Workforce Needs Assessment & Training Landscape

Green Jobs Regional Partnership

HR&A

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Executive Summary

Overview

As green industries and technologies have rapidly evolved, new jobs and training modules are emerging across the region in response to the market. There is a need for a coordinated effort to ensure the current and future workforce is inclusive, adaptable, and properly trained. A responsive workforce ecosystem will be critical in ensuring that the Los Angeles County (LA County) region continues progress towards meeting its bold climate targets, including reaching **600,000 green jobs countywide by 2050**, and does so in a manner that creates a more just and inclusive economy.

The Los Angeles Cleantech Incubator (LACI) formed the **Green Jobs Regional Partnership** (GJRP) in 2024 to guide workforce goals and strategies for the county, documented in a **workforce roadmap** (Roadmap), to lay the foundation for a new and sustainable workforce development model. The approaching 2028 Olympic and Paralympic Games (2028 Games) present a tremendous opportunity for economic growth, particularly in the region's clean transportation sector, the GJRP has homed in on transportation electrification as their initial focus to realize the county's transportation electrification goals, including those laid out in LACI's Transportation Electrification Partnership (TEP) Roadmap.

To provide an informed foundation for the GJRP Roadmap's targets and strategies, LACI tasked HR&A Advisors with assessing the current landscape of electric vehicle (EV) and electric vehicle support equipment (EVSE) occupations and training opportunities in LA County. This resultant Workforce Needs Assessment and Training Landscape builds on existing LACI studies, incorporates both quantitative data and qualitative data sourced from the GJRP members, and identifies job targets informed by LACI's TEP goals for 2028. This report:

1. Provides an overview of the region's transportation electrification targets;
2. Summarizes job demand for the top three priority occupations: Electricians, EV Technicians, and EVSE Technicians;
3. Outlines additional priority occupations, prioritization criteria, and overarching occupational characteristics for the current workforce;
4. Provides a skill-based analysis to determine the most highly requested skills and qualifications needed across the EV and EVSE industries;
5. Assesses the training landscape and details existing training programs, gaps, and opportunities for EV and EVSE job training in LA County.*

This executive summary focuses on the report's top three priority occupations (i.e., **electricians, EVSE technicians, and EV technicians)**, which are the focus of the GJRP's Roadmap of near-term workforce actions for the region. However, the full report includes profiles of additional occupations which should also be future priorities for the broader workforce development ecosystem in EV and EVSE industries.

*All data was collected through September 2024. More recent data may have emerged since this research was completed due to the rapidly evolving nature of the industry.

Workforce Needs Assessment

Based on the LA County region's transportation electrification targets, there is a strong need to rapidly train, upskill, and hire **electricians, EVSE technicians, and EV technicians** to meet the growing need for EVs and their supportive equipment. For instance, the TEP Roadmap has set a goal for 30% of light-duty private vehicles to be electrified by 2028, meaning LA County residents must adopt **1.7 million new EVs** by 2028 and LA County must have the supportive charging infrastructure necessary to sustain those vehicles.

Workforce Demand

The table below demonstrates the current workforce size and projected need by 2028 for each of the priority occupations (electricians, EVSE technicians, and EV technicians). A series of statewide policies aim to increase EV and EVSE uptake may help unlock and accelerate this workforce demand (see pp. 19-21 for more details).

Occupation	Current workforce in LA County	Projected need to meet TEP goals by 2028	Impact/Takeaway
Electricians	**15,000** electricians	**260** EVITP certified commercial electricians **1,000** residential electricians	There is an overarching shortage of electricians in LA County compared to national averages.* Electricians will face greater demand pressures as other industries electrify, meaning the workforce must expand to accommodate electrification needs, including those of the EV and EVSE industries.
EVSE Technicians	**N/A** - Lack of accurate data on current workforce size	**1,500** EVSE technicians to support public and private chargers	This is an emerging occupation and will require significant investment to build up a new workforce.
EV Technicians	**80-460** ASE-EV certified technicians **16,400** general automotive service technicians	**4,850** ASE-EV certified technicians *(for light-duty vehicles and buses)*	As more EVs enter the market and LA County implements policies to increase the uptake and sharing of EVs, more auto service technicians and mechanics will need to learn how to operate on EVs.

*LA County currently has a shortage of 7,200 electricians to meet the national ratio of electricians to households of 6.6 electricians per 1,000 households. In speaking with industry experts, there are enough commercial electricians to meet demand from current union contracts, however, there is a shortage of electricians for non-unionized and residential work. In the long-term, the region will need to increase the workforce for both types of electricians to meet its ambitious yet achievable electrification goals.

Workforce Needs Assessment

Electricians

To meet the demand for the public, Level 2 and DC Fast Charging (DCFC) chargers and private, Level 2 chargers needed by 2028, LA County will need an estimated **260 EVITP certified commercial*** and **1,000 residential electricians**.

LA County's current electrician workforce may appear sufficient for EVSE installation, but many need upskilling in Level 2 and DCFC charger installation. As electrification expands across industries, competing demand for electricians will rise, highlighting the need to grow and train the workforce.

EVSE Technicians

LA County will need approximately **1,500 full-time EVSE maintenance jobs** to meet demand by 2028.

Over 95% of EVSE maintenance needs are not electrical, meaning an EVSE technician, rather than an electrician, can fix EVSE issues. With the EVSE industry still evolving, most technicians are new or transitioning from other fields. To ensure these positions are filled by technicians rather than oversubscribed electricians, the region must support startups, standardization of training, and inclusion of EVSE technicians in charger maintenance contracts.**

EV Technicians

By 2028, LA County will require **4,400 additional EV-certified technicians** for light-duty EVs, and **450 additional electric bus technicians** to meet both current and future EV maintenance needs.

Of LA County's current 16,000 automotive service technicians and mechanics, few have certifications to maintain EVs. EVs require less maintenance than internal combustion engine (ICE) vehicles, but as more residents of LA County drive EVs, the demand for mechanics with EV skills has grown exponentially. Given its strong existing mechanic workforce, upskilling will be key to meeting the EV maintenance needs.

*According to IBEW Local 11 there are enough EVITP certified electricians to meet demands through 2030.

***IBEW Local 11* strongly believes that any work involving line voltage on EVSE must be completed by a licensed electrician to ensure safety and quality.

Workforce Needs Assessment

Skillset Demand

EV and EVSE occupations and career pathways are rapidly evolving. Job training that is industry-driven and skill-based, rather than occupation-specific, will best cater to an adapting market. To guide the current and future EV and EVSE job training needs, this report compiles the most common and relevant skills associated with EVSE maintenance, EV maintenance, and Electrician job postings in LA County:

The **specialized skills** in high demand among these priority occupations in LA County included:

- Electric Vehicle Skills*
- Electric Vehicle Charger Installation**
- Field Service Management
- OSHA and other safety standard trainings
- High Voltage Systems
- Electromechanics and Electrical Systems
- Electrical Wiring and Electrical Equipment
- Low Voltage Systems
- Hand Tools

The **common skills** in high demand among these priority occupations in LA County included:

- Communication
- Customer service
- Operations
- Management
- Problem Solving/ Troubleshooting
- Physical Lifting Ability
- Good Driving Record
- Computer Literacy

The **qualifications** in high demand among these priority occupations in LA County included:

- Valid Driver's License
- Automotive Service Excellence (ASE) Certification
- Electric Vehicle Infrastructure Training Program (EVITP) certification
- Commercial Driver's Licenses (Class C or A)
- CPR Certification
- Forklift Certification

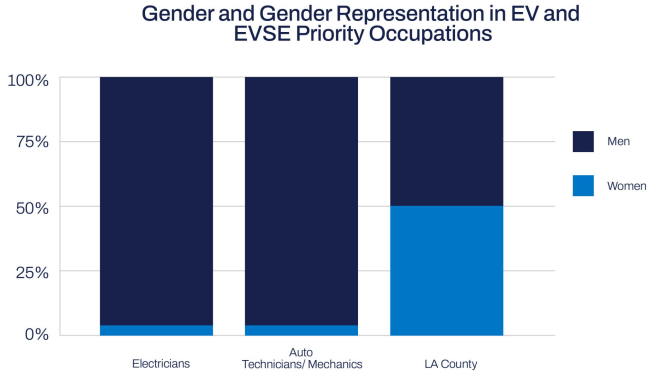
**Includes understanding the unique components and systems that power EVs, such as the motor, battery, and charging system (Lightcast).*
***Encompasses knowledge of electrical systems, safety protocols, and compliance with local regulations to ensure proper functionality and safety of the installation*

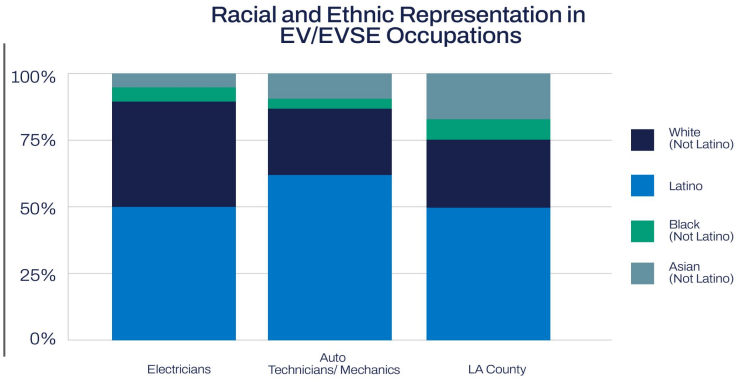
Workforce Needs Assessment

Key Findings

Representation and Inclusion of EV and EVSE Occupations

EV and EVSE jobs in LA County are primarily held by white and Latino men, with women, Black, and Asian workers severely underrepresented. While no data exists yet on the demographics of EVSE technicians in particular, local partners have confirmed this underrepresentation anecdotally.





Residential Charger Installation

Residential charger installation is simpler and lower-paying than commercial installations, requiring only an electrician to oversee installation and occasional panel upgrades. Public charger installation is more complex, involving multiple chargers, higher voltage needs, and often requiring multiple occupations including electricians, planners, contractors, utilities workers, and permitting administrators. Though residential demand is highest, **lower wages and job security make it less appealing** to electricians.

Key Findings

Upskilling vs. New Training

LA County's automotive technicians and electricians have many transferable skills for EV maintenance and EVSE installation, making retraining key to meeting demand by 2028.

As EVs become ubiquitous in LA County, automotive technicians will need to learn EV maintenance skills to adapt to a changing market. If LA County focuses its efforts on retraining and upskilling for these occupations, the region will be able to meet a significant amount of its demand by 2028.

EVSE technicians, however, may require a new workforce because the occupation is emerging. The region will require significant investment in training new EVSE technicians. Standardized EV and EVSE training is also essential to streamline workforce development and reduce employer training burdens.

Workforce Needs Assessment

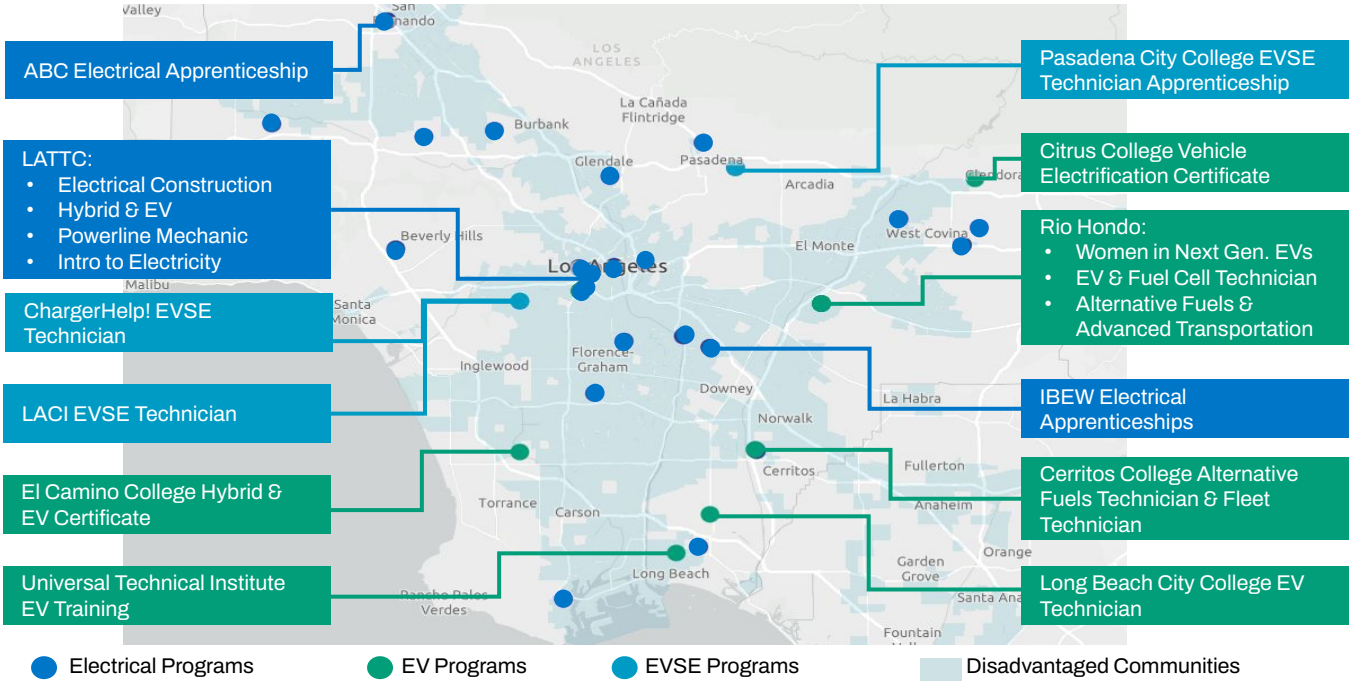
Naming and Data Tracking

This research has highlighted the imperfect and speculative nature of EV and EVSE industry data. The EV and EVSE industries should develop:

1. Shared language and definitions for EV and EVSE occupations, including job titles and standard qualifications and certifications required for each role.
2. A unique and recognized set of SOC or O*NET codes specific to EV and EVSE occupations to ensure these occupations can be isolated from larger codes that may encompass all electricians or all mechanics.

Training Landscape

The projected demand for priority occupations exceeds the current workforce, indicating a need to both train new workers and upskill or reskill existing workers. The Training Landscape maps existing programs for priority occupations in transportation electrification (EV and EVSE), and identifies gaps based on the projected demand in the Workforce Needs Assessment.



Disadvantaged Communities based on CalEnviroScreen 4.0

Training Landscape

Key Findings

Electrical Training Programs

The county's primary electrician training program is offered by the International Brotherhood of Electrical Workers (IBEW) in partnership with the National Electrical Contract Association (NECA), supplemented by programs at the Associated Builders and Contractors (ABC), Los Angeles Trade Technical College, LAUSD's Division of Adult and Career Education, and other school districts and community colleges throughout the region.

Training Gaps and Challenges

- **Scale**: unlike other EV and EVSE occupations, electricians are a well-established trade with several apprenticeship programs throughout the County. Even so, most programs are not operating at a large enough scale to meet projected demand.
- **Specialization**: Electricians who work on EVSE need additional specialization (e.g., EVITP certification and other specialized skills mentioned above). The number of electricians trained to work on EVSE projects will need to be scaled dramatically across the county.

EVSE Technician Training Programs

EVSE Technicians are responsible for the diagnosis and repair of non-electrical problems on EV chargers, which make up more than 95% of charger errors. EVSE Technician programs are in short supply: only three exist across LA County, limiting geographic coverage and proximity to lower-income and under-resourced communities. Some employers offer on-the-job training, but these positions tend to require a baseline of experience that makes them less accessible to new entrances to the EVSE workforce. Successful programs from LACI and LACI alumna company ChargerHelp! should be scaled across the county to meet demand.

Training Gaps and Challenges

- **Lack of standardization**: Program participants receive basic training applicable to all or most chargers, but after completing basic training students must still receive manufacturer-specific training for each company whose chargers they service. Increasing standardization across manufacturers would increase the efficiency of programs (and the resulting workforce).
- **Digital literacy**: Workers who enter training programs without basic computer literacy skills must first make up that knowledge before they can be trained on the specifics of charging stations. Digital literacy skills gaps disproportionately impact students of color.

Training Landscape

Key Findings

EV Technician Training Programs

Electric Vehicle technician programs are prevalent throughout the county, typically as part of "alternative fuels" programs that focus on a combination of hybrid, electric, and other non-ICE vehicles. Many offer options for either a certificate or an associate degree, maximizing accessibility for workers. Many programs are on the edge of lower-income and under-resourced communities, but the core of communities are not well served.

Training Gaps and Challenges

- **Re-Skilling:** Los Angeles has an existing network of mechanics who service ICE and Hybrid vehicles. These workers have a strong base of knowledge and could easily service EVs with the proper training, but most existing training programs are geared towards new workers rather than re-skilling. New programs may be needed that are more tailored to this population.
- **Hands-On Training:** Current training programs provide a strong base of knowledge, and many offer hands-on training. However, employers reported that new employees are often lacking both knowledge and confidence in technical skills. Finding opportunities for programs to partner with employers could allow for additional hands-on training.

Training Landscape

Key Findings

Other Training Programs

Additional EV and EVSE-related programs include building trades pre-apprenticeships, BYD's apprenticeship program, and a Fleet Technician program at Cerritos College. Career technical education (CTE) and vocational schools also provide exposure to electrical careers and foundational skills that can serve as a foundation for electrician training programs.

Additional Gaps and Challenges

- **New and Incumbent Workers:** Existing training programs for EV and EVSE roles are primarily geared towards new workers, but one of the largest needs is retraining existing mechanics to work on electric vehicles. Stakeholders identified a need for two changes: 1) dedicated reskilling programs for auto mechanics interested in working on EVs, and 2) greening existing ICE programs to train future mechanics to work on EVs.
- **Quality of Programs:** Ensuring alignment between training programs and employer needs is difficult in an industry changing as rapidly as transportation electrification. Stakeholders noted some gaps in alignment, particularly when it comes to hands-on learning. Defining a common baseline for entering the field would help ensure a high standard of training across programs.
- **Funding and Policy:** Training is expensive and can be cost-prohibitive both for workers and for employers. Grant funding could help fill this gap, offering funding to employers to provide meaningful on-the-job training for new or re-skilled workers. Wraparound services are also critical and should be treated as a necessity for any training program. Lastly, many stakeholders noted that undocumented workers cannot be the beneficiaries of federal workforce development funding, creating a significant challenge in a county like Los Angeles with a large undocumented population.
- **Outreach and Recruitment:** Many occupations in the EV and EVSE industry do not reflect the diversity of LA County, particularly for Black residents and women. Exposure programs and pre-apprenticeship programs can help increase representation by broadening the audience of people who are aware of new and emerging jobs.
- **Timing of Job Creation:** The timing of demand for emerging industries is often unclear, and employers and training partners can end up training workers for jobs that are not yet available. Training programs should emphasize transferable skills that are not isolated to one role, creating a more resilient workforce that can adapt to the changing needs of the industry.

