

Zero Emission-Electric Vehicle Technology

California

Introduction

The transportation industry is experiencing significant changes in terms of the advancement of alternative fuel vehicles. President Joe Biden's plan to reach net-zero emissions by 2050 includes a call to electrify the federal government's 645,000 fleet vehicles (Kaplan, 2021). Additionally, California's Governor, Gavin Newsom, signed an executive order that requires that, by 2035, all new cars and passenger trucks sold in California will be zero-emission vehicles (Office of Governor, 2020). Government mandates and growing consumer demand has led to the expansion of the electric vehicle market. In the United States, the share of electric vehicles is projected to grow to approximately 9% of the automotive market, up from 1.8% in 2020 (Priddle, 2021). Traditional automotive manufacturers have bolstered this transition, with companies, like Ford pledging that 40% of its vehicles sold will be electric by 2030 (Isidore, 2021).

The commercial transportation industry has begun its adoption of electric vehicles through pilot programs. Volvo Trucks is working with the state of California, regional air quality regulators, and two commercial motor carriers to create the LIGHTS (Low-Impact Green Heavy Transport Solutions) program, which is attempting to electrify the transportation in and out of Los Angeles's ports. "The project includes the 23 battery-electric Volvo VNR heavy-duty trucks, 29 other electric vehicles such as yard trucks and forklifts. The Volvo trucks will run between the Inland Empire in cities of Ontario, Chino and Fontana, and the massive combined Long Beach and Los Angeles port complex" (Hirsch, 2020). Distribution centers in the Inland Empire may serve as a foundation for the region's heavy-duty electric truck service and maintenance industry. The workforce demand for electric vehicle service technicians will likely increase as the share of electric vehicles increases.

This report details the employment demand and educational supply for electric vehicle workers. Traditional labor market information does not capture demand for electric vehicle workers due to the recent emergence of this automotive segment. This first section of this report utilizes real-time job advertisement information to analyze the demand for workers servicing and maintaining electric vehicles. The second section of this report details student completion and outcome data for regional alternative fuels and advanced transportation technology programs (TOP 0948.40), presented on page 6.

Job Opportunities for Electric Vehicle Workers

A real-time job advertisement search was conducted to quantify employer demand for electric vehicle workers with electric, hybrid, and other alternative fuel skills. Quantifying the relationship between electric vehicle demand and the demand for associated workers is challenging due to the specificity of the work and the historically limited number of job advertisements seeking workers in this field. The limited number of job advertisements may result from employers upskilling their existing workforce to service electric vehicles. State-level demand for electric vehicle workers was analyzed for this report because there were only four job ads posted for community college-level and bachelor’s degree-level occupations in the Inland Empire/Desert region over the last 12 months. Approximately 80% of statewide advertisements were listed in the San Francisco-Oakland-Hayward Metropolitan Statistical Area (MSA) and Los Angeles-Long Beach-Anaheim MSA.

A search of online job advertisements yielded 194 results posted in California over the last 12 months through a combination of skill, employer, job title, and occupation filters. Exhibit 1 displays the number of job ads listed over the past twelve months for community college-level and bachelor’s degree-level occupations that produce, service, and maintain electric vehicles. Of the 194 total advertisements posted for these occupations, approximately 58% (112 ads) were posted for community college-level occupations.

This report focuses on the community college-level alternative fuels and advanced transportation technology programs (TOP 0948.40). Exhibits 2 through 8 displays job ad information for the combined community college-level occupations, further referred to as the electric vehicle occupational group in this report.

Exhibit 1: Occupations from employer job ads, May 2020 – April 2021

Occupations (SOC Code)	Job Ads
Community College-level Occupations	
Automotive Service Technicians and Mechanics (49-2023)	64
Engineering Technicians, Except Drafters, All Other (17-3029)	31
Maintenance and Repair Workers, General (49-9071)	17
Total Community College-level Occupations	112
Bachelor’s degree-level Occupations	
Mechanical Engineers (17-2141)	44
Engineers, All Other (17-2199)	23
Electrical Engineers (17-2071)	15
Total Bachelor’s degree-level Occupations	82

Occupations (SOC Code)	Job Ads
Total	194

Source: Burning Glass – Labor Insights

Exhibit 2 displays the job titles most frequently mentioned in employer job advertisements for the electric vehicle occupational group. Job title information may provide insight into the types of positions sought by employers seeking electric vehicle workers.

Exhibit 2: Job titles with 'electric vehicle' skills from employer job ads, May 2020 – April 2021

Job Titles	Job Ads
Service Technician	8
Engineering Test Technician	5
Master Certified Technician	4
Dynamometer Test Operator	4
Mechanical Engineer	3
Flat Rate Technician	3
Drive Unit Test Operator	3
<i>All other job titles</i>	79
Total	112

Source: Burning Glass – Labor Insights

Exhibit 3 displays the employers posting job ads for the electric vehicle occupational group over the last 12 months. Lucid Motors, Inc., a luxury electric vehicle manufacturer located in Newark, California, posted 49 job advertisements in the previous 12 months, accounting for 44% of statewide advertisements.

