last more than a decade due to the requirement for a bond measure to finance the public project. This would add a significant amount of time and cost to the process. This obstacle could be overcome, however, through a partnership with a local OEM training facility or dealer that could serve as a site host for training.

The stakeholders listed in Table 4 also shared that the current state of enrollment in the East Bay has decreased by ~20% regionally since 2019. This decrease is primarily influenced by population shifts out of the Bay Area, coupled with a national trend in community college enrollments away from trades training. The upside is that curriculum completion is high once students are enrolled.

Regarding the ZE MDHD goods movement industry, perception also drives decision-making and community colleges perceive that industry dealerships and OEMs are not being proactive in providing training support. Additionally, community college stakeholders shared that their institutions lack knowledge on how to mitigate the risk of current technology irrelevance over time in the absence of OEM support for training programs. This could lead to workers who are not marketable because they cannot keep up to date on the latest software or hardware and may also lead to stranded assets on campuses.

<b>Key Obstacles/ Challenges to Curriculum Development</b>	Bureaucratic process for development
	Lack of buy-in from existing staff
	Outdated perspective (curriculum will follow demand)
	OEM partnerships driven solely by OEM interest
	Enrollment down
	State and grant funding reduced

Table 5. Community College Automotive Programs

Program/Training Provider	Ava Service Area	General Automotive (Light Duty)	General Automotive (Heavy Duty)	Alternative Fuel Vehicles (Introduction)	Electric Vehicle Technician (Light Duty)	Electric Vehicle Technician (M/HD Duty)
College of Alameda	N	<u>Automotive Technology (AS)</u>	<u>Diesel Mechanics (AS)</u>	-	-	-
Chabot College	Y	<u>Automotive Technology (AS)</u>	-	<u>Hybrid &amp; Alt. Fuel Vehicles (Cert. of Achievement)</u>	-	-
Contra Costa College	N	<u>Automotive Service Technician (AS)</u>	-	-	-	-
De Anza College	N	<u>Automotive Technology (AS)</u>	-	-	-	-
Evergreen Valley College	N	<u>Automotive Technology (AS)</u>	-	-	<u>EV Service Tesla START (Cert. of Achievement)</u>	-
Hartnell College	N	<u>Advanced Automotive Technology (AS)</u>	<u>Advanced Diesel Technology (AS)</u>	-	-	-
Las Positas College	Y	<u>Automotive Electronics Technology (AS)</u>	-	<u>Light Duty Hybrid &amp; Electric (AS)</u>	<u>Light Duty Hybrid &amp; Electric (AS)</u>	-
Los Medanos College	N	<u>Automotive Technology (AS)</u>	-	-	-	-
College of Marin	N	<u>Automotive Technology (AS)</u>	-	<u>Alternative Fuels Fundamentals (2 Unit Class)</u>	<u>EV/Hybrid Maintenance Fundamentals (3 Unit Class)</u>	-
Monterey Peninsula College	N	<u>Automotive Technology (AS)</u>	-	-	-	-
City College of San Francisco	N	<u>Automotive Technology (AS)</u>	-	<u>Hybrid &amp; EV Technology (Cert. of Achievement)</u>	<u>Hybrid &amp; EV Technology (Cert. of Achievement)</u>	-
Santa Rosa Junior College	N	<u>Automotive Technology (AA)</u>	<u>Diesel Equipment Technology (AS)</u>	-	-	-
Skyline College	N	<u>Automotive Technology (AA)</u>	-	-	-	-
Solano College	N	<u>Automotive Technician (AS)</u>	-	-	-	-

In addition to the automotive programs listed in Table 5, the College of Alameda offers a Transportation and Logistics program, targeted to goods movement facility managers and fleet owner/operators, with evening courses offered for students’ convenience.