Workforce Needs Assessment

Introduction

The Los Angeles Cleantech Incubator (LACI) set a goal for Los Angeles County (LA County) of growing the green job sector from 338,000 green jobs in 2018 to 600,000 green jobs by 2050 countywide[1] through targets ranging from decarbonizing buildings to improving climate resiliency to increasing the use of public transportation. In service of these goals, LACI commissioned HR&A Advisors, Inc. (HR&A) in 2017 to undertake a Green Jobs Study which quantified and characterized the green economy in LA County. Acting on a study recommendation, LACI formed the Green Jobs Regional Partnership (GJRP) in 2024 to guide workforce goals and strategies for the county. The GJRP has homed in on **transportation electrification** for its 2024 – 2028 work and created a **workforce roadmap** (Roadmap) **for the green jobs and training needed to electrify all public and private vehicles on the roads of LA County and sustain the supportive electrification infrastructure**.

To achieve full transportation electrification and meet the interim electrification goals by 2028, LA County will require a pipeline of skilled workers. This report informs the GJRP Roadmap by guiding the quantitative and qualitative targets set forth in a future roadmap. This research builds on existing LACI studies and incorporates both quantitative data and qualitative data sourced from the GJRP Research Group members.* The jobs targets in this report are also informed by the Transportation Electrification Partnership (TEP) goals for 2028, outlining the workforce needs to reach the targets laid out in the TEP Roadmap.

In this assessment, we will:

1. **Define the EV and EVSE industry and LA County's transportation electrification targets** as a benchmark for where the county should be by 2028
2. **Outline the job demand** to meet these LA County targets
3. **Provide LA County demographics** to contextualize the data and set benchmarks for representation
4. **Prioritize occupations** for the focus of this assessment and the Roadmap
5. **Characterize and profile each priority occupation** to profile the current workforce and highlight occupational requirements
6. **Conduct skill-based analysis** to supplement occupational data and outline the primary skills that employers are seeking in this emerging industry
7. **Discuss occupational gaps and takeaways** to inform the GJRP Roadmap

Needs Assessment Guiding Questions:

- What are the types and numbers of jobs that comprise the EV and EVSE sectors?
- What skills are needed for these jobs, and how prepared is LA's workforce to fill these positions?
- Who is currently employed in the EV and EVSE sectors? Who is facing barriers to entry?
- What does the existing EV and EVSE training landscape look like?
- What is the quality of training programs, and do they have the capacity to meet the projected demand?
- Who is being served by the current training ecosystem? Who is facing challenges to accessing these trainings?

**See appendix page 67 for full list and structure of GJRP Research Group.*

Defining the EV + EVSE Industries

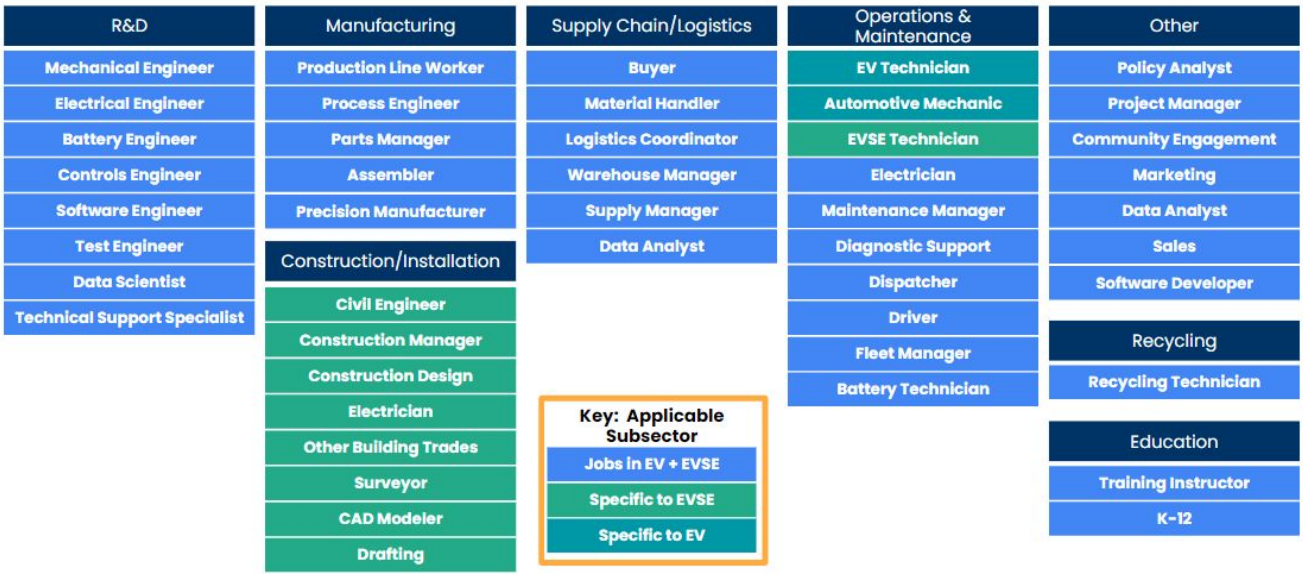
The Electric Vehicle (EV) industry encompasses all stages of transportation electrification, from the engineering, manufacturing, and supply chain of EVs and their parts to operations and management of EV fleets, to the maintenance of EVs, and the eventual recycling of EVs at the end of their life cycles. Electric vehicles include:

- micromobility EVs
- light-duty, private and shared vehicles
- medium-duty delivery vehicles
- heavy-duty vehicles for short and long-haul goods movement
- buses for public transit and schools

The Electric Vehicle Supply Equipment (EVSE) industry accounts for all support equipment required to sustain an electric vehicle ecosystem, including EV chargers and charging stations, batteries, and electric grids. In addition to manufacturing and supply chain occupations, the EV and EVSE industries include occupations such as urban planners and engineers, software developers, construction laborers, and EVITP certified electricians for EVSE installation, as well as EVSE technicians for maintenance and repair.

Occupations of Interest for EV + EVSE Industries

The full list of transportation electrification occupations is a synthesis of O*NET's "Green Occupations" list, research from LACI and HR&A, and input from the GJRP Research and Leadership Groups. HR&A worked with these GJRP groups to establish a prioritization framework, detailed in a later section [see page 30], to narrow this list to a set of priority occupations.



Regional Transportation Electrification Targets

To understand LA County's EV and EVSE job needs, we must look at TEP's regional targets and commitments for electrifying transportation. These targets lay out how many vehicles on the road should be electrified by 2028 and how many chargers should be adopted by 2028. From these targets, the demand for jobs to meet those targets, and the gap between existing jobs and projected need, is estimated.

EV and EVSE Targets for LA County

TEP has set ambitious transportation decarbonization and electrification goals for LA County through the TEP Zero Emissions 2028 Roadmap.[2] The Roadmap includes targets for EVs, as well as targets for EVSE.

TEP aims to have:

- **30%** of light-duty, private vehicles electrified by 2028
- **100%** of shared cars including taxis and transportation network companies electrified by 2028
- **45%** of school buses on the road and 100% of school bus sales electrified by 2028
- **100%** of Metro, LADOT, Santa Monica and Culver City buses on the road are electric*
- **60%** of medium-duty vehicles electrified by 2028
- **40%** of heavy-duty drayage vehicles be zero emissions by 2028
- **5%** of heavy-duty long-haul trucks be zero-emissions vehicles (ZEVs) by 2028

To support the adoption of EVs, TEP also has the following EVSE targets:

- **95,000** chargers for goods movement by 2028
- **129,000** public and workplace chargers installed by 2028

Implicitly, to reach the TEP EV targets, new private chargers will need to be installed. For instance, to reach TEP's light-duty EV target, we will need approximately 1.4 million new home chargers across all single- and multi- family homes.**

**The TEP Roadmap identifies targets for bus electrification including both local transit and school bus electrification. The analysis for this report currently only includes local bus electrification in the estimates for EV technicians but does not include buses in EVSE technicians or Electricians/EV Installation estimates. These calculations also do not include school bus electrification. More information on bus electrification job estimates can be found on page 68 of the Appendix.*

***This calculation is based on TEP assumptions of an average of 1.2 cars per home charger in LA County, inclusive of single and multi-family housing [California Energy Commission 2023 data and TEP estimates] and the number of new private, light-duty EVs needed to achieve 30% electrification by 2028 [see Table 1.5 of the appendix.]*

Regional Transportation Electrification Targets

TEP also recognizes the need to grow the 'green workforce' to realize its own goals and targets:

> **"Identify workforce development needs and training opportunities to meet our EVSE infrastructure goals and grow the green economy."**
>
> **– TEP, Zero Emissions Roadmap 3.0**

EV + EVSE Job Demand

To inform how many additional jobs and workers will be needed to meet TEP's 2028 targets for the LA region, this section estimates the overall demand for three key occupations – Electricians, EVSE Technicians, and EV Technicians. These jobs have been identified by GJRP members, industry experts, the CA Energy Commission, and others as most vital to transportation electrification and a just transition because they are mid-skill, non-degree jobs that are overwhelmingly accessible to underrepresented communities [see pages 33-36]. This report summarizes additional priority occupations in later sections that were identified as accessible, in-demand, and important to transportation electrification, but were not included in demand projections given data limitations and feedback that they were of lower priority for initial actions of the GJRP.

We calculate demand based on the targets outlined in the previous section and industry estimates for number of jobs needed to support the maintenance or installation of one EV or EV charger. Though these estimates are high-level, and job ratios are imperfect and evolving, these numbers are helpful in guiding and understanding the overall scale of demand, growth, and need that LA County must meet. The following pages detail the demand for each of the occupations below.

EV + EVSE Job Demand

Summary of Occupational Demand

Electricians
[EVSE Installation]

To meet its 2028 goals, LA County needs an additional:

260* commercial + **1,000** residential

electricians with EVSE installation expertise for public and private charger installation, and enough EVITP certified electricians to support labor demand and state certification requirements for publicly funded EVSE projects.

EVSE Technician
[EVSE Operation + Maintenance]

LA County will need approximately:

1,500

additional EVSE technicians by 2028 to support and maintain new public and private EV chargers based on estimates that one technician can maintain about 200 chargers per year. These jobs would be ongoing, with each technician responsible for a set of chargers and charger locations.

EV Technicians
[EV Maintenance]

To meet current light-duty EV (LDEV) and electric bus maintenance needs, LA county needs 930 ASE-EV certified technicians total, or an additional 470 - 850 technicians with ASE-EV certification. Including those required to meet current need, the county will need an additional:

4,400 ASE-EV certified technicians for LDEVs + **450**** EV bus technicians

to meet the projected 2028 maintenance needs for LA County based on the target number of 1.7 million new LDEVs on the road by 2028 and 100% electrified bus fleets.

Other Occupations

To meet demand for public charger installation for light, medium, and heavy-duty EVs, LA County will need a range of other supportive occupations including:

- electrical and general contractors
- planners and designers
- utilities workers for grid connection
- permitting administrators
- battery technicians
- registered service agents*

see appendix page 69 for more details.
***bus electrification targets for public transit are only included in calculations for EV technicians. More info is available in appendix page 68.*

EV + EVSE Job Demand Context

Clean transportation is a rapidly growing field due to the increasing adoption of public and private electric vehicles. In particular, the Clean Vehicle Rebate Project (CVRP) helped bolster the uptake of EVs in California,[3] along with other national vehicle incentives such as the Federal Tax Credit for New EVs.[4] As EV adoption accelerates, public and private charger installation will increase as well to sustain the growing vehicle fleets. In particular, LA County will see an increased demand for Level 2 chargers at single and multi-family residences to ensure residents can quickly and efficiently charge their vehicles at home.

Between 2020 and 2023, the number of LDEVs in LA County grew by over 150%, increasing from 157,000 to 392,500 LDEVs. As shown in the chart below, growth in the number of EVs in LA County has been exponential.[5]

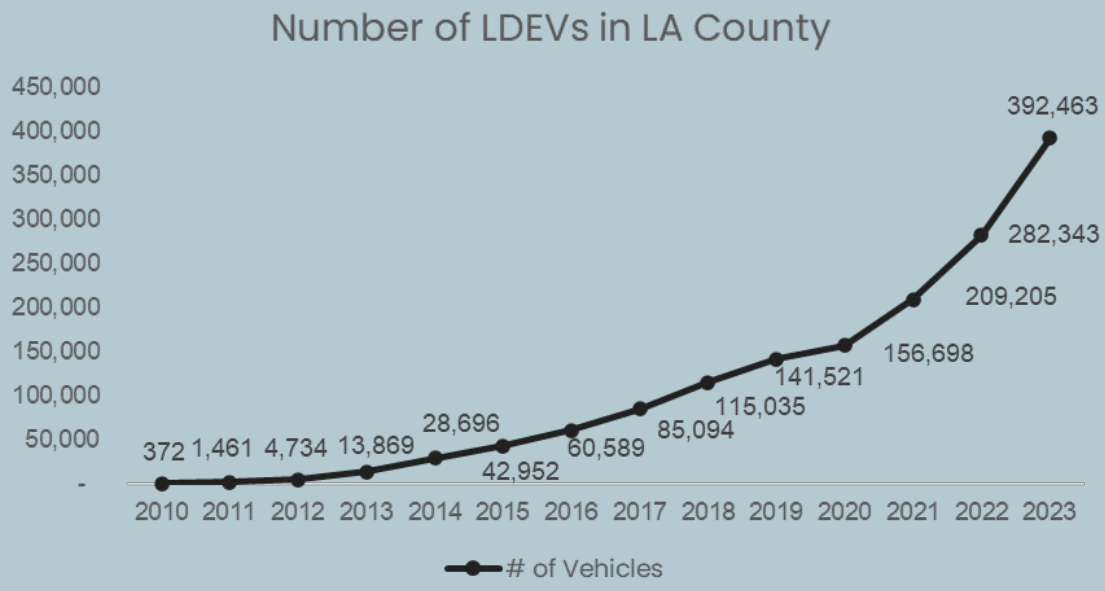


Chart data from [the California Energy Commission]

Conversation with private sector representatives confirmed the high upside for growth in the industries but noted barriers to effective business planning. Insufficient data and regulatory barriers (e.g., public sector installation and service contract requirements) have made it difficult to assess the current state of the industry and to plan for growth. Companies like InCharge have been able to overcome these challenges through vertical integration and operating at a national scale.

EV + EVSE Job Demand Context

Projected Job Growth in LA County: Electricians

According to analysis of the Electrician Occupation by the Center of Excellence for Labor Market Research (COE), the broader occupation is projected to see a net growth of **8,620 jobs** from 2022 to 2028, of which **630** will be newly created jobs and 7,990 will be replacement jobs.[6]

Though these projections apply to all electricians rather than the subset that focus on EVSE installation, this analysis shows a clear growth in the occupation from 2022 to 2028 as multiple industry sectors electrify.

Projected Job Growth in LA County: Auto Service Technicians + Mechanics

According to COE projections, the general auto service technician and mechanic occupation is projected to see a **decrease of 350** jobs but will experience a turnover of **8,390 replacement jobs** from 2022 to 2028, with a net of 8,040 open jobs.[7]

This decline in overall positions aligns with the lower auto maintenance needs with higher-tech EVs. Continued growth in job openings may indicate necessary shifts in marketing of careers and retraining of technicians to learn skills specific to EVs.

State Policy Highlight

What state policies are driving demand for EV and EVSE uptake, or are impacting workforce demand and qualifications in California?

WAIRE Rule

California's WAIRE Rule – the Warehouse Actions and Investments to Reduce Emissions Program – requires warehouse operators in California to mitigate their emissions by medium- and heavy-duty trucks based on how many trips are made to and from the warehouse each year. Warehouse owners and operators can either take various actions to reduce their emissions or can pay a mitigation fee that is used to incentivize zero-emission trucks and charging infrastructure near the warehouse.

The rule pushes warehouse facilities to decarbonize goods movement, increasing the demand for medium- and heavy-duty ZEVs along with the EVSE infrastructure to sustain them.

California State Assembly Bill 841

Assembly Bill 841 mandates that any EV chargers or other EVSE funded by the California Energy Commission (CEC) or the California Air Resources Board must be installed by a licensed contractor, and that at least one electrician on the crew must be EVITP certified. If the project involves chargers supplying 25 kilowatts or more, at least 25% of the crew's electricians must be EVITP certified. The rule encourages the uptake of EVITP certification to allow electricians and contractors to work on publicly funded projects and helps establish EVITP as the highest standard of electrical certifications.

State Policy Highlight

California State Executive Order N-79-20

Executive Order N-79-20, signed in September 2020 by Governor Newsom, expands zero-emission vehicle (ZEV) adoption targets which include 100% ZEV sales for in-state, light-duty vehicles and 100% ZEV operations for drayage trucks and off-road vehicles and equipment by 2035. The Executive Order also mandates that 100% of medium- and heavy-duty vehicles should be ZEVs by 2045.

The rule pushes all vehicles in California to transition to ZEVs by 2035 or 2045, increasing the demand for light-, medium-, and heavy-duty ZEVs along with the EVSE infrastructure to sustain them.

California State Assembly Bill 126

Assembly Bill 126 preserves and expands upon existing law requiring the Energy Commission to develop reporting standards for EVSE that were installed after January 1, uptime and and received public incentives or charges on ratepayers. It also requires the adoption of tools and incentives for increasing charge station uptime and requires the Energy Commission to set standards for how stations notify customers about public charger availability.

The rule improves reporting standards and aims to expand usage and efficiency of EVSE infrastructure.

California State Assembly Bill 2127

Assembly Bill 2127 requires the California Energy Commission to assess (biennially) the EV charging infrastructure necessary to meet the state's goals of having 5 million ZEVs on the road by 2030 and reducing greenhouse gas emissions to 40% below 1990 levels by 2030.

The bill enables the proper data and information collection to understand the state's EVSE need.

California State Assembly Bill 2061

Assembly Bill 2061 requires the CEC to develop uptime recordkeeping and reporting standards in coordination with the California Public Utilities Commission, which applies to any chargers installed on or after January 1, 2024 using state incentives or through a charge on ratepayers. Charging station infrastructure must be assessed biennially starting January 1, 2025. This law applies for at minimum 6 years.

The rule improves reporting standards and aims to expand reliability and efficiency of EVSE infrastructure.

California Air Resources Board (CARB) Advanced Clean Cars II

CARB's Advanced Clean Cars II regulations aim to rapidly reduce emissions from light-duty vehicles including passenger cars, pickup trucks, and SUVs with model years between 2026 and 2035. The regulations amend the Zero-emission Vehicle (ZEV) Regulation to increase the number of required ZEVs and rely on current ZEV technologies including battery-electric, hydrogen fuel cell electric, and plug-in hybrids to meet air quality and emissions standards.