Exhibit 3: Employers posting job ads, May 2020 – April 2021

Employers	Job Ads
Lucid Motors, Inc.	49
Rivian	12
Tesla Motors	9
Karma Automotive	6
Carvana, LLC.	6
Chevrolet	5
Cummins Inc.	4
Toyota Motors	4
Chrysler	4
Canoo	3

Employers	Job Ads
Nikola	3
Meritor	3
EV Connect, Inc.	2
Nissan North America, Inc.	1
Honda	1
Total	112

Source: Burning Glass – Labor Insights

Exhibit 4 displays the county locations in which employers are posting the most job ads for the electric vehicle occupational group over the last 12 months. The San Francisco-Oakland-Hayward MSA (Alameda, Contra Costa, Marin, San Francisco, and San Mateo counties) accounted for 54% of advertisements, and the Los Angeles-Long Beach-Anaheim MSA (Los Angeles and Orange counties) accounted for 24% of advertisements. These regions, combined, accounted for 78% of statewide advertisements for community college-level electric vehicle workers.

Exhibit 4: Counties with the most job ads posted, May 2020 – April 2021

Counties	Job Ads
Alameda	57
Los Angeles	14
Orange	13
Santa Clara	8
Solano	3
San Francisco	3
San Diego	3
<i>All other counties</i>	8
Total	112

Source: Burning Glass – Labor Insights

Exhibit 5 displays a sample of specialized and employability skills that employers seek when looking for workers to fill positions in the electric vehicle occupational group. Specialized skills are occupation-specific skills that employers are requesting for industry or job competency. Employability skills are foundational skills that transcend industries and occupations; this category is commonly referred to as "soft skills." The skills requested in job postings may be utilized as a helpful guide for curriculum development.

Exhibit 5: Sample of in-demand skills, May 2020 – April 2021

Occupational Group	Specialized Skills	Employability Skills
Electric Vehicle Occupational Group (n=112)	<ul style="list-style-type: none"> • Repair • Vehicle Systems • Automotive Industry Knowledge • Power Tools • Data Acquisition • Electric Motors 	<ul style="list-style-type: none"> • Detail-Oriented • Communication Skills • Organizational Skills • Problem Solving • Multi-Tasking • Computer Literacy

Source: Burning Glass – Labor Insights

Exhibit 6 displays the minimum advertised education requirement from employer job ads for the electric vehicle occupational group. Job advertisements reveal that the majority (84%) of employers seeking electric vehicle workers sought candidates with a high school diploma or vocational training.

Exhibit 6: Minimum advertised education requirements, May 2020 – April 2021

Occupational Group	Minimum Advertised Education Requirement from Job Ads			
	Number of Job Ads (n=)	High school diploma or vocational training	Associate degree	Bachelor's degree or higher
Electric Vehicle Occupational Group	50	84%	16%	-

Source: Burning Glass – Labor Insights

Exhibit 7 displays the real-time work experience requirements from employer job ads for the electric vehicle occupational group. Approximately 87% of employers sought candidates with three to five years of previous work experience.

Exhibit 7: Real-time work experience requirements, May 2020 – April 2021

Occupational Group	Real-Time Work Experience			
	Number of Job Ads	0 – 2 years	3 – 5 years	6+ years
Electric Vehicle Occupational Group	60	7%	87%	6%

Source: Burning Glass – Labor Insights

Advertised Salary from Online Job Ads

Community colleges should ensure their training programs lead to employment opportunities that provide self-sustainable income. The University of Washington estimates that a self-sufficient hourly rate for a single adult with one school-age child is \$21.78 per hour or \$45,992 annually in Riverside County; \$21.24 per hour or \$44,867 annually in San Bernardino County (Pearce, 2020). For this study, the higher hourly

earnings requirement in Riverside County is adopted as the self-sufficiency standard for the two-county region.

Exhibit 8 displays online job ad salary data for electric vehicle worker positions over the 12 months. Online job ad salary information reveals that employers are willing to pay electric vehicle workers \$68,000 annually, above the \$45,992 annual (\$21.78 hourly) self-sufficiency standard for the region. Consider online job ad salary with caution since only 22% (25 out of 112) of results for this occupational group provided information. The salary figures are prorated to reflect full-time, annual salary status.

Exhibit 8: Advertised salary information

Number of job postings	Real-Time Salary Information				Average Annual Salary
	Less than \$35,000	\$35,000 to \$49,999	\$50,000 to \$74,999	More than \$75,000	
25	-	28%	52%	20%	\$68,000

Source: Burning Glass – Labor Insights

Student Completions and Program Outcomes

Exhibit 9 displays annual average completion data for the California Community College alternative fuels and advanced transportation (0948.40) program, based on the most recent three academic years. The student completion and program outcome methodology are displayed on page 9.