Table 6. [College of Alameda Transportation and Logistics Program](#)

	Certificate of Achievement	Associate of Arts (AA)	Associate of Sciences (AS)
<a href="#">Auto Body &amp; Paint</a>	X		X
<a href="#">Automotive Technology</a>	X		X
<a href="#">Diesel Mechanics</a>	X		X
<a href="#">Transportation, Distribution &amp; Logistics*</a>	X	X	
<a href="#">Transportation, Logistics &amp; Operations*</a>			X
<a href="#">Warehouse &amp; Forklift Operations*</a>	X		

\*ATLAS Program

The most significant challenge for community colleges in developing and sustaining ZE MDHD vehicle and/or charging infrastructure training programs is funding from state grants, the [California State Lottery](#)<sup>7</sup>, and other sources like [Perkins](#) funding. Adequate funding is critical to support the workforce necessary to transition to a ZE goods movement economy. We are reinventing the way we move freight in real time. The vehicle and refueling infrastructure needed to ensure business continuity of the goods movement economy depends on a robust workforce that can keep vehicles in operation and chargers online at least 97% of the time. This level of preparedness requires the state to make investments that support all community colleges on faculty professional development and retention, curriculum development, and training equipment purchases (from software and computers to trucks and chargers). The perspective shared by Ava’s community college stakeholders was that funding sources were a major gap due to diminishing investments by the state in workforce training. Existing automotive and heavy-duty diesel training programs have not been properly prioritized in terms of state funding which has increasingly focused on healthcare or information technology. This is unfortunate given the emissions from MDHD trucks contribute to health care issues and ZE MDHD vehicles are new on-road technologies driven by software. Additionally, the state regulations mandating the transition to ZE MDHD vehicles do not account for the need to prioritize funding for workforce development today, to enable this transition to be successful in the coming decade.

Despite the challenges identified by Ava’s community college stakeholders, there is still a significant and optimistic willingness to develop meaningful ZE MDHD curriculum to accelerate vehicle adoption and support regional workforce development. This is currently observed by various ongoing efforts: automotive (light-duty) program partnership pursuits with OEMs, apprenticeship development potential and ability to be creative in program development, exploring municipal partnerships and development of high-level training manuals/materials.

The community college process diagram (Appendix A) demonstrates a high-level process of curriculum development and the program pathways. It is understood that the traditional curriculum development pathway – a for-credit program with a robust and retained faculty – may not be a realistic option given

<sup>7</sup> Click [here](#) for additional information on how the California State Lottery has funded each school district.

the uncertainty with ZE technologies and lack of trained faculty in those fields. The process in Appendix A suggests what community colleges have mentioned as alternative pathways with OEM partnership including a part-time teaching representative that provides evening coursework or a “train the trainer” approach where OEM training technicians can provide training to future community college instructors.

There are several considerations for providing adequate facilities (including equipment) that would support a ZE MDHD mechanic training program.

1. Same facilities, different programs: A program with existing HD diesel training facilities may be best suited for ZE MDHD vehicle training program but it’s unclear if the pipeline of diesel students would show interest in ZEVs.
2. Shared facilities, internships: The result of an OEM partnership, enrolled students able to learn and have hands-on training at OEM dealerships or facilities.
3. Donated resources: OEMs may be in a position to provide vehicles or vehicle parts to existing programs or programs in development.

It is also understood that colleges share curriculum and are in constant communication with other institutions. Additionally, representatives from the community colleges in Ava’s service area confirmed that potential OEM partnership development is ongoing. For example, both the Peralta Community College District for example and the Chabot-Las Positas Community College District have pursued partnerships with light-duty OEMs. This experience could lead to partnerships with MDHD OEMs. The College of Alameda for example is currently in discussions to explore a MDHD partnership which could include both training and future internship program opportunities.

From a college’s perspective, an OEM partnership will require the following<sup>8</sup>:

- Robust negotiation process – potentially 2-year timeline
- Memorandum of Understanding
- Detailed programming from OEM on:
  - Internship details
  - Alignment of hands-on training with curriculum
  - Candidate qualifications
  - Candidate assessment
- Program costs
- Assurance from faculty and students of program success
- Insurance requirements
- Potential for growth and sustainability

#### High Schools and Regional Occupational Programs

Like college programs, high schools provide pipeline workforce development programs for industry and skill development. High school programs are embedded within the pathway<sup>9</sup> programs selected by students. According to the Oakland Unified School District (OUSD), “pathways consist of a cohorted group

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<sup>8</sup> List is not exhaustive and does not reflect complexity of program development. It also does not include liability considerations from OEM’s perspective.

<sup>9</sup> A [career pathway](#) is a career-themed program available at a high school. An academy is another term used at individual schools to describe career pathways.

of students who experience a sequence of industry-themed curricula that integrates career and technical education courses, core academic courses, work-based learning opportunities and student support services.” For example, the Skyline Energy, Environment & Utilities Green Academy is currently supporting building construction trade skill sets with hands-on training. Fremont High School has a similar program with a construction boot camp.