State Policy Highlight

CARB Advanced Clean Trucks

CARB's Advanced Clean Trucks regulations aim to achieve nitrogen oxide and greenhouse gas emission reductions by adopting advanced clean technology and expanding the uptake of zero-emission heavy-duty technologies wherever possible. Truck fleets operating in cities that are centrally maintained and fueled are identified as prime targets for shifting to zero-emission technology.

CARB Advanced Clean Fleet

CARB's Advanced Clean Fleet regulations require fleets well suited for electrification to reduce their emissions by phasing-in the use of ZEVs, and by requiring manufacturers to only manufacture ZEV trucks beginning in 2036. This regulation will advance the uptake of zero-emission technologies in California's truck and bus fleets.

CEC's $1.4 Billion Plan

In December of 2024, the CEC approved a $1.4 billion investment plan to expand zero-emission transportation infrastructure. The funding will support the deployment of infrastructure for light, medium, and heavy-duty ZEVs, with a commitment to spending at least 50% of the funds to benefit priority populations across California. Overall, the approved plan will lead to 17,000 new light-duty vehicle chargers statewide.

Electrician (EVSE Installation) Demand

Between public and private charger installation, LA County will need an additional **1,260 electricians with EVSE installation expertise** to meet its 2028 goals, with enough EVITP* certified electricians to support labor demand and state certification requirements for publicly funded EVSE projects.

Public Charger Installation Demand

Public* EV charger installation requires the support of planners and designers, general contractors, electrical contractors, and electricians. On average, one person can install about **33 public EV chargers per year.**[8] Appendix Table 1.2 details the estimates for charger installation and estimated jobs needed. To meet the goals of installing **129,000 public chargers** for LDEVs and **95,000 chargers for goods movement** by 2028, LA County will need:

**Public chargers include both public and shared private chargers. Shared private chargers include workplace chargers, chargers for multi-family residences, and other privately-owned chargers that are made accessible to visitors, residents, and employees.*

Electrician (EVSE Installation) Demand

260

total full time EVITP certified Electrician jobs for EVSE installation

In addition to electricians, public installation will require:

515

full time EVSE installation jobs to install 130K public chargers for light-duty vehicles, (inclusive of electricians and other supportive occupations)

+

715

full time EVSE installation jobs to install 100K chargers for medium and heavy-duty vehicles (inclusive of electricians and other supportive occupations)

>

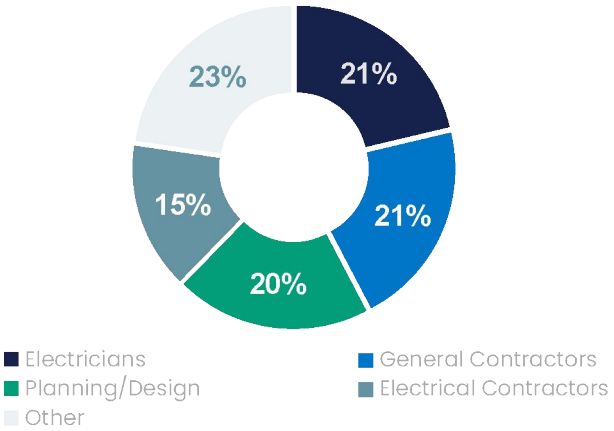
1,230

total full time EVSE installation jobs [~260 new jobs per year until 2028]. (inclusive of electricians and other supportive occupations)

EV chargers can be Level 1, Level 2, or Level 3 – *Level 1 is primarily for residential chargers and Level 2 is generally for home, workplace, and public chargers. Level 3 or DC Fast-Charging (DCFC) chargers are necessary for medium and heavy-duty vehicle charging and should be the standard for all public chargers.*

EVSE installation requires high-voltage system expertise and should be completed by **EVITP certified electricians.** The 1,230 Public EVSE installation jobs for Level 2 and DCFC chargers will include approximately **260 EVITP certified commercial electricians** and other occupations as follows:

Public EVSE Supportive Jobs: LA County



Public EVSE Support Jobs: LA County	
	Estimated Jobs[9]
Electricians	**262**
General Contractors	258
Planning/Design	246
Electrical Contractors	185
Other Related Jobs	179

EVSE Installation Demand Continued

Private Charger Installation Demand

Private EV charger installation generally only requires electricians and can be done at a faster rate than public charger installation. Though some residences use Level 1 chargers which do not require an electrician to install, in the future most new installs will likely consist of faster Level 2 EV chargers.

TEP's goal of 30% electrified light-duty vehicles by 2028 requires LA County to add an estimated **1.7 million new EVs in the next 4 years** [see appendix Table 1.4]. To support the projected growth in private EVs on the road by 2028, LA County will need approximately:

1M
Private household Level 2 chargers installed

1K
full time installation jobs*

These small-scale, residential installations are also likely to be **lower-paying jobs** and are frequently **non-union labor.** In the building trades, residential construction workers **earn 33% less** per year than non-residential workers.[10] This indicates a strong need for greater protections for the growing workforce that will meet this need, as well as a point of advocacy for labor to take on more residential charger installation projects.

Overarching Shortage of Electricians

Electricians play an important role in the EV and EVSE industry with the heavy reliance on high-voltage electrical systems running EV chargers and the supportive grid. Electricians with EVITP certification will be in particularly **high demand with the initial build-out of EVSE infrastructure.** Additionally, the increasing electrification of all other sectors ranging from building electrification to new energy generation and grid projects will **put pressure on the occupation** as industries compete for electricians.

In our analysis, LA County has an overall shortage of electricians, exacerbating the shortage of electricians who specialize in EVSE. In 2023, there were **4.5 electricians** per 1,000 households in LA County, but **6.6 electricians** per 1,000 households in the US.**

In 2023, LA County had
15K
electricians.

LA County needs a total of
22.2K
electricians to meet the national average benchmark.

LA County needs an additional
7.2K
electricians to fill this gap.

According to the Bureau of Labor Statistics (BLS), the electrician workforce in California is projected to grow by **18%** by 2030, however in the past 10 years, it has only grown by **1% in LA County.** [11]

*See Appendix Table 1.5 for detailed calculations.

***This shortage is not uniform across commercial and residential electricians. There are enough commercial electricians to meet demand from current union contracts, however, there is a shortage for non-unionized and residential work. In the long-term, however, the region will need to increase the workforce for both types of electricians to meet its ambitious electrification goals*

EVSE Maintenance Demand

EVSE technicians are crucial to the EV and EVSE workforce and will be in high demand as the EVSE landscape expands – though charger installation will decline once the infrastructure has been laid, **maintenance will be an ongoing, consistent need** moving forward. An EVSE technician would be **perpetually responsible for a set of chargers,** much like an IT technician is to computers. .

It is difficult to know the current total number of EVSE technicians because it is not a standardized occupation with a broadly used SOC or O*NET code. However, in 2024, there were approximately 100 jobs listed under "Electrical and Electronics Installers and Repairers, Transportation Equipment" (code 49-2093), which has previously been used for EVSE technicians.

One EVSE Tech can support ongoing maintenance of

200

chargers per year.

LA County will be able to support about

1,500

full-time, four-year EVSE maintenance jobs by 2028 based on charger installation need.

Special Context

Most charger maintenance calls and needs are not electrical and do not require an electrician.* According to industry data gathered by ChargerHelp!, more than **95% of maintenance calls they receive are not electrical,** but are instead software or bandwidth issues, or hardware issues such as overheated screens, insects, or other chip or motherboard replacement needs. Nonetheless, many electricians are still currently doing this work which is an inefficient use of electricians' time.

Businesses often have a **greater incentive to invest in the training and placement of EVSE technicians** as they are more affordable to hire than electricians.

As EVSE is an emerging and evolving industry with little standardized nomenclature and data, most EVSE technicians will be new to the workforce or transitioning from other technical industries. Whether these jobs are filled by electricians, who already face competing demands, or emerging EVSE technicians will depend **upon support for startups, standardization of training, and inclusion of EVSE technicians as an option in maintenance contracts** for newly installed public and privately-shared chargers.

**IBEW Local 11* strongly believes that any work involving line voltage on EVSE must be completed by a licensed electrician to ensure safety and quality.

See Appendix for details on additional assumptions and calculations.

EV Maintenance Demand

As more EVs enter the market and LA County implements policies to increase the uptake and share of electric vehicles, more auto service technicians and mechanics will need to learn how to operate on electric vehicles. Demand for EV technicians will be an ongoing need as LA County shifts to 100% electric.

Current EV-Certified Technicians

The most widely recognized training and certification programs in the automotive industry come from the **National Institute for Automotive Service Excellence (ASE)** – they offer a "Light Duty Hybrid/Electric Vehicle" certification, as well as two levels of an EV High-Voltage Electrical Safety certification.

Nationwide, in Spring 2024, there were:

824,400
Automotive Service Technicians and Mechanics[12]

~3,879
[0.5%]
Technicians with ASE-EV Certification[13]

In LA County, there are:

16,360
Automotive Service Technicians and Mechanics

80 - 460
Technicians with ASE-EV Certification*

**The low number of ASE-EV certified technicians in LA County is calculated based on the national ratio of ASE-EV certified technicians to total number of automotive technicians/mechanics [0.5%]. The high number is based on the ratio of EVs in LA County to those nationwide [12% of all US EVs are in LA County] and estimating that LA County would have a similar proportion of the nationwide ASE-EV certified mechanics.*

Demand for Reskilling Mechanics

To meet the projected 2028 EV maintenance needs for additional light-duty EVs (LDEVs), LA County needs:

4,400

additional Auto Service Technicians with ASE EV or equivalent certification**
(inclusive of the 660 needed to meet current demand)

To meet the projected 2028 electric bus maintenance needs, LA County needs an additional:

450

electric bus technicians***

***this analysis does not include demand for medium- and heavy-duty EV maintenance aside from electric buses. As of 2023, there were only 310 such vehicles in LA County.[14] Given this small EV fleet size and an anticipated slower EV adoption rate, there is likely minimal additional demand from these vehicles in the short-term through 2028*

**** see page 68 for more information on electric bus technicians*

EV Maintenance Demand

Demand for Reskilling Mechanics

EV maintenance can be seen as a specialty of the broader mechanic and technician occupation but is becoming an increasingly required skill for general mechanics as all vehicles implement more electric components and technology reliant on software. Due to increased innovation, EVs are also requiring less maintenance, meaning maintenance needs can be more easily met with widespread reskilling of the current workforce. Mechanics across age groups should be reskilled to ensure adaptability to the new automotive. In LA County:

58% of auto technicians [~9,500] are under 45 years old and will need retraining or upskilling to adapt and gain longevity in the increasingly EV-focused industry.

42% of technicians are 45+
Reskilling programs should be adapted and targeted for different age groups dependent on their comfort with varying forms of technology.

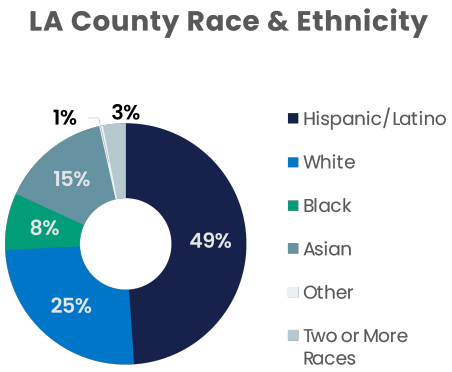
LA County Demographic Context

To contextualize the priority occupation data profiles and set benchmarks for industry representation, we must first set the context for the demographic makeup of LA County.

LA County is an extremely diverse county of nearly 10 million residents, but the county has strong disparities in educational attainment, income, and job access.[15]

Race + Ethnicity

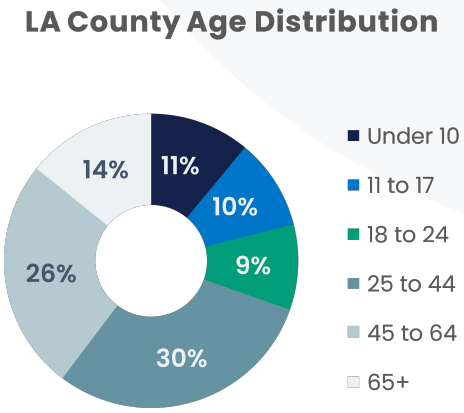
LA County is approximately 50% Hispanic or Latino identifying. Outside of the non-Hispanic or Latino residents, 25% identify as white, 8% identify as Black or African American, 15% identify as Asian, and 3% identify as two or more races.



LA County Demographic Context

Age

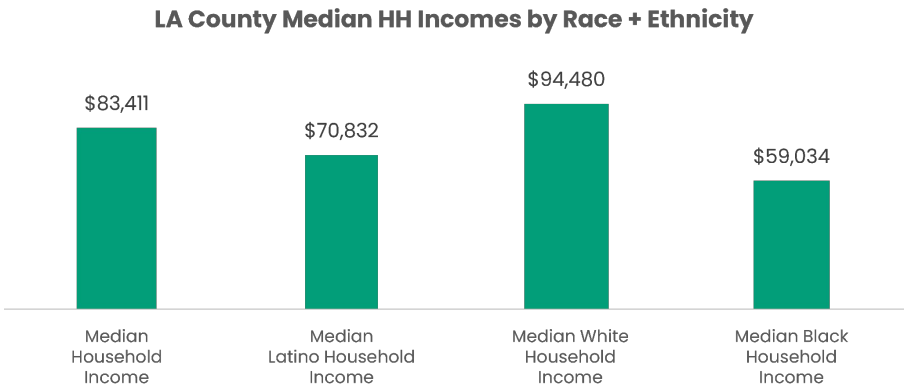
About 56% of LA County residents are between the ages of 25 and 64, and 65% of residents are of working age [18 – 65]. About one quarter of residents are late-career or nearing retirement age.



Median Household Income

The median household income for LA County was **$83,411** in 2022. However, the median income for Black and Latino households was significantly lower, at **$59,034** and **$70,832** respectively. The living wage in LA County varies by household composition, but for two working adults with one child – the average household – it is **$54,330 per working individual** or **$108,660 per household**.

	Wage Per Hour [per person]	**Wage Per Year*** [per person]
Minimum Wage in LA County	$16.00	**$33,300**
Living Wage [1 Adult, No Kids]	$26.63	**$55,390**
Living Wage [1 Working Adult, 1 Non-Working Adult, 1 Kid]	$43.61	**$90,710**
Living Wage [2 Working Adults, 1 Kid]	$26.12	**$54,330**
Living Wage [2 Working Adults, 2 Kids]	$33.24	**$69,139**

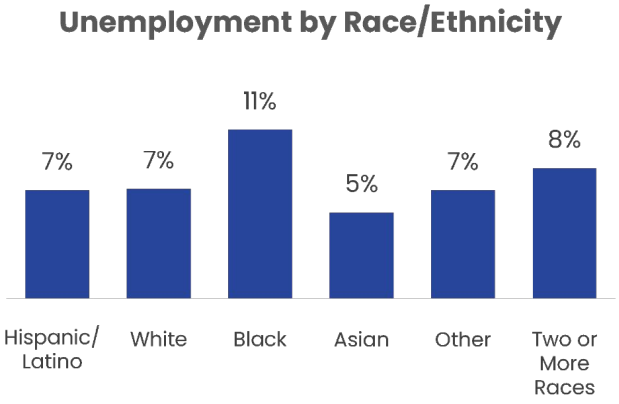


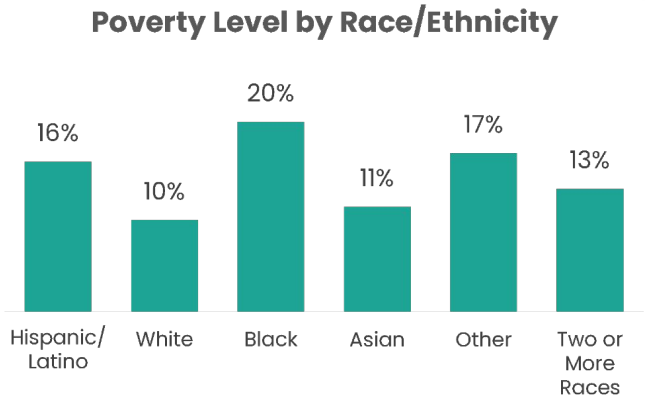
**This calculation is based on the MIT Living Wage Calculator wages per hour, per working individual in a household. The calculator assumes an individual is working full-time, or 2080 hours per year.*

LA County Demographic Context

Poverty & Unemployment

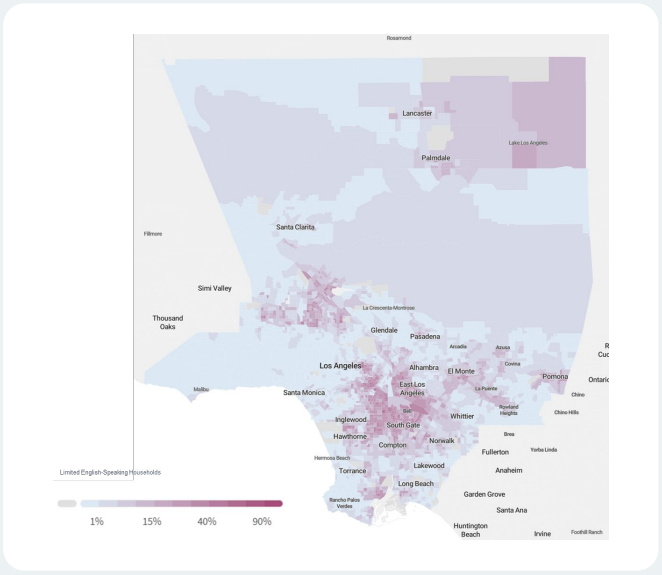
Unemployment rates are significantly higher for Black residents (11%) than white residents (7%), and poverty levels are twice as high. While Latino residents have unemployment rates comparable to white residents, they face substantially higher poverty levels (16% for Latino residents, vs. 10% for white residents).





Language Isolation

Among LA-County's Latino population, many residents live in households that speak limited English. Many areas in Central and East LA have 20-40% of Spanish-speaking households with limited English proficiency. This language isolation has strong implications for accessibility of job training and job placement. If trainings are not offered in the most prominent languages of an area, large swaths of the population will not be able to access them.



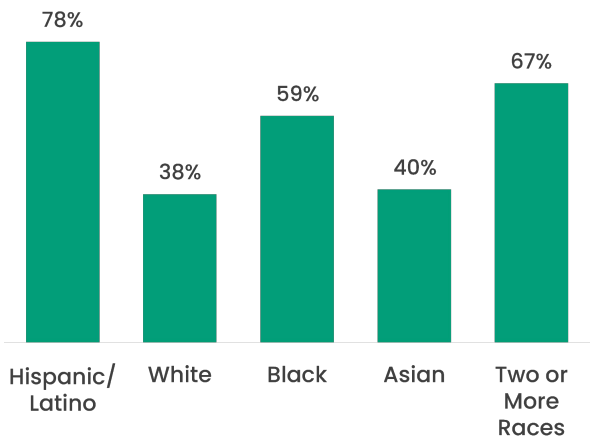
Limited English-Speaking Households for Spanish Speakers [2022]

Limited English-Speaking Households

LA County Demographic Context

Education

About 40% of LA County residents have a highest educational attainment of high school or less, and about 25% of the population has attended some college but does not have a four-year degree. Black and Latino residents are far more likely to have only a high school diploma (or less), compared to white and Asian residents.