Exhibit 9: 2017-20, Annual average community college credentials for the alternative fuels and advanced transportation technology program in the Inland Empire/Desert Region

0948.40 – Alternative Fuels and Advanced Transportation Technology (Local program title)	Associate Degree	Certificate requiring 30 to < 60-semester units	Certificate requiring 18 to < 30-semester units	CCC Annual Average Credentials, Academic Years 2017-20
Copper Mountain (Alternative Fuel Vehicles)	-	1	-	1
Desert (Automotive Alternative Fuels, Advanced Transportation Technologies, Hybrid, Fuel-Cell, & Electric Vehicle, Compressed Natural Gas Essential/Inspection/Installation Essentials)	2	-	0	2
San Bernardino Valley (Heavy/Medium Duty Clean Vehicle Technology)	-	-	-	0
Total	2	1	0	3

Source: MIS Data Mart, COCI

California program outcome data may provide a useful insight into the likelihood of success for the proposed program. Community college student outcome information based on the selected TOP codes and region is provided in Exhibit 10. The outcome methodology is available in the appendix section of this

report. Dashes indicate that there were too few program completers to obtain accurate outcome information.

Exhibit 10: 0948.40 – Alternative fuels and advanced transportation technology strong workforce program outcomes

Strong Workforce Program Metrics: 0948.40 – Alternative Fuels and Advanced Transportation Technology Academic Year 2017-18, unless noted otherwise	Inland Empire/ Desert Region	California
Unduplicated count of enrolled students (2018-19)	140	639
Completed 9+ career education units in one year (2018-19)	38%	45%
Economically disadvantaged students	94%	78%
Students who earned a degree, certificate, or attained apprenticeship (2018-19)	-	34
Job closely related to the field of study (2016-17)	-	81%
Median annual earnings (all exiters)	\$20,288	\$32,216
Median change in earnings (all exiters)	-	52%
Attained a living wage (completers and skills-builders)	48%	41%

Sources: LaunchBoard Community College Pipeline and Strong Workforce Program Metrics

Recommendation

The increasing availability of electric vehicles and government mandates will likely increase the demand for electric vehicle workers. In California, 112 job postings were identified for community college-level workers that build and maintain electric vehicles over the last 12 months. Employer demand for electric vehicle workers is highly concentrated in the San Francisco Bay Area and Los Angeles/Orange County, accounting for 78% of statewide advertisements. No job advertisements were listed in the Inland Empire/Desert Region.

Limitations of job ad analysis suggest that internal training programs are upskilling the existing workforce or relevant employers are finding workers by methods other than online job ads. State metrics show that 81% of students exiting alternative fuels and advanced transportation technology community college programs find work in their field of study. Regionally, 48% of students exiting these programs are attaining a living wage. Job advertisements reveal that employers are willing to pay electric vehicle workers \$67,000 annually, above the \$45,992 annual (\$21.78 hourly) self-sufficiency standard for the region.

The COE recommends that colleges considering a zero emission-electric vehicle program partner with relevant employers to understand their need for more workers and the necessary skills that will lead to self-sustainable wages for students.

Contact

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Student Completions and Program Outcome Methodology

Exhibit 9 displays the average annual regional California Community College (CCC) credentials conferred during the three academic years between 2017 and 2020, from the California Community Colleges Chancellor's Office Management Information Systems (MIS) Data Mart, along with the enrollments from the most recent year available on LaunchBoard. Credentials are the combined total of associate degrees and certificates issued during the timeframe, divided by three in this case to calculate an annual average. This is done to minimize the effect of atypical variation that might be present in a single year. Enrollments are the count of enrollments in courses assigned to the TOP code in the selected year.

Community college student outcome information is from LaunchBoard and based on the selected TOP code and region. These metrics are based on records submitted to the California Community Colleges Chancellor's Office Management Information Systems (MIS) by community colleges, which come from self-reported student information from CCC Apply and the National Student Clearinghouse. Employment and earnings metrics are sourced from records provided by California's Employment Development Department's Unemployment Insurance database. When available, outcomes for completers are reported to demonstrate the impact that earning a degree or certificate can have on employment and earnings. For more information on the types of students included for each metric, please see the web link for LaunchBoard's Strong Workforce Program Metrics Data Element Dictionary in the References section (LaunchBoard, 2020a). Finally, employment in a job closely related to the field of study comes from self-reported student responses on the CTE Employment Outcomes Survey (CTEOS), administered by Santa Rosa Junior College (LaunchBoard, 2020a).

It is important to note limitations when examining employer job ads. Job postings data is limited to the information provided by employers and the ability of artificial intelligence search engines to identify this information. Additionally, preliminary calculations by Georgetown Center on Education and the Workforce found that "just 30 to 40 percent of openings for candidates with some college or an associate degree, and only 40 to 60 percent of openings for high school diploma holders appear online" (Carnevale et al., 2014). Online job advertisements often do not reveal employers' hiring intentions; it is unknown if employers plan to hire one or multiple workers from a single online job ad or collect resumes for future hiring needs. A closed job ad may not be the result of a hired worker.