High schools can access supporting networks from CBOs, labor unions and community colleges alike. Fremont High School is looking into working with IBEW, particularly the Local IBEW 595, and the [Cypress Mandela Training Center](#) (Cypress Mandela) on the development of electrical infrastructure installation and maintenance training. More information will be provided on CBOs and labor unions in the next section.

In addition to school districts, Ava also invited the [Eden Area Regional Occupation Program](#) (Eden Area ROP) to join the working sessions. Eden Area ROP provides “post-secondary career preparedness” specializing in Career Technical Education (as a CTE provider) and partners with Castro Valley, Hayward, San Leandro, and San Lorenzo Unified School Districts to strengthen and broaden the students’ educational experience. The organization is governed by a board of Unified School District representatives. Eden ROP provides programming for high school students and adult students as well. While Eden Area ROP representatives shared that there is board support to provide training for emerging and growing market sectors like ZE goods movement, they do not currently provide any training that directly prepares participants for ZE MDHD vehicles maintenance or fast charging installation/maintenance.

High school students within the listed school districts are eligible for Eden ROP’s high school programs, which currently provide programming for 4,500 students across various disciplines. There are currently no electrical programs available to high school students, though there are two automotive (light duty) classes offered per year with around 120 students participating annually. As for adult programs, Eden Area ROP offers an electrical program that is geared towards workers new to the trade. The course follows the NCCER Core [Curriculum](#), providing participants with a general introduction to various electrical concepts and settings. Upon completion, participants receive certification of program completion, [OSHA 10](#), CPR, and their Electrical Trainee (ET) card.

There was a clear distinction observed in comparison between Eden ROP and a traditional community college training program. While the ROP is governed by school district representatives, they are not held to the same requirements for program development as the community colleges. As a smaller organization, the ROP has benefitted from being able to maneuver more quickly when it comes to OEM partnerships, curriculum development, and program approval. For example, the duration for a program to be fully developed at the college level is about 2 years. Board approval for programs at the Eden ROP can be turned around in a few weeks.

The high school students can benefit from several automotive programs provided in the daytime and at nighttime: automotive collision and refinishing and automotive technology. According to the program’s website, “Automotive Technology I introduces students to standard automotive repair and maintenance, through online industry safety training, instructional content and hands-on shop work.” Course Skills include:

- Function and name of auto parts

- Front end alignment
- Safety, fasteners, hand tool identification and usage
- Vehicle systems
- Electrical fundamentals
- Service information access and use
- Automotive chemical and fluid applications
- Hazardous waste handling
- General shop equipment usage
- Vehicle servicing
- Troubleshooting, Analysis, and Shop Practices

Automotive Technology II courses include:

- Advanced technical skills and essential worker traits
- Further development of work ethics
- Organizational and leadership skills
- Diagnostics and repair

Within their adult programs, Eden ROP provides the Electrical Program, which is a California state-approved provider for Electrical Trainee Program School #109. Program topics include:

- Residential, Commercial, and Industrial Wiring
- Motor Controls
- OSHA 10 Construction Safety
- CPR/First Aid
- Programmable Logic Controllers
- Solar and Basic Instrumentation

While current programming does not include ZE MDHD vehicle maintenance or charging infrastructure training, Eden ROP and similar programs may be uniquely positioned to provide a pipeline of students to community colleges or directly to industry. This is the model observed through current programs where students go to Chabot College or to industry.

Table 7. Stakeholder Session: High School Participants

Ava Service Area Stakeholders	Session Participants (Y/N)
Oakland Unified School District	Y
Eden Area Regional Occupation Programs	Y

Key Obstacles/ Challenges to Program Development	Lack of instructors with adequate skill set
	Lack of MDHD vehicle resources

## Community Based Organizations (CBOs) and Labor Unions

Labor Unions and CBOs intersect two relevant functions within the workforce development space: they provide training and also constantly evaluate the needs of their members. In this case – unions are focused on the laborers and CBOs are focused on uplifting the impacted communities by providing supportive resources along with workforce training. This was the largest stakeholder cohort engaged in Blueprint’s workforce development working given their wide-ranging interests and concerns.