Educational Attainment by Race/Ethnicity: High School or Less

ACS 2022 5-Year Estimates

Priority Occupations

Though the EV and EVSE industry will require an expansion of many occupations ranging from manufacturing and supply chains to operations and maintenance, we focused this research and the Roadmap on a few select occupations. To highlight the most critical gaps in the transportation electrification workforce, this section outlines the occupations that may need the greatest training intervention and provides summaries of key characteristics of each of these occupations.

Methodology: Occupational Characterization

Occupational data on EV and EVSE jobs is incomplete and difficult to track because this is an emerging industry.

Occupation and industry analyses are often completed using SOC and O*NET codes, however many EV and EVSE occupations are emerging and do not have unique SOC or O*NET codes. HR&A identified a series of relevant codes that align with many of these jobs [see Table 2.1 of the Appendix], however these codes encompass more than just occupations that focus on EV and EVSE jobs.

> Example: the SOC code for electricians [47-2111] will include electricians that specialize in residential building electrification and commercial buildings and any other electrical work, in addition to those who specialize in high-voltage work and EV charger installation.

For this needs assessment, data on the current EV and EVSE workforce is therefore supplemented with qualitative data from current employers and trainers from the GJRP Research Group and other relevant stakeholders. We surveyed Research Group members on their existing targets and EV and EVSE occupational priorities, and held one-on-one interviews, group discussions, and focus groups with employers, training providers, and trainees to ensure the data more accurately reflects current pay, educational requirements, skill demands, and other factors that are not currently being captured in the available quantitative data from the Bureau of Labor Statistics.

Prioritization Framework

We selected the priority occupations of focus in this assessment using previous LACI research, input from the GJRP Research Group, and a set of prioritization criteria to narrow the occupations from 47 to the top 5 area of focus for the GJRP and this report [see Appendix Table 2.2].

The six prioritization criteria included:

1. Occupation is **present in LA County**
2. Occupation is **in demand**
3. Occupation is **accessible** to workers without a Bachelor's degree
4. Occupation meets some of the definitions of '**good jobs**'
5. Occupation has a significant **gap in training**
6. Occupation has a notable **gap between the demand & the current workforce**

Priority Occupations

Priority Occupations

The priority positions that emerged from Research Group input and prioritization criteria are all present in LA County and were identified as top "in-demand" occupations by employers. All are also accessible without a four-year degree. Two additional occupations – fleet managers and production line workers – were included here because they were identified as relevant and important to the TEP occupational demand and goals. See the following occupational profiles on pages 36-42 for more information on each occupation.

1. Electricians

- Many union jobs that pay a living wage
- Significant gap in EVSE certifications and training
- Workforce does not meet current or future need

2. EVSE Technicians

- Gap in EV training among current mechanic workforce
- Strong opportunity for upskilling current workforce

3. EV Technicians

- Significant gap between demand and current workforce as the industry and occupation are both emerging

4. Fleet Managers

- Potential for high wages
- Serves as a good job to advance an EV or EVSE career pathway

5. Production Line Workers

- Labor agreements set job quality and access expectations as LA County expands manufacturing capabilities

Table 2.1 of the Appendix displays the related SOC codes that can be associated with each of the five priority occupations.

Supplementary Skill-Based Analysis

To supplement occupational data, we also conducted Skill-Based analyses using the primary EV skills included in Appendix Table 3.1. From this analysis, the top EV and EVSE occupations that emerged included:

1. **Maintenance and Repair Workers, General**
2. **Automotive Service Technicians and Mechanics**
3. **Electricians**

Priority Occupations

These top three occupations closely align with the priority job needs of this analysis – EVSE maintenance, EV maintenance, and EVSE installation – and provide additional confirmation for the selected priority occupations in conjunction with GJRP feedback, the prioritization criteria, and other SOC-based data analysis.

A full review of this skill-based analysis can be found on page 43.

Occupational Characteristics

To understand the occupational need for meeting transportation electrification goals, we must first understand the nature of these occupations, what the current workforce looks like, what skills are required, and the baseline that the workforce must grow from. These occupations are predominantly newer roles – or jobs that do not yet exist – in an emerging industry, so many do not yet have accurate data and are included in larger occupational categories. As a result, we do not have the level of nuance for EV and EVSE jobs that exists for most other occupations and are reliant on anecdotes from industry experts as supplementary information to build the following job profiles.

Summary of Occupational Characterization

Though most of these jobs are accessible without a college degree and require little to no experience, many jobs still require training or apprenticeships and years working in the trade before someone is qualified and ready for the workforce. These jobs also all require valid driver's licenses and access to reliable transportation which can pose a significant barrier for many prospective employees.

These jobs also generally pay a livable wage for an individual in a household with two working adults and one child, though many of them do not have sufficient wages for an individual supporting another non-working adult and a child. Wages are impacted by many factors – for example, residential work tends to pay lower wages than commercial work, and union-work pays higher wages and has more job protections than non-union work.

Despite the accessibility and decent pay of these jobs, most EV and EVSE priority occupations are still not reaching a representative population and are currently predominantly held by White, Hispanic or Latino men, while Black residents, Asian residents, and women are often left out of these occupations.

Occupational Characteristics

Accessibility Characteristics

Key: **LA County Data** | **Well Below Average** | **Well Above Average**

Education

Most EV and EVSE jobs require at most a high school diploma or equivalent, with some requiring specialized certifications or apprenticeships. Though the educational requirements for these jobs create fairly low barriers to entry, 20% of the LA County population does not have a high school diploma or equivalent and may still be unable to access positions in the EV and EVSE industry.

	Educational Requirements or Attainment
LA County	**40% of LA County residents age 25+ have at most a high school diploma.**
Electricians	High School Diploma or Equivalent
EVSE Techs	High School Diploma or Equivalent
Auto Techs/ Mechanics	Postsecondary nondegree award
Fleet Managers	High School Diploma or Equivalent
Production Line Workers	High School Diploma or Equivalent

Training + Experience

Most EV and EVSE jobs do not require previous experience and provide on-the-job training, largely because these jobs are trades and skill-based. Fleet managers are the only occupation that does require a few years of experience, and therefore may be an ideal job for someone further along in their career or transitioning into this field. Workers with electrical experience are more easily trained for EVSE roles.[16]

	Experience + Training Requirements
Electricians	No Prior Experience + Apprenticeships
EVSE Techs	No Prior Experience + On-The-Job Training
Auto Techs/ Mechanics	No Prior Experience + Short-Term On-The-Job Training
Fleet Managers	5+ Years Experience + No On-The-Job Training
Production Line Workers	No Prior Experience + Moderate-Term On-The-Job Training

Occupational Characteristics

Workforce and Compensation Metrics

Key: **LA County Data** | **Well Below Average** | **Well Above Average**

Age

Nearly 25% of people working in most of the related EV & EVSE priority occupations, double the LA County average, could retire in the next decade. Reskilling to help current workers adapt to the shifting industry and training of new workers will both be necessary workforce strategies to meet the occupational demand of EV & EVSE jobs and counter attrition.

	% Nearing Retirement Age [55+]
LA County	**12%**
Electricians	24%
EVSE Techs	N/A
Auto Techs/ Mechanics	22%
Fleet Managers	27%
Production Line Workers	38%

Pay

Average wages for these occupations vary but are generally near or above the LA County living wage for an individual in a household with 2 working adults and 1 child. Wages for EV & EVSE jobs are not sufficient for an individual supporting another non-working adult and a child, however.

	Average Pay per Hour	Average Annual Pay
LA County Living Wage [2 working adults + 1 kid]	**$26.12**	**$54,330**
LA County Living Wage [1 working adult + 1 non-working adult + 1 kid]	**$43.61**	**$90,710**
Electricians*	$35.02	$72,846
EVSE Techs	$25.00 - $35.00**	$52,000 - $72,800
Auto Techs/ Mechanics	$26.48	$55,082
Fleet Managers	$48.82	$101,549
Production Line Workers	$19.88	$41,360

**Average pay varies between residential and commercial work, with residential workers earning nearly 33% less than commercial in other building trades.*[17]

***Not enough information to establish an occupational average. Job posting looked at for EVSE technician positions ranged between $25.00 and $35.00*

Occupational Characteristics

Workforce and Compensation Metrics

Key: **LA County Data** | **Well Below Average** | **Well Above Average**

Gender Identity

Women are heavily underrepresented in EV & EVSE jobs. The EV & EVSE industry needs to target outreach and address the barriers for women to enter the EV & EVSE field.

	% Women
LA County	**50%**
Electricians	2%
EVSE Techs*	N/A
Auto Techs/ Mechanics	2%
Fleet Managers	22%
Production Line Workers	54%

Race + Ethnicity

Black residents are broadly underrepresented in most building and automotive trades, while white residents are overrepresented. This pattern is also visible in the EV & EVSE installation and maintenance occupations in LA County.

	Hispanic or Latino	Black	Asian	White
LA County	**49%**	**8%**	**15%**	**25%**
Electricians	50%	4%	5%	37%
EVSE Techs	N/A	N/A	N/A	N/A
Auto Techs/ Mechanics	60%	3%	9%	24%
Fleet Managers	42%	7%	14%	34%
Production Line Workers	45%	5%	32%	18%

**EVSE technicians do not have sufficient data, but anecdotal conversations suggest similar gender, racial, and ethnic representation as the rest of the EV and EVSE sectors.*

Occupational Characteristics

Women, Black, and Asian residents are underrepresented in the trades encompassing EV and EVSE occupations (e.g. electricians, automotive technicians). There are many reasons for this skewed representation:

In the building trades, many of the disparities can trace back to a legacy of systemic racism and exclusion that has been examined by the EEOC[18] and has been documented in cities across the US.[19] These occupations historically passed through informal networks and affinity groups, and a general lack of exposure, outreach, and existing representation continue to make it difficult for Black residents and women to break into the trades, find their own communities, feel welcome, and even know about the occupations.[20] Targeted outreach to affinity groups and supporting networks for Black and female-identifying employees in this sector can help overcome some of these disparities in representation.

Many of these occupations are physically demanding and require significant time commitments to go through training and apprenticeship programs, meaning many women – and particularly women with children – may not have the time, financial resources, and childcare to take time away from other jobs to go through the training process.

Non-trade occupations like fleet managers and production line workers show different patterns in representation and may require different interventions than jobs in the building and auto trades.

Electricians

LA County has an overall shortage of electricians, particularly among residential electricians, and needs to rapidly grow its workforce with EVSE and high-voltage skills to meet the County's residential and commercial EV charger demand.

Context

EVITP certified Electricians are some of the most widely needed jobs for EVSE charger installation and are required for any high voltage system work. There are varying levels of electrician—electricians range from helpers and apprentices to journeymen to licensed electricians. Electricians working on EVSE may also have high voltage expertise and may seek EVITP certification to ensure specialized knowledge in electric vehicle infrastructure. Electricians can be seen as an accessible, well-paying position with a clear career pathway.

With the ongoing electrification of buildings and other fossil fuel-dependent sectors, the County will face competing demand for electricians outside of the EVSE industry, furthering the need to expand the workforce.

Occupational Characteristics

Job Description

EVITP certified electricians in the EVSE industry are responsible for charger installation and EVSE maintenance that involves electrical systems. EV charger installation is split between public and private installation – public chargers are Level 2 [up to 240V] or DCFC [400 – 1000V] chargers that involve larger public station installations, whereas most private installations are single-charger, Level 1 [120V] or Level 2 installations.[21] Residential electricians generally work on projects of up to 240V, and commercial electricians work on projects exceeding 240V.[22]

Commercial vs. Residential Electricians

Commercial and residential electricians have the same foundational trainings and certifications, but commercial work is often larger-scale and more complex, requiring more extensive training:

General/Commercial Electrician	Residential Electrician
• Require 8,000 hours of on-the-job experience and an exam[23] • Higher pay • Often high voltage work • Most union work is commercial	• Require 4,800 hours of on-the job experience and an exam[24] • Less complex work, lower pay • Often low voltage • Residential electrical work is usually non-union

Occupational Takeaways

LA County has about 15,000 electricians and needs 7,200 more to meet the national ratio of electricians to households.

Electricians will need special certifications such as high voltage for larger and commercial projects, and EVITP for publicly funded projects.

Electricians often require a valid driver's license, clean driving record, and access to transportation. They also need OSHA training and experience through apprenticeships and working as a journeyman electrician.

EVITP Certification

The State of CA requires many publicly funded chargers to be installed by Electric Vehicle Infrastructure Training Program (EVITP) certified electricians – EVSE funded by the California Energy Commission (CEC) or the California Air Resources Board must be installed by a contractor with proper licensing and at least one electrician on the crew must be EVITP certified. If projects install ports with 25kw or more, at least 25% of the electricians on the crew must be EVITP certified.[25] In LA County, there are currently about 72 contractors who employ EVITP certified electricians, and 278 statewide.[26]

EVSE Technicians

EVSE Technicians are a new and accessible occupation primarily responsible for the operation and maintenance of EV chargers and other support equipment. EVSE technicians generally do not have electrical licenses and do not install chargers.

Context

EVSE Technicians do not have to be licensed electricians and can be hired independently of electricians to work only on non-electrical maintenance. Though some companies hire electricians to do all EVSE maintenance, electricians require more extensive training, are more expensive, and are in demand from other industries. Additionally, over 95% of maintenance touchpoints with charger stations are not electrical,[27] so EVSE technicians can be deployed to solve most issues including software malfunctions, bandwidth issues, or hardware issues such as overheated screens, weather damage, insect damage, or faulty chips.

Job Description

EVSE Technicians are responsible for inspecting and maintaining EV charging stations and other EVSE. Because EVSE technicians are a new and emerging occupation, few people come in with prior direct experience, so most employers will provide specialized training and are looking for candidates with transferable technical skills and prior electrical experience.

Occupational Takeaways

EVSE technician employers look for transferable skills and soft skills, but the occupation is not old enough to require pre-existing EVSE skills and will continue evolving.

EVSE technicians need basic digital literacy to maintain chargers and must have access to reliable transportation to visit each charging station.

Many technician jobs pay a living wage for families with 2 working adults but may not be able to support a single adult with dependents.

Training Takeaways

EVSE technicians must undergo basic training, as well as required manufacturer-specific trainings for each type of charging station. EVSE roles will likely need to train beyond the charger itself, such as connection to the vehicle.

Current training needs are manufacturer driven. EVSE trainers desire standardization of training around baseline knowledge that can transfer across EVSE models.

Workers with some electrical experience are most easily trained for EVSE roles.

EV Technicians

The EV industry is still nascent, meaning few automotive technicians have EV knowledge, creating a large reskilling opportunity for current workers.

Context

Electric Vehicle Technicians are not yet defined separately from traditional automotive mechanics and technicians (automotive technicians) in data, and today, many standard technicians are required to gain EV technology skills because an increasing number of vehicles on the road are EVs, hybrids, or contain electrified parts. Though the number of overall technicians has been declining and the amount of maintenance needed for EVs is lower than ICE vehicles, demand for technicians with EV expertise is growing, providing an opportunity to reskill much of the workforce.

Job Description

There are two primary types of EV Technician:

1. Technicians who build or retrofit (which can often be considered a production line worker)
2. Technicians who **fix and maintain**

EV-building technicians need deep knowledge of the vehicle from front to back and are more successful if they have an existing background in mechanical training. Ideal candidates have training in diesel and auto work, a few years of field experience, and a willingness to learn a new technology.[28] Employers seek candidates with previous mechanic or auto technician experience because it is easier to retrain or upskill.

Occupational Takeaways

There are ~16,400 Auto Technicians in LA County, declining by ~2% annually.[29]

New electric cars require less maintenance, reducing the need for auto mechanics.

LA County has enough standard mechanics to meet the EV need, but the current workforce needs reskilling for specialized EV training and certifications.

Training Takeaways

About 58% of the workforce, or ~9,500 workers, are under age 45, far from retirement, and may be well suited for upskilling.

Many small auto repair shops employ undocumented workers, creating challenges for training programs reliant on federal funds.[30, 31]

Existing training programs are equipped to teach about EVs, but new trainees lack hands-on experience and need a few years in the field to be fully trained.

Fleet Managers

Fleet Managers are an important operations and maintenance occupation in the EV and EVSE industries and will need to be equipped with specialized training to manage the differences between internal combustion engine vehicles and EVs.

Context

Fleet Managers guide the adoption of EVs, determine when vehicles need to be taken off the road for charging or maintenance, and help drive demand for light, medium, and heavy-duty EVs. This position generally does not require a higher education degree, however it often requires five or more years of experience and is not an entry-level position. Fleet manager can be seen as an accessible, well-paying position further in an EV or EVSE industry career pathway.

Job Description

Fleet Managers are responsible for overseeing EV fleets, ranging from determining how many EVs a given company or public agency needs to serve its users, to ensuring the EV fleets and EVSE are safe and well maintained. Fleet managers are also often categorized as transportation managers or logistics managers. EVSE and EV technician skills are also often considered parts of a fleet manager's duties.[32]

Skills + Accessibility

Whereas most other priority EV & EVSE occupations are more physically demanding and do not require a college degree, fleet management requires a few years of experience, and management skillsets. Many employers also prefer a candidate with a college education.

Other Occupations of Interest

GJRP Research Group members, identified additional occupations that may not fit the prioritization criteria directly, but will play a prominent role in transportation electrification. Though these occupations were not fully analyzed, they contain skillsets that are more widely needed within the priority occupations and were included in the subsequent skill-based analysis.

Software Developers

- Often prefer a college degree, but is not required
- High-paying position
- Significant recent industry growth
- Software is core to developing, updating, and maintaining EV and EVSE technologies

Battery Technicians

- Often incorporated into EV technician roles
- Vital for safe high-voltage EV and EVSE battery management

CAD Modelers + Drafters

- Support roles for electrical designers and engineers
- Important to designing EV and EVSE grid connections and charger stations
- Entry level positions with specific technical skills that do not require a college degree

Production Line Workers

Production line workers are entry level jobs with few barriers to entry that will be necessary for all EV and EVSE manufacturing.

Context

LA County needs specific manufacturers to continue to grow in the field and create the jobs for which people are being trained. Labor agreements are also essential to deliver quality jobs. LA County and its neighboring cities have around 19 ZEV or ZEV-related manufacturers[33]–many related to electric trucks, buses, and EV chargers[34] -and may see an increase in micro-EV manufacturing and battery production positions in the coming years.[35,36] Production line jobs, while overall declining and, in many cases, paying less than LA County's living wage, require little to no education or experience, employ many women (over 50%), and provide on-the-job training.

