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01

ev




San Diego-Imperial Counties Region

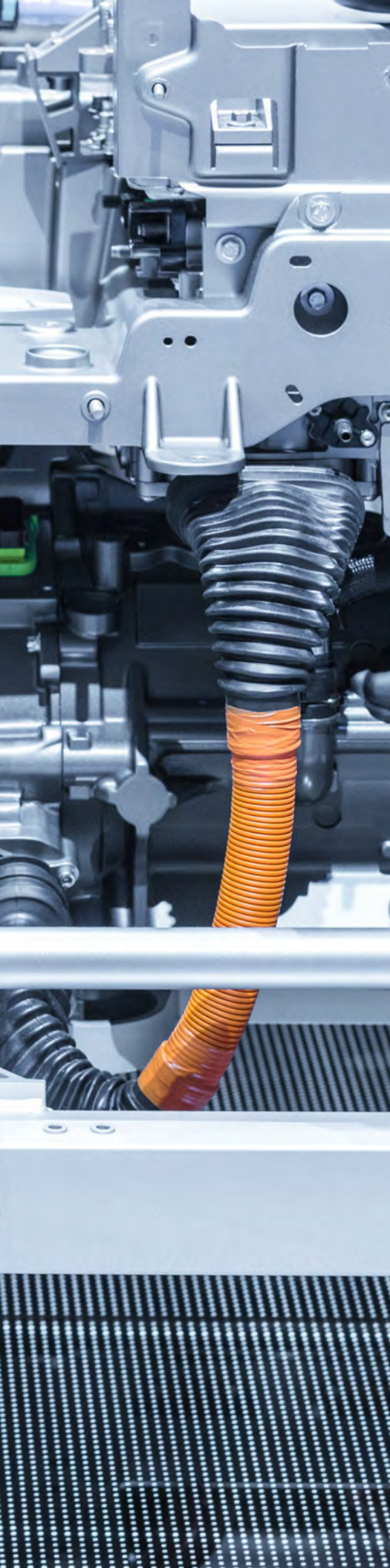
**Electric Vehicle
Sector Strategy**

REPORT

SAN DIEGO AND IMPERIAL COUNTIES COMMUNITY
COLLEGES REGIONAL CONSORTIUM

A close-up photograph of a car's front suspension system. The image shows a black tire with a tread pattern, a silver metal control arm, a shock absorber, and various other mechanical components. The background is slightly blurred, showing more of the car's chassis. The overall color palette is dominated by metallic grays and blacks.

**“ We shall see more change
in the next 5 years, than
there’s been in the last 50
Dan Ammann, President
of General Motors**



ELECTRIC **REVOLUTION**

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JUNE 30, 2022

SAN DIEGO - IMPERIAL
COUNTIES REGION
ELECTRIC VEHICLE
SECTOR STRATEGY

Prepared for
**San Diego and Imperial
Counties Community Colleges
Regional Consortium**



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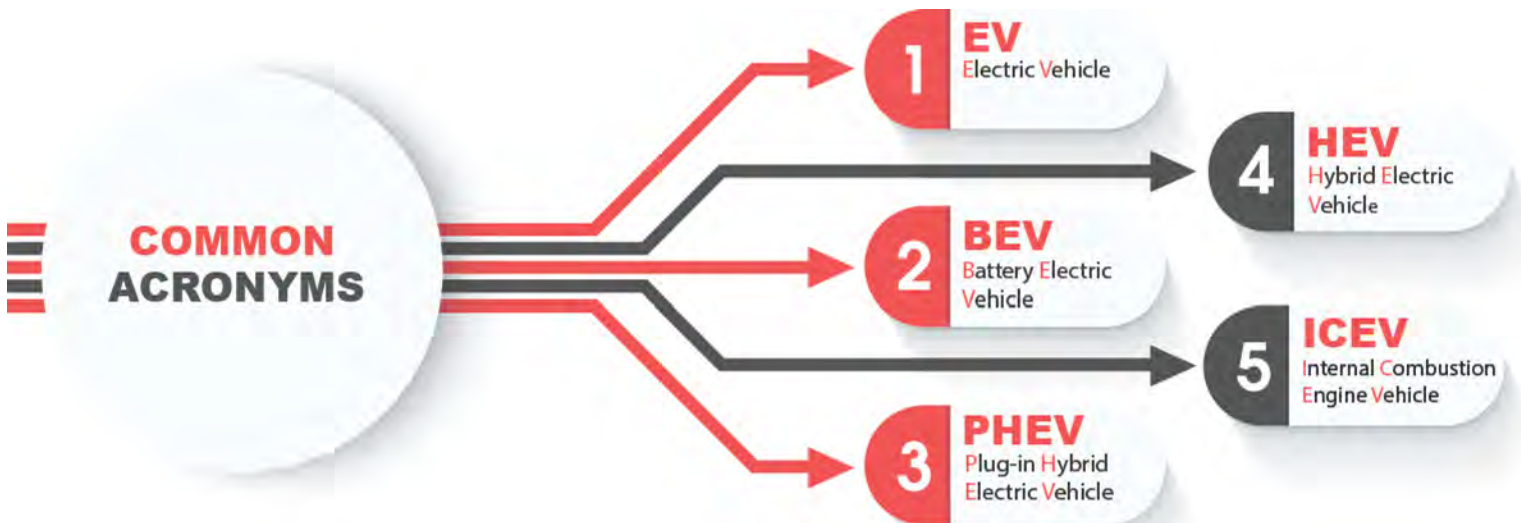
EXECUTIVE SUMMARY

The adoption of alternative fueled vehicles in California, particularly plug-in electric, continues to grow at a rapid pace. This growth is due in part to Governor Newsom's Executive Order N-79-20, directing the state to require that by 2035 all new cars and passenger trucks sold in California be zero-emission vehicles (ZEV), all new off-road vehicles and equipment be zero emission by 2035, and medium and heavy-duty vehicles sales must be zero-emission by 2045. As this growth continues, there is an increased need for technicians to service these vehicles. While the availability of training in clean fuel vehicle technology is increasing, specialized training in alternative fueled and advanced vehicle technology is offered primarily by manufacturers, making it less accessible to technicians, trainers, and independent shops.