IBEW is the union representing electrical workers. The local chapter (Local 595) represents electrical workers in Alameda, San Joaquin, and Calaveras Counties. Driven by a national curriculum by the National Joint Apprenticeship Training Committee (NJATC), Local 595 provides continued education and electrician certification programs for journeymen wiremen (journeymen). Electrical apprentices become journeymen by completing in-class and on-the-job training hours. The IBEW-NECA Inside Electrician Apprenticeship is a 5-year program requiring 900 hours of classroom instruction and 8,000 on-the-job hours. In partnership with Electrical Contractors, Local 595 formed the Alameda County Joint Apprenticeship Training Committee (JATC), which currently has capacity for 400 apprentices. This committee is also associated with Chabot College in Hayward.

IBEW 595 is aware of the electrical skills needed to support the ZE vehicle industry, particularly with regard to charging infrastructure. As previously noted, Local 595 is currently offering EVITP training to its members, as well as administering EVITP testing for anyone eligible. EVITP eligibility is dependent on a state licensure, electrician certification, or otherwise demonstrating 8,000 hours of hands-on electrical construction experience. Course instruction and examination is estimated to be 20 hours.

The Alameda JATC receives 300-500 apprenticeship applications on a quarterly basis and have receive about 50-60 new apprentices per year, while 20-25 retire. While Local 595 has the capacity to train 400 participants at a time, the number of apprentices accepted is related to labor demand in the field to ensure apprentices can achieve their 8,000-hour on-the-job training requirement in the targeted 5-year period. To maximize – or at least increase – the number of apprentices accepted for training, Local 595 requires evidence of union labor demand in the field. Local 595 and the [Construction Trades Workforce Initiative - Building and Construction Trades Council of Alameda County](#) (CTWI-BTCA) stated that the absence of ubiquitous labor standards for EV charging installation and/or service projects requiring union labor is their top barrier. For example, state-certified electricians are only required for [C-Specialty Contractors](#) and not by a Class A General Engineering License, so if a project does not have an explicit requirement for Class C specialty contractors, union contracts are much less likely to get the work.

As for CBOs, GRID Alternatives (GRID), Rising Sun Center for Opportunity (Rising Sun), and Cypress Mandela have all been pivotal organizations in providing various construction and clean energy job trainings to the East Bay workforce. GRID has historically trained people for solar jobs, and does not currently offer any training programs for auto or fast charging infrastructure. Given their role and position in the regional workforce training space, GRID was engaged in the stakeholder sessions and will support on the Stakeholder Guidance Committee. Rising Sun, similarly does not currently offer any training programs for auto or fast charging infrastructure, focusing more on solar, energy efficiency, and construction training. They are aware of the career opportunities in the growing ZE M/HD sector, and are considering if and how they might expand training to support people pursuing those careers. Cypress Mandela, a CBO providing pre-apprentice construction training to community members at no cost, offer a 16-week green construction training pre-apprenticeship which can represent 7 college credits at Laney

College and University of California campuses. Cypress Mandela also provides an 8-week advanced training in the PG&E PowerPathway™ Program which could eventually lead to workforce opportunities associated with grid upgrades. Cypress Mandela representatives shared that providing training equipment is a challenge and they recommended standardizing training to support local CBOs.

While none of the CBO training programs in Ava’s service area have any existing training capabilities directly tied to the ZE vehicle industry specifically, whether for vehicle maintenance or charger installation and maintenance, they have been active in providing training opportunities in the solar industry. This experience gives these CBOs relevant perspective to potentially support the development of the workforce training for the ZE MDHD vehicle ecosystem.

Various CBOs also shared with Ava that attracting system-impacted people (formerly incarcerated) can be a key strategy to expand the regional workforce and to ensure equitable opportunity to participate in this growing sector. CBOs noted that some industries have historically been more sensitive to system-impacted workers, highlighting that the construction industry has been more accepting, while the solar industry has been more likely to turn away prospective workers based on failed background checks. As stakeholders in the ZE MDHD sector consider how to expand labor pipelines it will be important to consider providing some amount of assistance as various CBOs and other training programs have done. This type of assistance includes childcare, transportation assistance, public funding for externships, stipends, etc.