Job Description

EV and EVSE production line workers play varying roles in the manufacturing process but can include assembling and testing electrical components for EV chargers or actual electric vehicles. Workers must operate under safety compliance and have the physical ability to use power tools and work with electrical systems. Employers prefer someone with a high school diploma or equivalent, as well as someone who has attended vocational training.

Occupational Takeaways

Production Line jobs for EV and EVSE technology have low educational and training barriers to entry.

Manufacturing and Production jobs require physical ability and capacity to use power tools and other machinery.

Production Line jobs are generally low-wage jobs, paying less than living wage for the average LA County resident.

Industry Drivers

Labor agreements drive quality jobs for the manufacturing sector and can increase wages, inclusion, and training opportunities for production line workers. This is seen in the Build Your Dreams (BYD) + Jobs to Move America (JMA) partnership to hire from populations facing barriers to employment and providing other support for workers.[37]

While manufacturing jobs are decreasing in LA County and motor vehicle manufacturing is growing more dispersed across the country,[38] areas surrounding LA County may soon see an increase in EV-related manufacturing.

Skill-Based Analysis

Most EV and EVSE occupations and their associated career pathways are constantly evolving as the industry grows. Job training will need to be primarily skill-based and industry-driven, rather than based on occupational titles, to cater to an adapting market. To further guide the current and future EV and EVSE job training needs, we compiled the most common and relevant skills associated with the current EV and EVSE job postings. The following section summarizes the skills required for the top three job categories for EV and EVSE jobs in LA County––EVSE maintenance, EV maintenance, and Electricians. Because EV and EVSE roles lack standardized job titles, skills were analyzed across all roles combined.

Methodology: Skill-Based Analysis

To determine the most requested skillsets for job postings in the emerging EV and EVSE job market, we analyzed all LA County job postings from 2023 – 2024 that included any "Electric Vehicle" related skills in Lightcast, as well as any relevant EV and EVSE skills from the platform's "green skills" library. The skills inputs include the following [see Appendix Table 3.2]:

- **Specialized Skills** – EV Repair, EV installation, Service + Repair of Electric and Hybrid Vehicles, High Voltage, Battery Pack, and more
- **Qualifications** – EVITP, IMI Accreditation Electric Vehicle Technician, Awards in Service and Repair of EVs, and more

Lightcast includes 17 different specialized skills and qualifications related to electric vehicles, in addition to "battery" skills and "high voltage" skills for electricians. We also filtered for positions that require less than a Bachelor's degree [associate's degree, high school diploma or equivalent, or list no education requirements] to highlight the most accessible occupations available.

Finally, occupations were filtered out if they lacked direct relevance to EV and EVSE production, maintenance, and installation. Excluded occupations include: Janitors and cleaners, locksmiths, parking attendants, nurses, drivers, and other jobs [see appendix Table 3.2]. The resulting data included all specialized skills, common skills, and qualifications associated with those job postings.

Summary of Skills Analysis

Primary Occupations of EV Skills

From the EV, battery, and high voltage skills used in this analysis, the top three EV and EVSE occupations that emerge in job postings in LA County closely align with the priority job needs from this analysis: EVSE maintenance, EV maintenance, and EVSE installation. The job postings included:

TOP 3

1. Maintenance and Repair Workers, General
2. Automotive Service Technicians and Mechanics
3. Electricians

OTHER EV & EVSE Occupations:

4. Electrical and Electronic Engineering Technologists and Technicians
5. First-Line Supervisors of Mechanics, Installers, and Repairers
6. General and Operations Managers
7. Electrical Engineers
8. Mobile Heavy Equipment Mechanics, Except Engines
9. Software Developers

Primary Skills of Interest

To ensure trainees are prepared and employable when entering the EV and EVSE workforce, training programs and employers should prioritize training for the most frequently requested skillsets and qualifications in the industry.

Specialized Skills

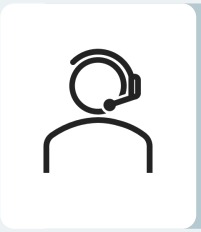
The **specialized skills** in high demand among EV, EVSE, and Electrician occupations in LA County include:

- Electric Vehicle Skills
- Electric Vehicle Installation
- Field Service Management
- OSHA and other safety standard trainings
- High Voltage Systems
- Electromechanics and Electrical Systems
- Electrical Wiring and Electrical Equipment
- Low Voltage Hand Tools

Specialized skills are generally the focus of traditional training programs and apprenticeships, ensuring trainees receive industry-specific skillsets. These trainings, however, should be as hands-on as possible.

Common Skills

The common skills in high demand among EV, EVSE, and Electrician occupations in LA County include:



- Communication
- Customer service
- Operations
- Management
- Problem Solving/Troubleshooting
- Physical Lifting Ability
- Good Driving Record
- Computer Literacy

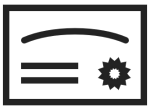
Common and soft skills can be difficult to train but are vital to success and eligibility in this industry. Soft skills such as communication, customer service, and problem solving can be nurtured and should be incorporated into all training programs, but some employers do not think these skills are currently taught well.

Computer literacy is an increasingly important skill to train prospective employees in, particularly for adults who are transitioning into the industry and may not have received prior computer and software training in school.

Physical lifting ability is a commonly requested "skill" or requirement that can be a powerful barrier to people wishing to enter the workforce. The manual labor of EV and EVSE maintenance and installation requires a baseline ability to lift and work in harsh weather conditions, something difficult for older and less able-bodied individuals.

Qualifications

The qualifications in high demand among EV, EVSE, and Electrician occupations in LA County include:



- Valid Driver's License
- Automotive Service Excellence (ASE) Certification
- Electric Vehicle Infrastructure Training Program (EVITP) certification
- Commercial Driver's Licenses (Class C or A)
- CPR Certification
- Forklift Certification

Certifications

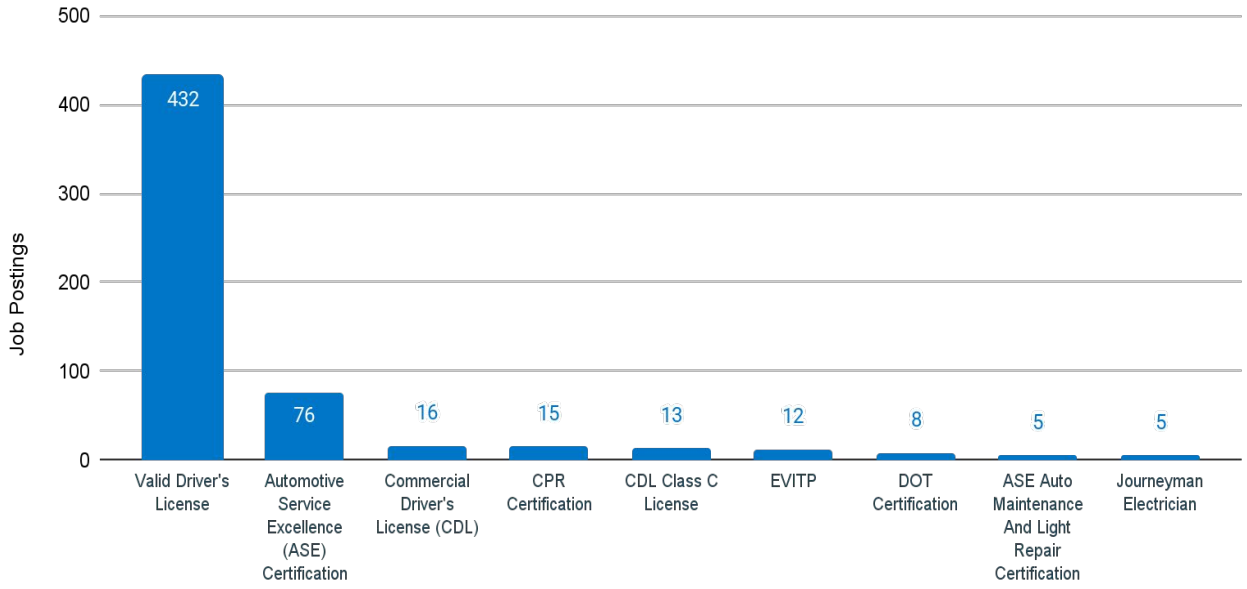
Certifications including **ASE and EVITP** can be obtained via training programs and an online exam. EVITP training is also available online, however EV and EVSE training programs should offer hands-on training to ensure trainees are prepared for the workforce and employable after passing their certification exams. EVITP certification costs $275, takes about 20 hours to complete, and is valid for 3 years.[39] EVITP training is only open to journeymen level electricians. Training partners have also noted there are limited in-person training opportunities for these training programs. The costs and time commitment can be prohibitive for many people interested in the certification, as is access to a computer or transportation to an in-person training site. SAE International also has a new EVSE Technician Certification that requires promotion and increased adoption to ensure it becomes an industry-recognized certification standard.[40]

Driver's Licenses

The most commonly requested qualification is having a **valid driver's license.** Employers require a valid driver's license to ensure employees can get to the charger station sites, however access to a driver's license can be a barrier to entry for many potential employees. Training programs can explore supporting trainees with obtaining a driver's license, and can help trainees obtain a commercial drivers license (CDL), however access to a license and transportation is often a barrier to even attending a training program.

Employers also frequently request a **clean driving record** and **access to a vehicle,** which serve as additional barriers to entry for many. Driving records are difficult to "clean," but to aid in this process, drivers can take defensive driving courses to remove points from one's license. Many people with a license and clean record also do not have reliable access to a vehicle, with 8.7% of county households living without a working vehicle.[41]

Top Qualifications for EV and EVSE Job Postings [2023 - 2024]



Gap Discussion and Takeaways

LA County will need a significant training and re-training push to ensure the workforce has the specialized knowledge and certifications to meet the EV and EVSE maintenance and installation need. The existing workforce of electricians and automotive technicians may be able to fill much of the immediate demand with rapid retraining for specialized EV and EVSE skills that expand on their current experience. However, long-term stability for the EV and EVSE workforce and ability to hit goals around EV adoption and charger installation, hinge on creating a pipeline of new entrants with the skills necessary to fill ever emerging and evolving occupations.

To achieve LA County's transportation electrification goals by 2028, the county will need to invest in and expand its EV and EVSE training landscape and increase the employment opportunities in the sector rapidly. Training will need to cater to two groups of potential employees:

1. **Those who are newly entering the workforce**
2. **Those who are transitioning from related industries but will require re-skilling**

EV Maintenance Gaps

Though LA County likely has enough automotive technicians and mechanics to maintain the current EVs on the road, the EV market is rapidly growing and will require scaling up for the EV technician workforce. Additionally, the CEC is developing reliability standards for publicly funded EVSE. Currently, program requirements for publicly funded EVSE programs, including the National Electric Vehicle Investment (NEVI) Formula program, require 97% uptime, underscoring a demonstrated need for preventative and corrective maintenance.

1.7 M

additional private EVs are projected to be on LA County roads by 2028*

16,360

existing mechanics will need retraining in EV systems to adapt to the new market

4.4K

technicians will need the ASE's EV certification or an equivalent to maintain EVs per ASE-EV certified technician ratios**

450

additional bus technicians will be needed to meet bus electrification targets

New Trainees

People who are entirely new to the workforce or new to any automotive technician and mechanic occupations will require initial, basic training in mechanics, in addition to learning the new automotive software and technology that is specific to EVs. These trainees will also need a few years of on-the-job, hands-on training to gain field experience to become a fully trained mechanic.

**see Appendix table 1.4*
***see Appendix table 1.7*

Re-Trainees

58% of the automotive service industry is under 45 years old (about 9,500 mechanics) and will likely need retraining to adapt to the electrifying industry. The current workforce is large enough to meet the county's EV maintenance needs if they are all retrained in new software and EV technologies, which requires less time and resources than training someone from scratch.

EVSE Installation Gaps

To meet its 2028 goals for public and private charger installation, LA County will need:

1.35K

electricians with EVSE installation expertise

260

full time electrician jobs through 2028 to meet demand for public chargers*

1K

full time jobs through 2028 to meet demand for private household Level 2 EV chargers

**electricians are one of many jobs necessary for public charger installation. When accounting for other occupations such as contractors, planners, and other supportive occupations, public charger installation will require about 1,230 full time, 4-year jobs.*

Residential Charger Installation

There is currently a lack of knowledge and data around residential, private EV charger installation, however private household EV chargers may account for the biggest installation need. These jobs may also be increasingly difficult to fill due to the lower wages, fewer benefits, and more limited job security for electricians and technicians working in the residential building trades.

Electrician Gap

The county needs an additional **7,200 electricians** to meet the national average ratio of **6.6 electricians per 1,000 households.** While the electrician workforce is projected to grow by 18% by 2030, it has only grown by 1% in the past 10 years. The County will need to implement targeted training programs and increased employment opportunities to facilitate this growth and ensure the workforce can meet the growing EVSE demand.

In addition to the current electrician shortage, **charger installation** needs will continue to increase demand for more electricians. This demand is then compounded by **competing demands for electricians as every other sector rapidly electrifies.**

EVSE Maintenance Gaps

There are currently no accurate estimates of the current EVSE technician workforce, though there could be as few as 100 existing EVSE technicians in LA County. To meet its 2028 goals for public and private charger installation, LA County will need:

1.5K | full time, ongoing EVSE maintenance jobs to maintain all public and private chargers

New Trainees

Most people entering the EVSE maintenance field require industry specific training because the occupation is new and each EVSE model requires training specific to the manufacturer. People entirely new to a maintenance job will also require baseline safety trainings and certifications.

Re-Trainees

Though all entering this industry will require baseline charger maintenance trainings and manufacturer-specific trainings, people who are transitioning from a similar maintenance position in another industry are preferred because they will already have basic mechanical skills and desired transferrable, common skills.

Additional Takeaways

Beyond the quantitative workforce training and certification needs to meet targets for LA County's workforce by 2028, engagement with data and the GJRP Research group has highlighted the imperfect and speculative nature of EV and EVSE industry data.

To improve data collection and tracking of the industry's needs and growth, the industry needs:

1. **Shared language and definitions for the EV and EVSE occupations**
   a. Is an EVSE-specializing electrician simply a charger installer? Do they play other roles? Is an EVSE technician the same as a charger technician? A battery technician?
   b. Do EV technicians require ASE-EV certification? What should a non-certified technician be allowed to work on?
   c. Do electricians doing EVSE installation require EVITP certification? What can a non-certified electrician or technician do?

2. **A unique and recognized set of SOC or O*NET codes specific to EV and EVSE occupations**
   a. Data is imperfect because these jobs are currently wrapped into much larger codes that incorporate a wide range of unrelated occupations

3. **Standardized training** to ensure trainees are equally prepared for the workforce and to ease the burden on employers to retrain or provide added on-the-job training specific to various EVSE or EV manufacturers

These industry needs will continue to be explored by the GJRP. In the next section, we will explore the current EV and EVSE training landscape in LA County.

Training Landscape

Introduction

As established in the Workforce Needs Assessment, meeting goals established for LA County's transportation electrification is going to require increasing the supply of skilled workers. The projected demand for priority occupations exceeds the current workforce, indicating a need to both train new workers and upskill or reskill existing workers. In some cases, this will require creating new training programs for emerging occupations.

Los Angeles County has a rich landscape of workforce development partners, including community colleges, trade unions, nonprofits, adult education schools, private sector companies, and more. Many of these training partners already have programs dedicated to priority occupations, and many more have training programs that could be adapted to incorporate EV and EVSE content (for instance, auto mechanic programs that could be adapted to cover electric vehicles).

This Training Landscape maps existing programs for priority occupations in transportation electrification (EV and EVSE), and identifies gaps based on the projected demand in the Workforce Needs Assessment.

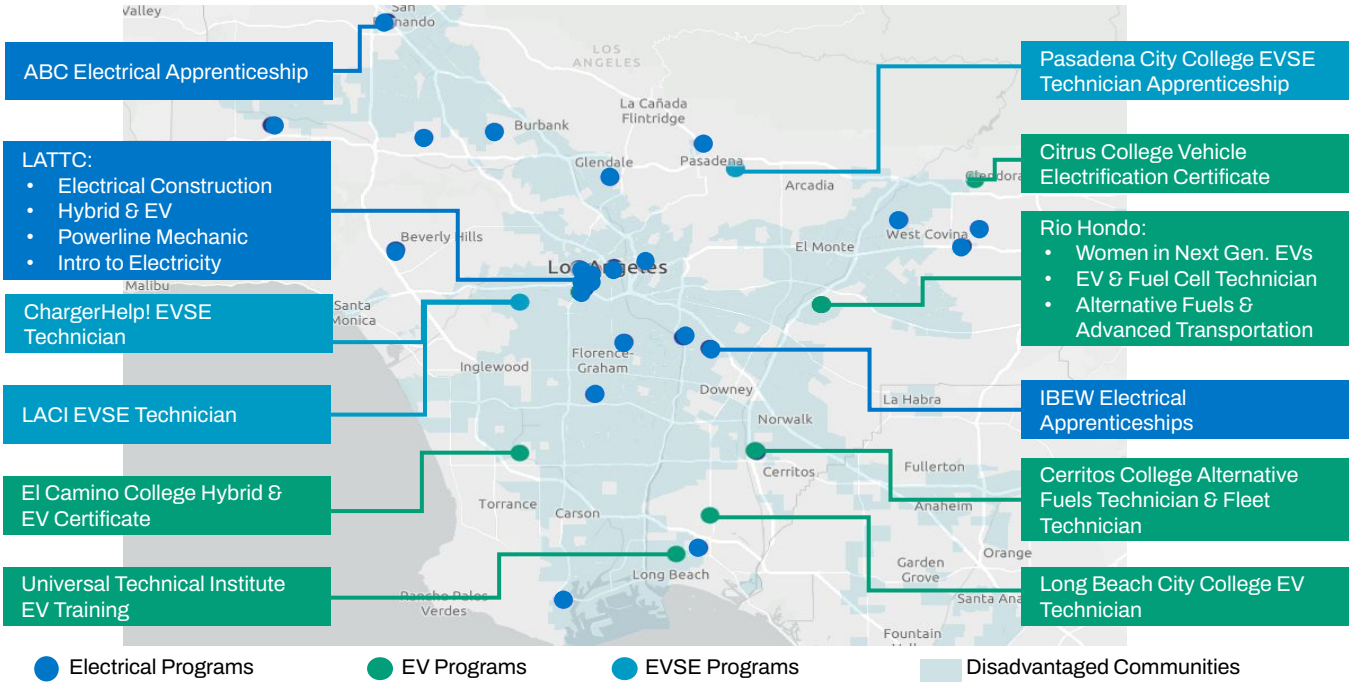
Current Training Landscape

To understand the current landscape of EV and EVSE training programs in LA County, we conducted a survey of GJRP members (many of whom either run training programs, hire workers from training programs, or direct community members into training programs) supplemented by an extensive review of online resources listing workforce training programs.