Table 8. Stakeholder Session: Labor Unions and CBO Participants

Ava Service Area Stakeholders	Session Participants (Y/N)
<a href="#">International Brotherhood of Electrical Workers (IBEW) Local 595</a>	Y
<a href="#">NorCal National Electric Contractors Association (NECA)</a>	Y
<a href="#">Construction Trades Workforce Initiative Building and Construction Trades Council of Alameda County (CTWI-BTCA)</a>	Y
<a href="#">GRID Alternatives</a>	Y
<a href="#">Rising Sun Center for Opportunity</a>	Y
<a href="#">Cypress Mandela Training Center</a>	Y
<a href="#">Alameda County Workforce Development Board</a>	N



## The Original Equipment Manufacturer (OEM) Nexus

Original Equipment Manufacturers (OEMs) were not engaged in the Blueprint workforce development stakeholder sessions, but they hold a unique position that overlaps or involves all stakeholders. Figure 3 demonstrates their ongoing and potential relationship.

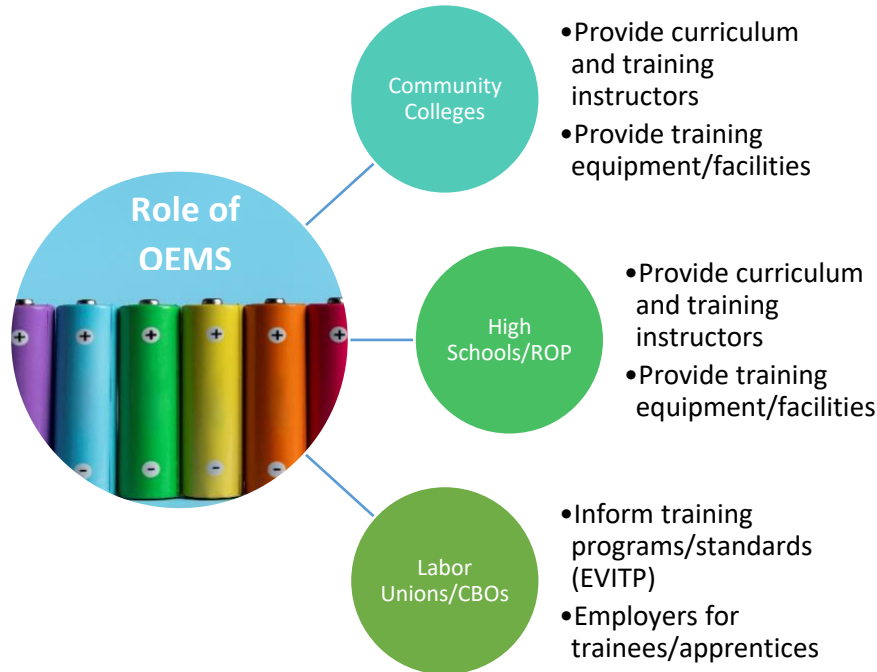


Figure 3 Workforce Development Roles of OEMs

Within the emerging ZE MDHD vehicle industry, the priority for vehicle manufacturers has focused on training current maintenance technicians employed by the OEM and their dealers to service their vehicles and new vehicle models. For example, Volvo Group has developed a [robust online training program](#) available to their technicians. Additionally, technicians need to be certified as ASCE Master Technicians before taking further training. Then, they provide in-person training at one of four US-based locations. The City of Hayward is where one of these training facilities is located, which is in Ava’s service area.

Regarding diesel support staff, ZE vehicle technicians are still the minority and can even be considered specialized. On the transit side, OEMs have historically provided two levels of support for ZE bus deployments: introductory high-level maintenance training for staff on site and sending over internal technicians/specialists for more complex issues found by the transit agencies. This is also the case for Volvo to service their heavy-duty trucks. Electric vehicle service managers<sup>10</sup> are available to provide diagnostics and repair services in the event of an issue with the truck. The industry acknowledges that this is not a long-term solution relative to the growing scale of ZE MDHD vehicle deployments and many fleets’ requirements to have their own fleet technicians certified to diagnose and service a vehicle as efficiently as possible, without having to either wait for a dealer-based technician or get the vehicle the dealer/OEM service center for repair. As more ZE MDHD vehicles get on the road, OEMs will quickly learn the most common issues and should integrate that knowledge into their approach to training technicians and better

<sup>10</sup> Technicians within Volvo’s staff that provide facility-based service after deployments of Volvo vehicles.

supporting customers' needs to receive efficient service in the field. For example, there is not yet enough data from the small number of vehicles in operation today to confidently identify the top 5 "fault codes".

As previously noted, educational institutions are continuously looking to partner with OEMs for a multitude of support options including curriculum development, training, providing equipment and/or shared facilities. A key example of a successful OEM and college partnership on ZE vehicle training was implemented through a \$45M grant project, Volvo LIGHTS, funded by the California Air Resources Board.

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### *Case Study 1: Volvo LIGHTS*

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Volvo Trucks and other partners, in support by CARB and the South Coast Air Quality Management District, deployed battery-electric equipment at two warehousing facilities in Southern California operated by Dependable Highway Express and NFI Industries. Equipment deployments, accompanied by charging infrastructure, include forklifts, yard tractors, Class 7 box trucks, and Class 8 tractors at both facilities. Facilities also benefitted from the installation of solar panels, energy storage systems, and workplace charging services. Volvo's TEC Equipment dealership, the nation's first EV certified dealer-provided electric truck maintenance facility, provided valuable insight on the future of electric truck maintenance. TEC Equipment, with locations in Fontana and La Mirada, are full-service, heavy-duty truck dealerships. TEC Equipment offered fleets the ability to lease the battery electric trucks for real-world trials. There were three (3) educational institutions involved in the project. The University of California-Riverside supported Portable Emissions Measurement Systems testing and data collection. Volvo Group partnered closely with two community colleges – Rio Hondo College and San Bernardino Valley College (SBVC) in the development of electric truck technician training curriculum to support workforce development. [According to Rio Hondo's Professor John Frala](#), Rio Hondo College is designing a technician program specific to Volvo heavy-duty electric truck maintenance, helping to support workforce development in the region and utilizing Volvo's first-of-its-kind augmented reality-based training program.

The San Bernardino Valley College (SBVC) is designing an associate degree training program specific to heavy-duty battery electric truck maintenance. Automotive Technology Department enables students to earn Automotive Technician certificates and take a range of courses, including truck electrical systems, electrical systems diagnosis and repair, and engine repair.

Volvo LIGHTS is an example of what an OEM/college partnership could look like. In addition to curriculum development, Volvo provided vehicle equipment and parts for the students to have hands-on training experience with ZE MDHD parts and systems. It provided a pathway for access to learning about Volvo MDHD vehicles and overcame hurdles seen by community colleges today. It is unclear if replicating the Volvo LIGHTS model statewide is a viable pathway given supply chain issues and excessive costs. These inhibitors may limit the opportunity for donation of vehicles and equipment. Volvo has also recently announced they plan to build a network of fast chargers ([California Electrified Charging Corridor](#)), and

there may be training opportunities between dealerships (and not the OEM itself) and community colleges to evaluate.

Another OEM training consideration is that providing training to external students or apprentices (e.g., non-OEM staff) are a liability. There may be more opportunities for grant-funded workforce development programs that lead to college-OEM partnerships, but other models will need to be explored to get to scale.

In addition to engaging Volvo, Ava and CALSTART spoke with Lion Electric. Like Volvo, Lion trains current and incoming staff on their electric bus and truck models. Lion also provides training to fleets that includes a two-day in-person training that provides a thorough overview of the systems, a foundational training on high voltage including lockout/tagout procedures, and vehicle preventative maintenance. Lion noted they also plan to utilize an online learning management system accompanied with a shadowing/apprenticeship model to train their internal technicians.

Throughout the Blueprint workforce development stakeholder conversations with OEMs, vehicle standardization was also raised as a challenge in training ZE MDHD technicians. There is little standardization of systems and component placement with ZE MDHD vehicle manufacturing so while educational centers can provide introductory training, not all systems may be covered in instruction. That said, OEMs did share that technicians that receive any extensive ZE MDHD training are much better suited to work on another OEM's vehicle than somebody brand new to the field.

### Next Steps

Ongoing conversations with OEMs and dealers will provide more insights relative to opportunities to leverage and apply elements of the Volvo LIGHTS partnership model, the exact skill sets sought from pathway programs, needs and requirements for sharing training facilities, and OEMs' regional goals for the East Bay. Ava and CALSTART will continue to engage all stakeholder groups to identify paths forward for partnerships that will foster a friendlier robust workforce pipeline of trained technicians for ZE MDHD vehicles and associated charging infrastructure.

# Appendix A: Stakeholder Process