One thing was clear: there is not a single, dedicated source for information on EV and EVSE training programs in the county. This is in part an artifact of how most people look for information about jobs or training programs – people are more likely to look for information on a job title they have heard about (e.g., auto mechanic), rather than an entire industry (EV and EVSE). Some of it is also a result of EV and EVSE being an emerging industry that many people are less familiar with. Regardless of the reason, EV and EVSE occupations are only going to grow in the coming years, and creating a well-publicized database of training programs can help direct county residents into well-paying occupations in a growing industry.

Training Landscape

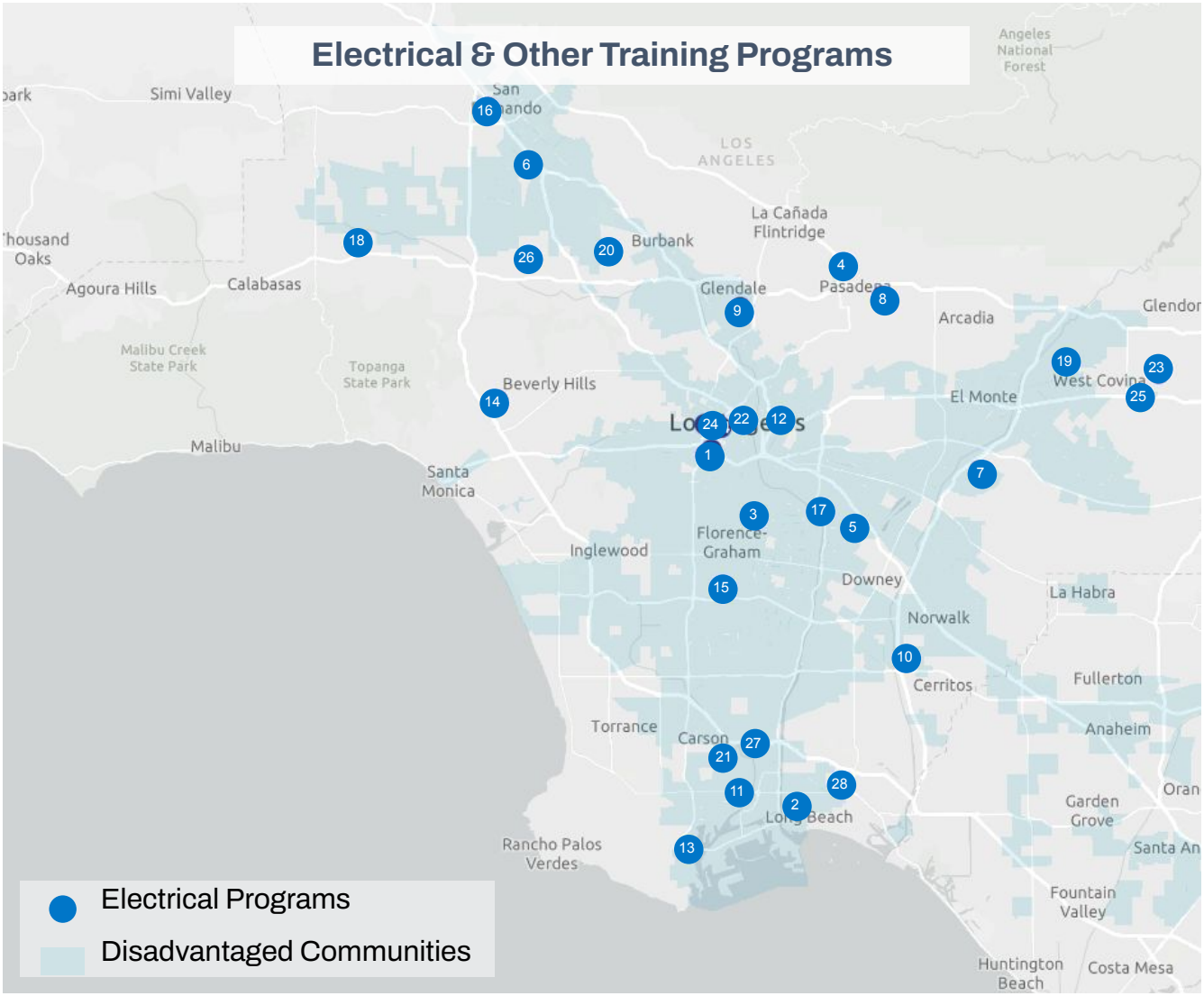
The information that follows includes **all dedicated training programs for EV and EVSE priority occupations,** including certificate programs, apprenticeships, and more. It does not include on-the-job training provided by an employer – while an incredibly important part of the workforce development landscape, this type of training serves a distinct purpose from formal programs and is not widely accessible for workers looking to enter the field for the first time. Additionally, four-year degree programs are not included, as jobs that require a four-year degree do not meet the accessibility standards laid out in the Needs Assessment.Note that this landscape analysis tracks the number and location of programs, but does not include an analysis of program quality or outcomes.



Disadvantaged Communities based on CalEnviroScreen 4.0

Electrical Programs

The primary electrician training program in LA County is run through IBEW-NECA, supplemented by programs from Associated Builders and Contractors (ABC), the Los Angeles Trade Technical College, LAUSD's Division of Adult and Career Education, and other school districts and community colleges across the County. Programs included below represent a wide-variety of electrician training programs that offer Whole and Partial General Electrician and Residential Electrician curriculums and are approved by the State of California Department of Industrial Relations.



Disadvantaged Communities based on CalEnviroScreen 4.0

1	Los Angeles Trade Technical College	15	Maxine Waters Employment Preparation Center
2	Long Beach City College	16	North Valley Occupational Center
3	UEI College	17	Slawson Southeast Occupational Center
4	Capstone College	18	West Valley Occupational Center
5	IBEW-NECA Electrical Training Center	19	Baldwin Park Adult Education Center
6	ABC	20	Burbank Adult School
7	Rio Hondo Community College	21	Bassett Adult School
8	Pasadena City College	22	El Monte Rosemead Adult School
9	Glendale Community College	23	Tri-Community Adult Education
10	Cerritos Community College	24	California Electrical Training, Inc
11	Abram Friedman Occupational Center	25	Intercoast College West Covina
12	East Los Angeles Occupational Center	26	Intercoast College Burbank
13	Harbor Occupational Center	27	Intercoast College Carson
14	Los Angeles Technology Center	28	National Lighting Contractors Association of America

Electrical Training Gaps and Challenges

Unlike other EV and EVSE occupations, electricians are a well-established trade with several apprenticeship programs throughout the County. Even so, current programs are not operating at a large enough scale to meet projected demand: IBEW-NECA and ABC combined graduate an average of 300-400 apprentices a year, compared to our projected demand of approximately 1,260 new electricians by 2028 in the county – and as demand for electrification grows, this number will only increase.* LATTC also offers several valuable programs, but they do not fill the gap between current apprenticeship numbers and demand for electricians.

In addition to training new electricians, LA County will need to dramatically scale the number of electricians who receive additional training on high voltage and other specialized skills. The Electric Vehicle Infrastructure Training Program (EVITP) provides this training, which is required for publicly funded charger installation.

Los Angeles County Electrical Training Programs

IBEW Apprenticeship	A state & federally recognized apprenticeship program, IBEW and NECA provides (separate) trainings for both outside lineman and inside lineman. For EVSE installation, inside lineman are required.
Associated Builders and Contractors Electrician Apprenticeship	A state & federally recognized apprenticeship program focused on inside electrical systems.
Electric Vehicle Infrastructure Training Program (EVITP)	*[Training for existing Journey-level Electricians]* The EVITP certification offers comprehensive training for electricians on installation of EVSE equipment.
LATTC Electrical Construction & Maintenance (Certificate or A.S.)	Program provides knowledge and skills for a career in Electrical Systems, including maintenance, troubleshooting, and commissioning of EVSE. Courses cover electrical theory, electrical controls, conduit installation, blueprints, low voltage systems, maintenance practices, equipment installation, and more.
LATTC Powerline Mechanic (Certificate or A.S.)	Program prepares individuals to obtain entry-level positions in the utility sector, particularly transmission and distribution occupations.
LATTC Introduction to Electricity Program	This free self-paced online course introduces basic electrical concepts including charge, voltage, current, energy and power. Introduction to Electricity is equivalent to the Hayden course, which is required to obtain electrical jobs with the City of Los Angeles or LADWP.

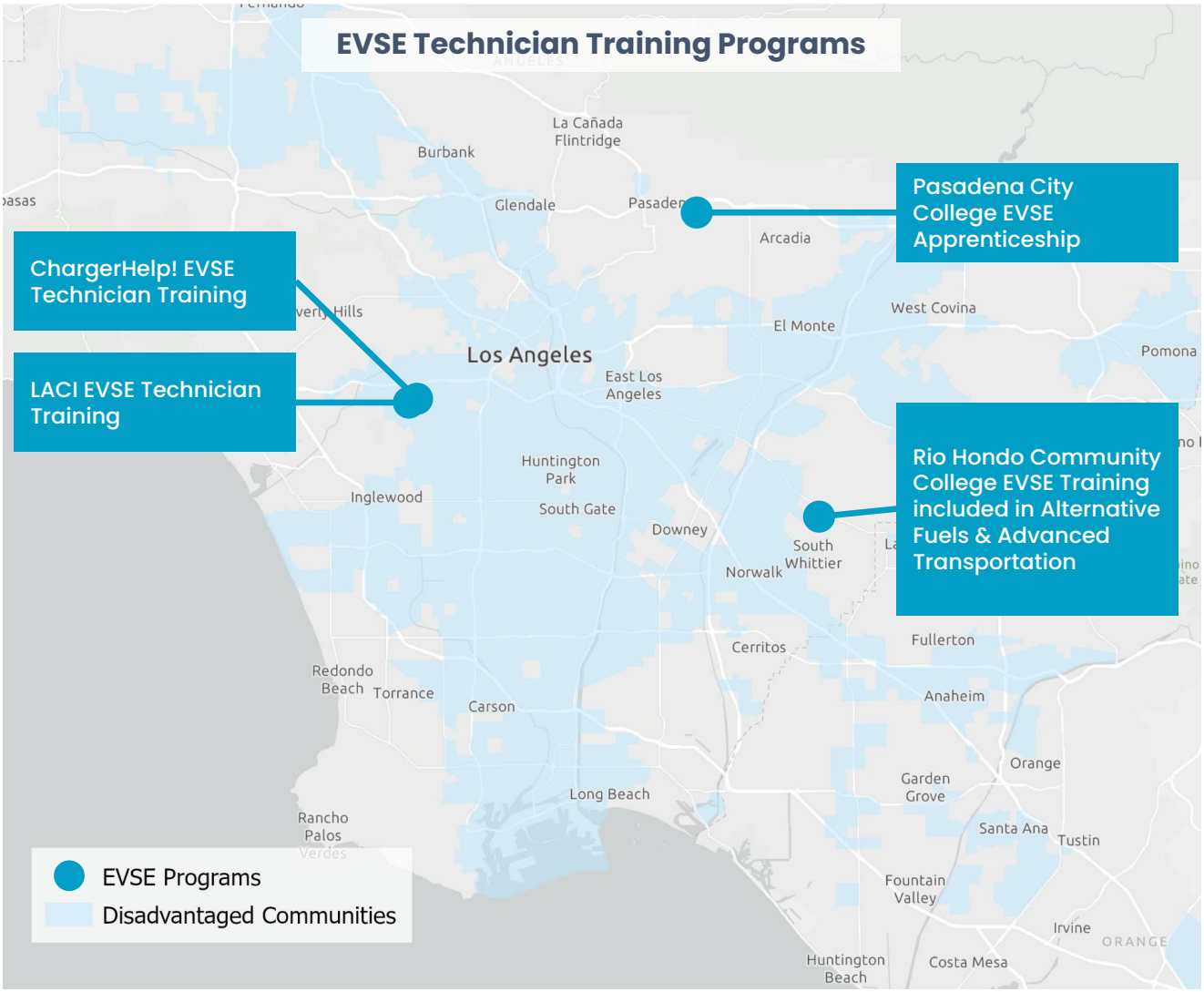
**This range is based on the annual new positions that would be needed to meet the demand from COE (see page 18) or HR&A's demand projection, including EVSE installation demand and rectifying the current shortage of electricians (see page 23).*

Additional Los Angeles County Electrical Training Programs

Type	Description	Programs
Additional Community Colleges	Community College programs are typically designed to meet the training requirements for electricians who have not yet passed the Electrical Certification test, and prepare students to pass that test. Enrolled students are legally allowed to work in California.	• Long Beach City College • Rio Hondo Community College • Pasadena City College • Glendale Community College • Cerritos Community College
Adult Education Schools	Adult Education programs provide Career and Technical Education (CTE) for adults, often at no or low cost. Electrician programs typically provide skills necessary to become a residential electrician or electrical technician, offering coursework in workplace safety, basic trade math and electrical concepts, circuits, and wiring.	• Abram Friedman Occupational Center • East Los Angeles Occupational Center • Harbor Occupational Center • Los Angeles Technology Center • Maxine Waters Employment Preparation Center • North Valley Occupational Center • Slawson Southeast Occupational Center • West Valley Occupational Center • Baldwin Park Adult Education Center • Burbank Adult School • Bassett Adult School • El Monte Rosemead Adult School • Tri-Community Adult Education
Other	In addition to community colleges and adult education programs, several additional partners offer electrical training programs – including for-profit training providers like Intercoast College and employer associations like NLCAA.	• California Electrical Training Inc. • Intercoast College West Covina • intercoast College Burbank • Intercoast College Carson • National Lighting Contractors Association of America (NLCAA) • UEI College • Capstone College

EVSE Technician Training Programs

EVSE Technicians are responsible for the diagnosis and repair of non-electrical problems on EV Chargers, which make up more than 95% of charger errors. EVSE Technician programs are in short supply: only four exist across LA County, limiting geographic coverage and proximity to disadvantaged communities. Some employers may offer on-the-job training, but these positions tend to require a baseline of experience that makes them less accessible to workers looking to enter the EVSE workforce for the first time. Successful programs from LACI and ChargerHelp! should be scaled across the county to meet demand.



Disadvantaged Communities based on CalEnviroScreen 4.0

EVSE Training Gaps and Challenges

LACI and ChargerHelp! have created best-in-class programs that combine industry expertise, safety certifications, and hands-on experience. To reach the target of 1,500 technicians, these programs will need to scale across the county. Workforce development boards, America's Job Center of California (AJCC), community colleges, other workforce agencies, and industry partners can all play a role in expanding these trainings.

One clear challenge with EVSE training programs is the lack of standardization across manufacturers. Program participants receive basic training applicable to all or most chargers, but after completing basic training students must still receive manufacturer-specific training before they can work on that company's chargers. Increasing the standardization across manufacturers would also increase the efficiency of training programs, allowing workers to quickly be trained to work on a wide variety of chargers.

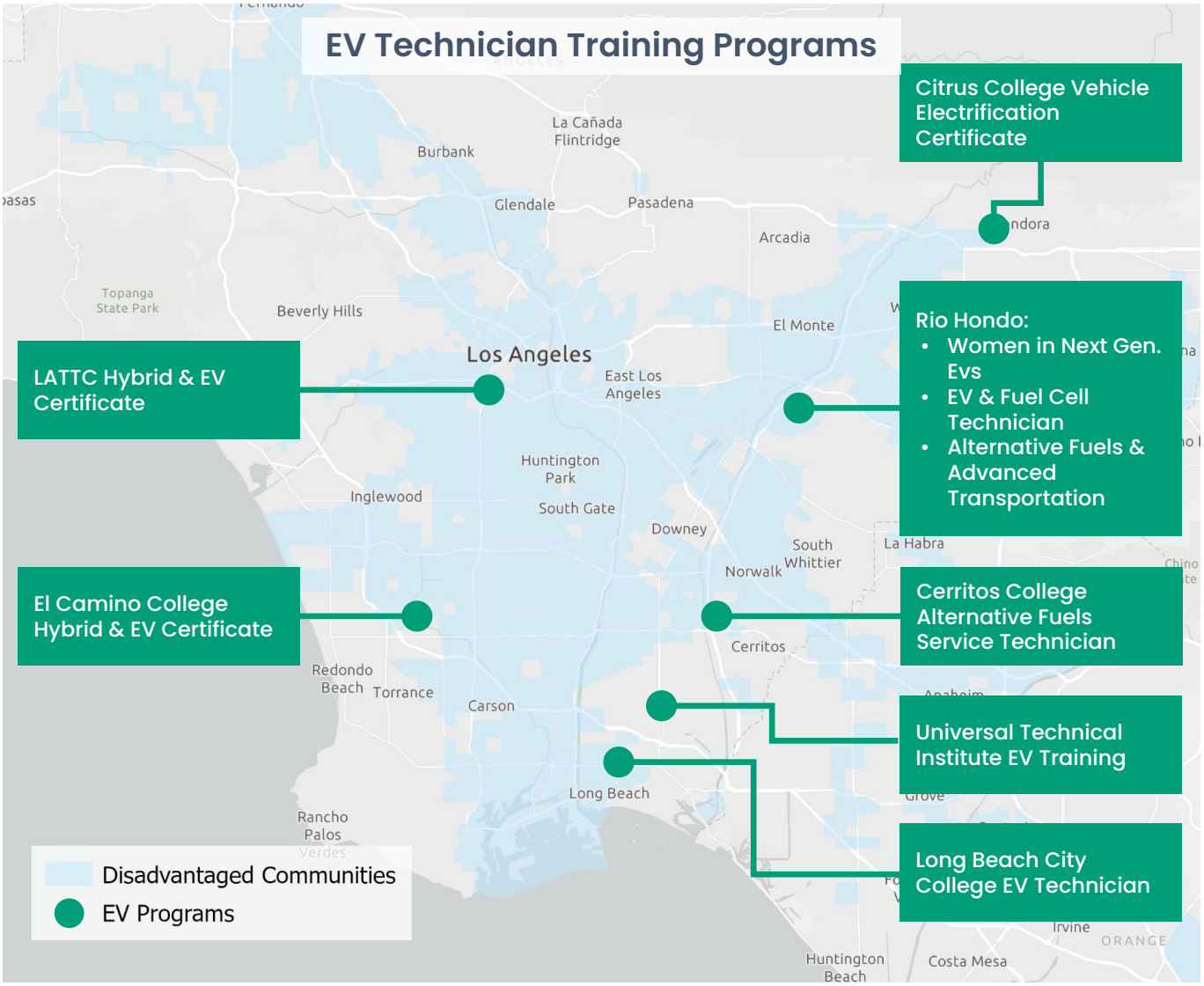
For students entering EVSE training programs, digital literacy skills are a significant gap. In the words of one training partner, "charging stations are a big computer," so workers who enter programs without basic computer literacy skills must first make up that knowledge before they can be trained on the specifics of charging stations. This also presents an equity obstacle, as students of color are more likely than their white peers to be affected by the digital skills gap.

Los Angeles County EVSE Technician Training Programs

LACI EVSE Technician Program	Participants acquire the technical skills and certifications to perform the maintenance, troubleshooting, and commissioning of EV supply equipment (EVSE). The course is hybrid and free for participants and offers opportunities for paid internships and job placement.
ChargerHelp! EVSE Technician Program	Participants acquire the technical skills and certifications to perform the maintenance, troubleshooting, and commissioning of EV supply equipment (EVSE). ChargerHelp! offers an online and in-person version of the course and works with partners across the US.
Pasadena City College EVSE Technician Apprenticeship	Program is the first registered apprenticeship program in the nation for EVSE Technicians. The competency-based apprenticeship combines coursework taught by PCC instructors, and paid on-the-job training provided by industry partners. The apprenticeship program lasts approximately 1 year and prepares students to work as **EVSE Technicians.**
Rio Hondo Alternative Fuels & Advanced Transportation	As part of this program, students learn about the basics of EVSE, vehicle to charger connection and the fundamentals of operation and maintenance.

EV Technician Training Programs

Electric Vehicle technician programs are prevalent throughout the county, typically as part of "alternative fuels" programs that focus on a combination of hybrid, electric, and other non-ICE vehicles. Many offer options for either a certificate or an associate degree, maximizing accessibility for workers. Many programs are on the edge of disadvantaged communities, but the core of disadvantaged communities are not well served.



Disadvantaged Communities based on CalEnviroScreen 4.0

EV Technician Training Gaps and Challenges

Stakeholders acknowledge the widespread prevalence of EV technician training programs, and did not articulate a need for more entry-level programs. Instead, two gaps emerged: 1) training programs that focus specifically on re-skilling existing ICE mechanics to be able to work on EVs, and 2) providing significantly more hands-on training in current EV technician programs.

Re-Skilling
Los Angeles has an existing network of mechanics who service ICE and Hybrid vehicles. These workers have a strong base of knowledge and could easily service EVs with the proper training. A similar transition occurred with the introduction of hybrid vehicles: once a specialized skillset, today most mechanics can perform repairs on hybrid vehicles. However, existing training programs are geared towards new workers rather than re-skilling, so new programs are needed that are tailored to this transition.

Hands-on Training
Community College programs provide a strong base of knowledge, and many offer hands-on training. Adult Education Schools and Career & Technical Education (CTE) programs also offer hands-on training in automotive training. However, employers reported that many new employees are still lacking both skill and confidence in technical skills. Finding opportunities for training programs to partner with employers could allow for additional hands-on training, better preparing employees to enter the workforce.

Los Angeles County EV Technician Training Programs

Los Angeles Trade Technical College Hybrid & EV Certificate	Certificate program provides theory and hands-on instruction in the repair of light, medium, and heavy-duty EV repair and maintenance.
El Camino College Hybrid & EV Certificate	Program prepares students for employment in the field and provides upgrade opportunities for currently employed personnel.
Cerritos College Alternative Fuels Service Technician (Certificate or A.S.)	Courses focus on both electrical and mechanical areas of the vehicles; students learn how to use specialty equipment and hand tools found in automotive and alternative fuels service and repair facilities.
Citrus College Vehicle Electrification Certificate	Prepares students to work in the field of Clean Energy and Vehicle Electrification by providing training in alternative fuel, hybrid, electric and fuel cell technology.
Rio Hondo Women in Next Gen EVs (WING)	Program supports women in completing the Automotive Electric Vehicle Specialist Certificate and entering the workforce as an EV Technician.
Rio Hondo EV & Fuel Cell Technician (Certificate or A.S.)	Prepares students to serve in the emerging field of servicing and diagnosing green vehicles, including electric, hybrid, and fuel cell automobiles.
Rio Hondo Alternative Fuels & Advanced Transportation (Certificate or A.S.)	Prepares students and incumbent employees to be EV technicians specializing in advanced transportation technology.

Other Training Programs

Far fewer training programs exist for fleet managers and manufacturing roles. Cerritos College offers a fleet technician program, which was the only fleet-related program identified in LA County. BYD offers a manufacturing apprenticeship in partnership with SMART Local 105 and Antelope Valley College, providing core production and safety skills. The building trades offer critical support to the electrification ecosystem, backed by strong pre-apprenticeship programs. Targeted programs offer support for underrepresented populations and represent a model that should be expanded for EV and EVSE roles.

Other Los Angeles County Training Programs

BYD Apprenticeship	Called the Industrial Manufacturing Technician Apprenticeship, the BYD program includes OSHA 10 safety training, blueprint reading, manufacturing concepts, machine trade mathematics, lean manufacturing techniques, technical memo writing skills, and emerging trends in manufacturing.
Cerritos College Fleet Technician Certificate	Program provides the necessary skills to succeed as a Fleet Technician, including strengthening the knowledge of incumbent workers. Through courses focusing on subjects unique to fleet service, certificate holders will be well prepared for employment in organizations that operate fleet vehicles.
Building Trades Multi-Craft Core Pre-Apprenticeship	The Multi-Craft Core (MC3) curriculum approved by the National Building Trades gives participants a leg up in understanding the crafts, gaining safety certificates, and being able to prepare for a successful apprenticeship.

Training for Priority Occupations

Based on the demand estimates calculated in the Needs Assessment, and our assessment of current training programs, the County will need more EVITP certified Electricians, additional training programs for EVSE Technicians, and re-skilling opportunities for EV Technicians and Fleet Managers.

1 Electricians

To meet its 2028 goals, LA County will need an additional 1,260 electricians. Current training programs do not meet this demand, indicating a need to both create new programs and scale existing programs.

2 EVSE Technicians

LA County will need about 1,500 EVSE Technicians to support public and private chargers. Current programs from LACI and ChargerHelp! have successfully trained workers over the years and could be scaled to meet demand.

3 EV Technicians

LA County will need more than 4,850 EV Technicians to meet its targets. However, the County already has 16,400 auto technicians – training programs should focus on re-skilling this population to be able to service EVs.

4 Fleet Managers

There is only one dedicated Fleet Management program in LA County. Like EV Technicians, the role is an opportunity for re-skilling existing workers; while employers expressed unique aspects to EV fleets, the role is very similar to existing fleet management roles.

5 Production Line Workers

Because production is generally specific to a manufacturer, there are generally not dedicated training programs available. Instead, individual employers like BYD can offer apprenticeship-style programs that offer strong pathways into production roles. Labor and community benefits agreements are critical in securing these programs.

6 Other Occupations

Several building trades provide crucial support to the transportation electrification ecosystem, including laborers and sheet metal workers. The trades typically offer robust apprenticeship programs supported by strong pre-apprenticeship programs including targeted programs for women & workers of color.

Additional Gaps and Challenges

Beyond the number of workers existing programs are poised to train, several additional gaps and challenges emerged in conversations with training partners and employers:

1. New and Incumbent Workers
2. Quality of Programs
3. Funding and Policy
4. Outreach and Recruitment
5. Timing of Jobs

New and Incumbent Workers

People entering the workforce for the first time have vastly different needs from workers who are reskilling or upskilling from an existing base of training but often training programs do not clearly distinguish between these populations. Stakeholders identified a need to clearly delineate between these populations, and design curriculum to meet the needs of each individually.

New workers need an entire training curriculum focused on the specifics of the skills but also need a set of core workplace skills like timeliness, communication, and problem solving. Workers who are transitioning from a similar career (e.g., auto mechanics transitioning to EV Technicians) or who are "upskilling" from a less complex job primarily need updated technical skills but typically do not need training modules on basic workplace skills. Workers who are transitioning from an entirely different field also typically do not need basic workplace skills but may need more robust theoretical knowledge than workers who are upskilling.

Existing training programs for EV and EVSE roles are primarily geared towards new workers, but one of the largest needs is retraining existing mechanics to work on electric vehicles. Stakeholders identified a need for two changes:

Reskilling

The County needs an additional 4,850 EV and electric bus technicians, but that can include ICE technicians who learn the necessary skills to work on electric vehicles – a far more efficient approach than training a new technician "from scratch."

There is also an enormous opportunity to reskill oil and gas workers to prepare them for careers in transportation electrification. The LA County Just Transition Taskforce identified green energy jobs as a top priority for re-employment of oil extraction workers and specifically named transportation electrification as an industry that could be a good match for workers' skills, interests, and pay expectations.

➡ To help fill unmet demand, training partners should create dedicated reskilling programs for auto mechanics interested in working on EVs.

Greening existing ICE programs

Reskilling programs help existing ICE mechanics, but in the future, ALL mechanics should be trained to work on electric vehicles. Employers expressed that while there are distinct skills between ICE vehicles and electric vehicles, it is far easier to train those differences than to train a brand-new employee.

➡ Training partners should integrate EV curriculum into existing ICE mechanic programs to ensure new technicians are trained on EVs.

Quality of Programs

Ensuring alignment between training programs and employer need is difficult in an industry changing as rapidly as transportation electrification. Employers, trainers, and trainees all noted gaps in alignment, particularly when it comes to hands-on learning. While theory is valuable in setting a baseline understanding of emerging technologies, all stakeholders expressed a need for more hands-on training before entering the workplace, even for entry-level roles.

Trainees praised the overall industry exposure they received in training programs, as well as safety training and basic technical knowledge. Trainees said the hands-on training they received was vital for securing their full-time roles, and all expressed a desire for additional, more technical, hands-on training.

Trainers expressed that their goal is to ensure a baseline of knowledge – one training partner pointed out that if we wait until trainees know every skill possible, they will never actually enter the workforce. However, trainers acknowledge the importance of hands-on training and are always working towards adding additional technical skills to their programs.

A recent report from the Los Angeles Economic Development Corporation's (LAEDC) Institute for Applied Economics and the Center of Excellence for Labor Market Research similarly found a need for more targeted and up-to-date curriculum, designed in collaboration with industry, government agencies, and education and workforce partners.[42]

Trainers and employers should define a common baseline for entering the field, to ensure a high standard of training across programs.

Funding and Policy

Funding for Employee Training

Several employers expressed interest in training their own employees, both to upskill/reskill and to bring on very junior employees who may need additional assistance once on the job. However, employee training is expensive: the training itself costs money, and employers have to contend with lost work hours for existing employees. Especially in an emerging industry with a large number of startups and small businesses, this cost can be prohibitive: several employers expressed that the cost is high enough to prevent them from hiring very junior employees, despite their interest in supporting new workers.

To help fill this gap, the GJRP should identify grant funding for employers who provide meaningful on-the-job training for new or reskilled workers. An apprenticeship model could also be explored, with employers joining together to fund worker training.

Wraparound Services

It is critical that training programs offer wraparound services to ensure equitable participation. Workers too often have to choose between paid employment and training programs, and without stipends and other wraparound services, training programs are often inaccessible to lower income and BIPOC workers. Community colleges often offer wraparound services like transportation or childcare subsidies, and apprenticeship programs are a model for earning while you learn.

As EV and EVSE programs scale, wraparound services should be treated as a necessity rather than an afterthought.

Funding and Policy (continued)

Federal Funding Restrictions

In many cases, undocumented workers cannot be the beneficiaries of federal workforce development funding. Particularly in a county like Los Angeles with a large undocumented population, this presents a serious challenge – many of the workers most in need of these programs are unable to access them. If reskilling programs cannot include undocumented residents, these workers could be left behind by a changing economy, deepening existing divides and worsening inequality.

While changing federal funding restrictions is beyond the ability of this Partnership, training partners should carefully consider how funding restrictions will impact their audience and consider alternative funding sources.

Outreach and Recruitment

As described in the Workforce Needs Assessment, many occupations in the EV and EVSE industry do not adequately represent the full diversity of LA County, particularly for Black residents and women. While most training programs do not report demographic information for participants, multiple stakeholders acknowledged challenges in reaching Black communities, in particular. Increasing BIPOC representation in training programs is a critical step towards increasing representation in priority occupations.

Exposure programs and pre-apprenticeship programs can both help to increase representation in outreach and recruitment, by broadening the audience of people who are aware of new and emerging jobs. Exposure programs are typically geared towards K-12 students and are designed to introduce new or less well-known occupations to students who have not historically had access. Programs often introduce concepts rather than talking about specific occupations – for instance, getting students excited about how electricity works rather than talking about the day-to-day responsibilities of an EVSE Technician.

Pre-apprenticeship programs are typically geared at workers with a high school diploma and introduce a range of trades or occupations while preparing workers with a baseline of skills that are widely applicable. The best model for pre-apprenticeship programs comes from the Building Trades, who have developed an integrated system for introducing the trades and creating a baseline of core skills. For EV and EVSE, a pre-apprenticeship program could focus on core skills like OSHA-10 certifications while introducing workers to the range of possible jobs one can hold in transportation electrification.

Beyond early exposure programs, ongoing mentorship and coaching are critical. Many workers we spoke to said they were unaware of careers in transportation electrification before being referred to a training program, and all said that staying in touch with their trainers and mentors was key to securing future employment. The Book of Green Jobs report from LAEDC and the Center of Excellence for Labor Market Research also highlighted limited awareness of green careers.[43] Formalizing mentorship structures allows workers from underrepresented backgrounds to succeed and advance in the industry.

Partners should strengthen and diversify outreach and recruitment efforts for workforce training programs, targeted at underrepresented residents. Partners should also focus on increasing industry awareness among K-12 students, to create a pipeline of interested talent.

Timing of Job Creation

Timing is perhaps the most challenging aspect of workforce training in an emerging industry. Partners want to meet the projected demand for key occupations, but in many cases, the exact timing of that demand is unclear. For instance, while LA County has a goal of installing up to 100,000 public chargers by 2028, the demand for those chargers may not be linear – residents may be slow to adopt EVs in 2025 and 2026, only to quickly adopt the technology in 2027 and 2028, requiring a significant uptick in charger maintenance.

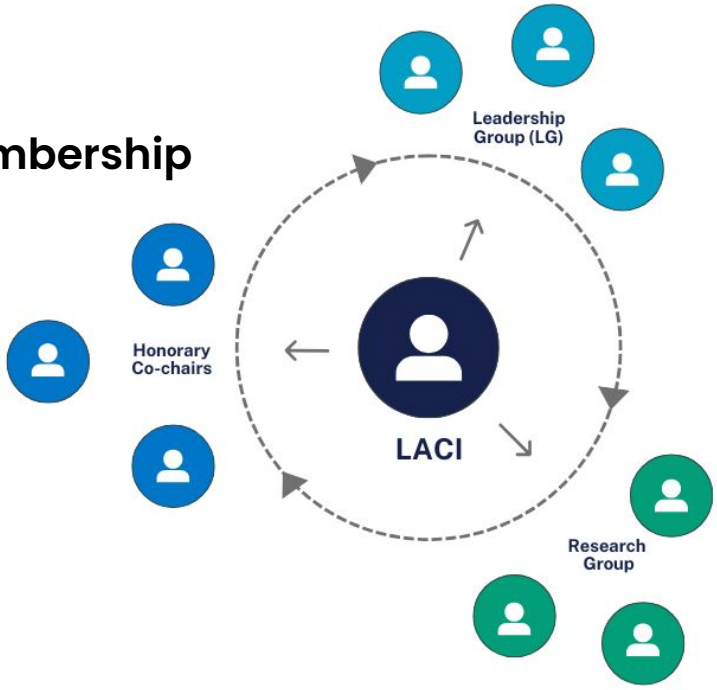
The result is that employers and training partners sometimes end up training workers for jobs that are not yet available. One employer reported that while they had created a dedicated manufacturing training program for new workers, they now had a long waitlist of trained people waiting for a job with the company – training efforts had preceded actual demand.

Because EV and EVSE occupations are part of an emerging industry, this challenge is likely to continue. Training programs should emphasize transferable skills that are not isolated to one role – such as entrepreneurship, project management, business development, and sales skills. This prepares workers to enter a range of different positions, creating a more resilient workforce that can adapt to the changing needs of the industry.

Appendix

GJRP Structure and Membership

GJRP Structure: Roadmap Development



GJRP Research Group Members

Anti-Recidivism Coalition (ARC), Angelica Martin
Apprenticeship Readiness Fund, Ben Garcia
Apprenticeship Readiness Fund, Myllex Guadamuz
Charge Collective, Aditya Gaiki
Charge Collective, Jon Guzik
ChargerHelp!, Kianna Scott
ChargerHelp!, Dr. Jessica Hutcheson
Chargie, Jaideep Upadhyay
Educate X, Audrey Childers
ElectricFish, Vince Wong
Evolectric, Andrew Pontius
GRID Alternatives, Stella Ursua
InCharge, Laura Rivas
Jobs for the Future, Taj Ahmad Eldridge
LATTC/Transportation Workforce Institute, Jess Guerra
Los Angeles Cleantech Incubator, Daniel Ferguson
Los Angeles County, Chief Sustainability Office, Raj Dhillon
Los Angeles County ISD, Minh Le
Los Angeles Department of Water and Power (LADWP), Kecia Washington
Los Angeles Department of Transportation (LADOT), Jillian Gillard
Metro, Tess Paige
Mt. Sac Community College, Center of Excellence, Luke Meyer
My Workfource Solutions, Michelle Yanez
ReJoule, Zora Chung
Ride_Co, Alexa Trujillo
Schneider Electric, Grant Firestone
SLATE-Z, Ruth McCormack
Smart Local 105, Chris Gonzalez
Teshinsky Foundation, Matt Albert
UCLA Labor Center, Larry Frank
Urban X Marketing, Starlett Quarles
US Green Building Council California (USGBC-CA), Robert Zardeneta
West LA College, California Center for Climate Change Career Education, Jo Tavares
Xos Trucks, Neil Madrid

GJRP Leadership Group Members

The Broad Foundation, Porsha Cropper
The Broad Foundation, Melissa Santizo
The Broad Foundation, Shona Sen
City of Los Angeles Mayor's Office, Tanya Pineda
City of Los Angeles Mayor's Office, Lizzeth Rosales
Jobs to Move America, Martin Barrera
Jobs to Move America, Hector Huezo
Los Angeles Cleantech Incubator, Kauleen Menard
Los Angeles Cleantech Incubator, Matt Petersen
Los Angeles Cleantech Incubator, Estelle Reyes
LADEO, Brenda Espiritu
LADEO, Sarah Fisher
LADEO, Kelly LoBianco
LADEO, Amy Srey
Los Angeles Regional Consortium, Dr. Narineh Makijan
Los Angeles Regional Consortium, Randy Morales
Southern California Edison, Tricia Joyner
Southern California Edison, Justina Garcia
UNITE-LA, Geraldine Contreras-Jaimerena
UNITE-LA, Bridget Netter
UNITE-LA, Pamela Williams

EV and EVSE Job Demand

Beyond the number of workers existing programs are poised to train, several additional gaps and challenges emerged in conversations with training partners and employers:

Other Occupations

Registered Service Agents

Registered service agents (RSAs) are certified technicians who are needed to place EVSE into commercial projects. They are required positions for installing commercial EVSE.[44] Many manufacturers and EVSE companies have been certified as Registered Service Agencies to ensure ability to work on both residential and commercial projects.[45]

EV Maintenance

Given the high-voltage components of EVs, it is dangerous for uncertified technicians to work on EVs. Many types of EVs have also now been on the market for a few years, so older EVs will soon need maintenance and will no longer fall under the warranty protections of their manufacturers, increasing demand for auto technicians with EV expertise.[46] EV manufacturers also drive up demand for EV technician trainings by requiring service partners to have proper trainings and certifications, often offering their own, product-specific trainings.

General Automotive Mechanic demand is declining as EVs and other modern cars require less maintenance.

Though demand for mechanics specializing in EVs is rising, EVs require less maintenance overall, and will therefore reduce the long-term number of new or re-trained mechanics necessary.[47] For example:

- Electric vehicle batteries, motors, and other electronics require minimal maintenance
- EVs require less fluids like engine oil
- Regenerative braking in EVs reduces brake wear
- EVs overall have fewer parts than an internal combustion engine

Electric Bus Fleets and electrification progress is tracked via LACI's Transportation Electrification Dashboard.

To calculate EV Bus technician needs, we use the assumption from MV Transit that **1 technician can maintain an average of 6 fixed route buses** per year.[48] We use this ratio to estimate both current workforce due to a lack of existing information, as well as the projected workforce need to reach 100% electrification of the top 4 bus fleets in LA County by 2028.

Table 1.1 – EV Bus Technician Demand

Fleet Name	Fleet Size	% Electrified	Total Electrified (as of March 2024)	Total needed EV Bus Technicians	Estimated Current EV Tech Workforce	Additional EV Techs Needed
LA Metro	2200	2.3%	51	367	9	358
LADOT	404	19.8%	80	67	13	54
Santa Monica	195	9.7%	19	33	3	29
Culver City	54	7.4%	4	9	1	8
Totals				476	26	450

EV and EVSE Job Demand

Public EVSE Installation

Based on estimates from the California Energy Commission (CEC) EV Charging Infrastructure Assessment, one job year* can support the installation of about **33 EV chargers** per year. To meet the goal of installing 129,000 public chargers for light-duty vehicles and 95,000 chargers for goods movement by 2028, LA County will need approximately **515 full time charger installation jobs for light-duty vehicles** and **715** charger installers for medium- and heavy-duty vehicles across 4 years. The jobs include electricians, general and electrical contractors, planners and designers, and other supportive occupations.

Table 1.2 - *Public Chargers and Installation Job Estimates [TEP - LA County]*

	Jobs Estimates
Chargers for Goods Movement by 2028	95,000
Est Jobs by 2028 [job years]*	2,861
Full Time Jobs (4 years)	715
Public Chargers by 2028	129,000
New Public Chargers Needed	68,464**
Est Jobs by 2028 [job years]	2,062
Full Time Jobs (4 years)	515
Total Full Time Jobs (4 years) for public EVSE installation *[number inclusive of electricians and other supportive jobs]*	**1,230**

**A job year is one full-time job equivalent for one year. The "full time jobs (4 years)" estimate one job that is occupied from today until 2028, assuming the employee stays in the job rather than a new job being created every year.*

***data as reported by TEP Dashboard of CEC data from March 2024. This data accounts for public chargers and shared-private chargers to be inclusive of workplace chargers, as well as multi-family residential chargers and other chargers at parking spaces designated by a property owner or lessee to be available to and accessible by employees, tenants, visitors, and residents.*

Table 1.3 - *Public Chargers Installation Job Estimates [CEC breakdowns]*

Occupation	**Estimated Jobs**[49]
Electricians	262
General Contractors	258
Planning/Design	256
Electrical Contractors	185
Other Related Jobs	279

Private EVSE Installation

Private Chargers and Installation Job Estimates

Table 1.4 – *Private, Light Duty EVs (LDEVs) in LA County*

Number of Cars in LA County[50]	6,906,768
% Electrified by 2028 (TEP)	30%
Target Number of Private EVs on the road by 2028	2,072,030
New private EVs needed	**1,679,567**

EV and EVSE Job Demand Continued

EVSE Installation Continued

Table 1.5 - Private Chargers and Installation Job Estimates

	Number
Cars per Home Charger	1.2
Additional EVs by 2028	1,679,567
Home Chargers to Support goal of additional EVs by 2028	**1,402,543**
L1 Chargers [some Single Family]	377,510
L2 Single Family Chargers	543,247
L2 Multi-Family Chargers	481,786
Total Private L2 Chargers	**1,025,033**
# of residential chargers an electrician can install per day	1
# of residential chargers an electrician can install per year	250
Jobs to Install Residential L2 Chargers	4,100
Full Time Jobs (4 years)	**1,025**

*__Jobs Estimate:__ These estimates assume (informed by industry experts) that each electrician can install approximately 1 charger per day, 5 days a week, for 50 weeks a year. This is roughly **250 chargers** per year, per person.

Private Charger Assumptions: private charger needs and job estimates are calculated based on assumptions informed by TEP:

- **1.2 cars** per residential charger
- **27%** of residential chargers are Level 1
- **73%** of residential chargers are Level 2 (39% are Level 2 for Single Family residences, and 34% are Level 2 for Multi-family residences.

Table 1.6 – Total Electrician Installation Job Estimates [Public and Private Chargers]

	Rounded Number of Electricians
Public Charger Installation Jobs [Electricians Only]	260
Private Household Charger Installation Jobs, rounded average [Electricians]	1,000
Full Time Jobs (4 years)	**1,260**

EV and EVSE Job Demand Continued

EVSE Maintenance

One EVSE technician supports the **ongoing maintenance of about 200 chargers per year**, visiting each charger on average once a month.[51] Based on the TEP targets, LA County will need:

- **350 EVSE Technicians** for public, light-duty charger maintenance,
- **5,000** technicians for private charger maintenance,
- **475** technicians for medium and heavy-duty charger maintenance per year.

From 2024 – 2028, LA County will be able to support a total of approximately **1,500 full-time, four-year EVSE maintenance jobs.**

EV Maintenance

Table 1.7 – Total ASE-EV Certified Technician Job Estimates [LDEVs]

	Number of EV Certified Technicians
Additional EV certified technicians needed to meet current demand	700
Additional EV certified technicians needed to meet additional EVs by 2028	3,700
Total additional EV certified technicians needed to meet current demand and the additional EVs on the road by 2028	**4,400**

Priority Occupations

Full List of Relevant SOC Codes

Occupation and industry analysis is often completed using SOC and O*NET codes, however many EV and EVSE occupations are emerging and do not have unique SOC or O*NET codes. Table 2.1 is a series of relevant codes that align with many of these jobs, however these codes encompass more than just occupations that focus on EV and EVSE jobs.

Table 2.1
Comprehensive SOC Code List for EV and EVSE Occupations

GJRP Grouping	SOC Code	Job Title
Production Line Worker	51-1011	First-Line Supervisors of Production and Operating Workers
	51-2028	Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers
	51-2031	Engine and Other Machine Assemblers
	51-2041	Structural Metal Fabricators and Fitters
	51-2098	Miscellaneous Assemblers and Fabricators
	51-9198	Helpers--Production Workers
	51-9199	Production Workers, All Other
Electrician	47-2111	Electricians
	47-3013	Helpers--Electricians
EVSE Installer + EVSE Technician	49-9071	Maintenance and Repair Workers, General
	49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment
	49-9098	Helpers--Installation, Maintenance, and Repair Workers
	49-9099	Installation, Maintenance, and Repair Workers, All Other
EV Technician	49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles
	49-2092	Electric Motor, Power Tool, and Related Repairers
Automotive Mechanic	49-3021	Automotive Body and Related Repairers
	49-3023	Automotive Service Technicians and Mechanics
Fleet Manager	11-3071	Transportation, Storage, and Distribution Managers
Software Developer	15-1252	Software Developers
Battery Technician	49-2092	Electric Motor, Power Tool, and Related Repairers
Recycling Technician	53-7062	Laborers and Freight, Stock, and Material Movers, Hand
Construction Design + Drafters	17-3012	Electrical and Electronics Drafters
Instructor	13-1151	Training and Development Specialists
	25-2032	Career/Technical Education Teachers, Middle School
	25-2032	Career/Technical Education Teachers, Secondary School
	25-3011	Adult Basic Education, Adult Secondary Education, and English as a Second Language Instructors
	25-3099	Teachers and Instructors, All Other

Priority Occupation Criteria Exercise

After applying the prioritization criteria, we asked the Research Group to identify which of the remaining occupations were most pressing based on their experience and through the lens of the prioritization criteria. Research group members were given the full list of occupations that had been filtered through the prioritization criteria and were asked to select their top three occupations. Table 2.2 outlines the results of the exercise:

Table 2.2

Topic	Occupation	Total Votes
Manufacturing	Production Line Worker	6
	Assembler	2
	Precision Manufacturer	0
	Other: Supply Chain/Logistics	1
Construction / Installation	Electrician	12
	CAD Modeler	0
	Drafting	3
	Other: HVAC	1
	Other: Welders	1
	Other: Pipefitters [Hydrogen]	1
Operations & Maintenance	EV Technician	10
	Auto Mechanic	0
	EVSE Technician	9
	Electrician	4
	Fleet Manager	6
	Battery Technician	1
	Dispatcher	2
	Other: Designers	1
	Other: Project Manager	1
	Other: Drivers	1
Recycling	Recycling Technician	3
	Other: N/A	0
Other	Sales	2
	Software Developer	2
	Other: Training Designers	1
	Other: Trianing Specialists	1
	Other: community engagement/policy	1
	Other: Customer service	1
	Other: Grant Administrators	1
	Other: Marketing/Influencers	1
	Other: Online Education	2

6+ Votes
3-4 Votes
<3 Votes

GJRP Research Group and Leadership Group members noted the importance of other supportive occupations as well, although they were outside the scope and spheres of influence for this assessment. In particular, members identified permitting and planners, as well as grid connection occupations and other jobs on the utility side that are important to the EVSE installation process.

Occupational Characteristics

Characteristics by Related Occupational Code

To estimate occupational demographics and summary data, the priority occupations detailed in this report were partially characterized by the closest-fitting SOC code[s]. SOC codes had varying levels of accuracy to each occupation depending on how broad the category was, meaning many codes encompass a much broader field of occupations than just those pertaining to EV and EVSE jobs. The data from these codes is useful, however, for general trends in demographic inclusion, average wages, and necessary experience or training, though the data was supplemented by outside quantitative and qualitative research.

Table 3.1

Production Line Workers

51-2028: Electrical, Electronic, and Electromechanical Assemblers, Except Coil Winders, Tapers, and Finishers

2024 Jobs	Change Since 2014	Race	Gender	Age	Average Pay	Education/ Experience	On-The-Job Training
6,576	- 1,266 jobs	45% Hispanic/Latino 18% White 32% Asian 5% Black	48% Male 54% Female	38% are 55+ years old	$19.88/hr $41,359/yr	High School Diploma or equivalent No experience	Moderate-term on-the-job training

EV Technicians

Skills & Qualifications

Technical Skills	Common Skills	Qualifications
- Traditional auto technician transferable skills [i.e. hand tools, electronics, power tools, computers] - Basic mechanical systems, particularly in electrical components of vehicles - Proficiency in software platforms and diagnostic tools [eg. CAN, LIN, J1939, and OBD] - High and low-voltage	- Communication - Interpersonal skills - problem solving	- Valid Driver's License - Commercial Driver's License - Access to personal transportation - hands-on training at a trade school [or previous experience] - High school diploma or GED

49-2092: Electric Motor, Power Tool, and Related Repairers

*encompasses only a small fraction of EV mechanic and technician positions

2024 Jobs	Change Since 2014	Race	Gender	Age	Average Pay	Education/Experience	On-The-Job Training
282	-258 jobs	42% Hispanic/Latino 39% White 11% Asian 6% Black	96% Male 5% Female	33% are 55+ years old	$28.63/hr $59,545/yr	High School Diploma or equivalent <5 years experience	Moderate-term on-the-job training

49-3023: Automotive Service Technicians and Mechanics

*includes ALL auto technicians and mechanics, not just those with EV specialties

2024 Jobs	Change Since 2014	Race	Gender	Age	Average Pay	Education/Experience	On-The-Job Training
16,359	-3,219 jobs	60% Hispanic/Latino 24% White 9% Asian 3% Black	98% Male 2% Female	22% are 55+ 42% are 45+	$26.48/hr $55,082/yr	Postsecondary nondegree award No experience	Short-term on-the-job training

EVSE Technicians

Skills & Qualifications

Technical Skills	Common Skills	Qualifications
- Hardware skills - Software basic training - Electronics / previous electrical experience preferred - Test equipment - Soldering - Familiarity with Microsoft Suite, IBM Maximo, Disassembler, CAD, and other software	- Communication - Problem solving/ troubleshooting - Physical ability to lift and work with heavy equipment and ability to work in various outdoor conditions - Basic computer skills	- Valid Driver's License - Clean driving record - Access to reliable transportation - Willingness to travel - High school diploma or GED - Product-specific certifications [training provided by employers] - Must be able to distinguish between colors [for wires]

Like many EV-EVSE Industry jobs, EVSE technicians do not have a unique SOC code and there is not yet industry standard classification for this occupation. Some EVSE technicians can be accounted for using the SOC code for Electrical and Electronics Installers and Repairers for Transportation Equipment [49-2093], which is used by organization, such as ChargerHelp! to classify their EVSE Reliability Technicians. To supplement the limited data on this emerging occupation, HR&A relied on conversations with EVSE industry providers.

49-2093: Electrical and Electronics Installers and Repairers for Transportation Equipment

Data supplemented with information from ChargerHelp!

2024 Jobs	Change Since 2014	Race	Gender	Age	Average Pay	Education/ Experience	On-The-Job Training
N/A	N/A	34% Hispanic/Latino 32% White 21% Asian	92% Male 8% Female	17% are 55+ years old	$25.00 - $35.00/hr $52,000 - $72,800/yr	High School Diploma or equivalent No experience	Short-term on-the-job training

Electricians

Skills & Qualifications

Technical Skills	Common Skills	Qualifications
- Electrical wiring - Electrical systems - Blueprinting - Hand tools - Low voltage - High voltage	- troubleshooting - communication - physical ability to work with heavy equipment - ability to work outdoors in all weather conditions	- Valid Driver's License - clean driving record - 30-hour OSHA General Industry card - experience as a journeyman electrician - 10-hour OSHA General Industry card - CDL Class C License

Electricians are abundant in LA County, however electricians with specialized EVITP certification or other EVSE specializations are scarce and the publicly available occupation data on electricians does not distinguish between general electricians and those with specialized EV skills.

47-2111: Electricians

*encompasses ALL electricians, not just those with EVITP certification or EVSE skillsets

2024 Jobs	Change Since 2014	Race	Gender	Age	Average Pay	Education/ Experience	On-The-Job Training
15,051	+94 jobs	50% Hispanic/Latino 37% White 5% Asian 4% Black	96% Male 2% Female	24% are 55+ years old	$35.02/hr $72,846/yr	High School Diploma or equivalent No experience	Apprenticeships

47-3013: Electrician Helpers

encompasses ALL electricians helpers, not just those with EVITP certification or EVSE skillsets. Electrician helpers are an earlier stage in the pipeline to becoming an electrician.

2024 Jobs	Change Since 2014	Race	Gender	Age	Average Pay	Education/ Experience	On-The-Job Training
779	- 245 jobs	76% Hispanic/Latino 16% White 2% Asian 3% Black	93% Male 6% Female	11% are 55+ years old 50% are 19 – 34 years old	$17.61/hr $36,638/yr	High School Diploma or equivalent No experience	Short-term on-the-job training

Fleet Managers

Skills & Qualifications

Technical Skills	Common Skills	Qualifications
- Warehousing - Supply chain - Inventory management - Fleet management software - Budget and accounting skills - Procurement/Purchasing	- Communication - Negotiation - Operations - Management - Basic computer skills including Microsoft Suite	- Valid Driver's License - clean driving record - Bachelor's degree in Business Administration related fields or MBA are preferred, but not required - Project management certifications - American Production and Inventory Control Society (APICS) certification

Fleet management is represented by the SOC code 11-3071: Transportation, Storage, and Distribution Managers. This code encompasses all forms of supply chain management, shipping management, and other distribution management positions, as well as fleet managers who work with non-EV fleets, so this data should be used only as a general overview of demographics, pay, and education.

11-3071: Transportation, Storage, and Distribution Managers

*encompasses all forms of supply chain management, shipping management, and other distribution management positions, as well as fleet managers who work with non-EV fleets

2024 Jobs	Change Since 2014	Race	Gender	Age	Average Pay	Education/ Experience	On-The-Job Training
8,945	+4,216 jobs	42% Hispanic/Latino 34% White 14% Asian 7% Black	78% Male 22% Female	27% are 55+ years old	$48.82/hr $101,549/yr	High School Diploma or equivalent 5+ years experience	Apprenticeships

Occupational Characteristics

Skill-Based Analysis Methodology

To determine the most requested skillsets for job postings in the emerging EV and EVSE job market, we analyzed all LA County job postings from 2023 – 2024 that included any "Electric Vehicle" related skills in Lightcast, as well as any relevant EV and EVSE skills from the platform's "green skills" library. The EV skills inputs include the following:

Table 3.2

Specialized Skill	Electric Vehicles
Specialized Skill	Electric Vehicle Repair
Specialized Skill	Electric Vehicle (EV) Installation
Qualification	IMI Accreditation Electric Vehicle Technician
Specialized Skill	Service and Repair of Electric and Hybrid Vehicles
Qualification	Electric Vehicle Infrastructure Training Program (EVITP)
Qualification	Level 2 Award In The Service and Repair of Electrically Propelled Light Vehicles
Qualification	Level 2 Award In Knowledge Of Service And Repair Of Electrically Propelled Light Vehicles
Qualification	Level 2 Award In Knowledge Of Service And Repair Of Electrically Propelled Commercial HGV Vehicles
Qualification	City & Guilds Level 2 Award in Hybrid Electric Vehicle Operation and Maintenance
Qualification	City & Guilds Level 3 Award in Hybrid Electric Vehicle Repair and Replacement
Qualification	IMI Level 2 Award in Electric/Hybrid Vehicle Routine Maintenance Activities
Qualification	IMI Level 3 Award in Electric/Hybrid Vehicle System Repair and Replacement
Qualification	IMI Level 2 Award in Preparing Heavy Electric/Hybrid Vehicles for Repair
Qualification	IMI Level 3 Award in Heavy Electric/Hybrid Vehicle System Repair and Replacement
Qualification	IMI Level 2 Award in Electric/Hybrid Vehicle Hazard Management for Emergency and Recovery Personnel
Qualification	IMI Level 4 Award in the Diagnosis Testing and Repair of Electric/Hybrid Vehicles and Components (VRQ)
Specialized Skill	Supercharger
Specialized Skill	Battery Pack
Specialized Skill	High Voltage

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