1,000,000+ Zero-Emission Vehicles Sold by the end of 2021

California is leading the way in ZEV adoption across the nation. In 2016 the light-duty market share in California was sitting at around 2.5%. Fast forward to the end of 2021 and that market share is currently at 12.41% (1) which represents a 396% increase in 5 years. In San Diego, the New Car Dealers Association estimated the electric vehicle market share to be around 13.4% with Tesla leading the way as a top performing brand in sales and growth. In San Diego alone, Tesla's growth was over 64% between 2020 and 2021(2). With more than 87 light-duty electric vehicle models currently available (2) and another estimated 200 on the way from various manufacturers, this segment is here to stay and will require workforce investments to service the technology.

However, the downside to the adoption of new technology and advancements in efficiency is a significant reduction in traditional automotive service technicians. This sector strategy report will explore the need in California and among the San Diego Regional Community Colleges to start or expand investments in tomorrow's ZEV workforce in order to stay relevant in a rapidly changing transportation environment.



THE ELECTRIC VEHICLE MARKET AT A GLANCE

CALIFORNIA

California's ZEV program includes regulation, state policy, and incentives all of which have contributed to over a million ZEVs on California roads. Most importantly, California's Executive Order N-79-20 sets forth the state's goal that 100% of in-state sales of new passenger cars and trucks will be zero-emission by 2035 (3). This is significant because California usually accounts for around 11-12% of all new cars sold in the United States, which gives it power to influence automotive manufacturers. We've seen this in the past with changes in emissions standards in California that affected the entire market. Additionally, California is leading a ZEV Collaboration comprised of various partners, a multi-state MOU, and the International ZEV Alliance (4). As a result of these plans, orders, and incentives, all major automotive manufacturers are setting goals that either directly or closely align with California.

Fig. 1 illustrates the growing popularity of EVs in California (5).

SAN DIEGO

San Diego's adoption of BEV and PHEVs is well above average at 17% (BEV + PHEV market share) when compared to other major markets. The only markets outperforming San Diego include Los Angeles, Orange County, and Silicon Valley (6).

1st quarter 2022

Market Share of Top Ten Selling Brands in San Diego County YTD 2022 thru March

Toyota #1 at 16.8%

Tesla #2 at 10.8%

Market Share for Top Ten Selling Models in County Market YTD 2022

#1 Tesla Model Y at 4.9%

#2 Tesla Model 3 at 4.8%

Fig. 2 illustrates the estimated quarterly alternative powertrain market share for San Diego County (6).

CALIFORNIA EV QUICK FIGURES (7)



1,214,516
CA EV SALES



2,826,923
U.S. EV SALES



115
CA MODELS AVAILABLE



79,023
CA EV CHARGERS



60
CA H2 CHARGERS

Fig. 1

California BEV Sales & New Vehicle Share Forecast

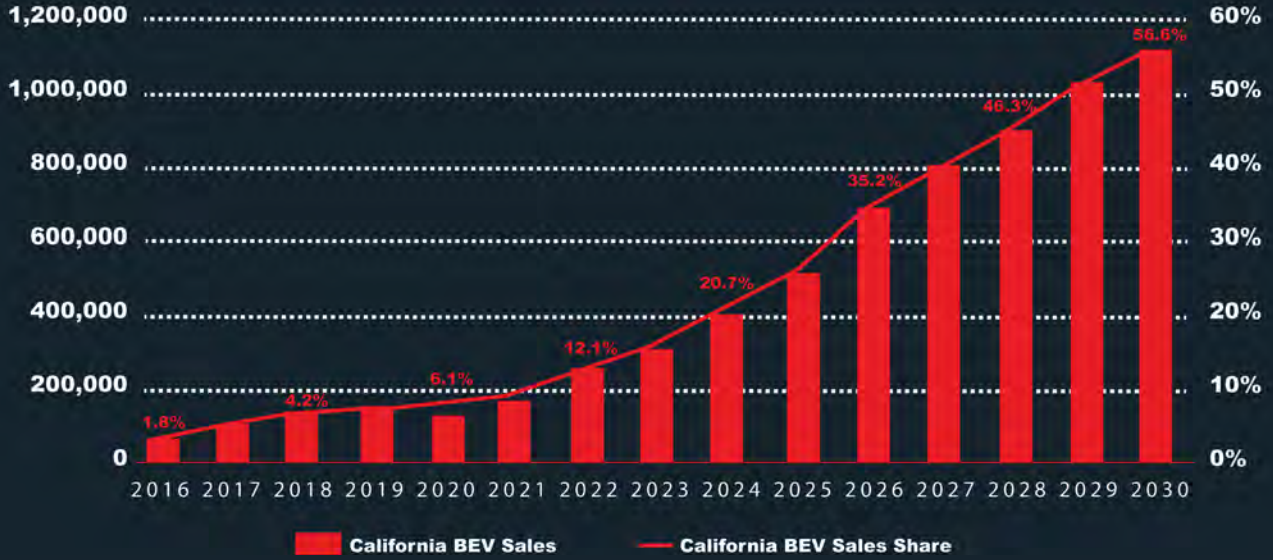
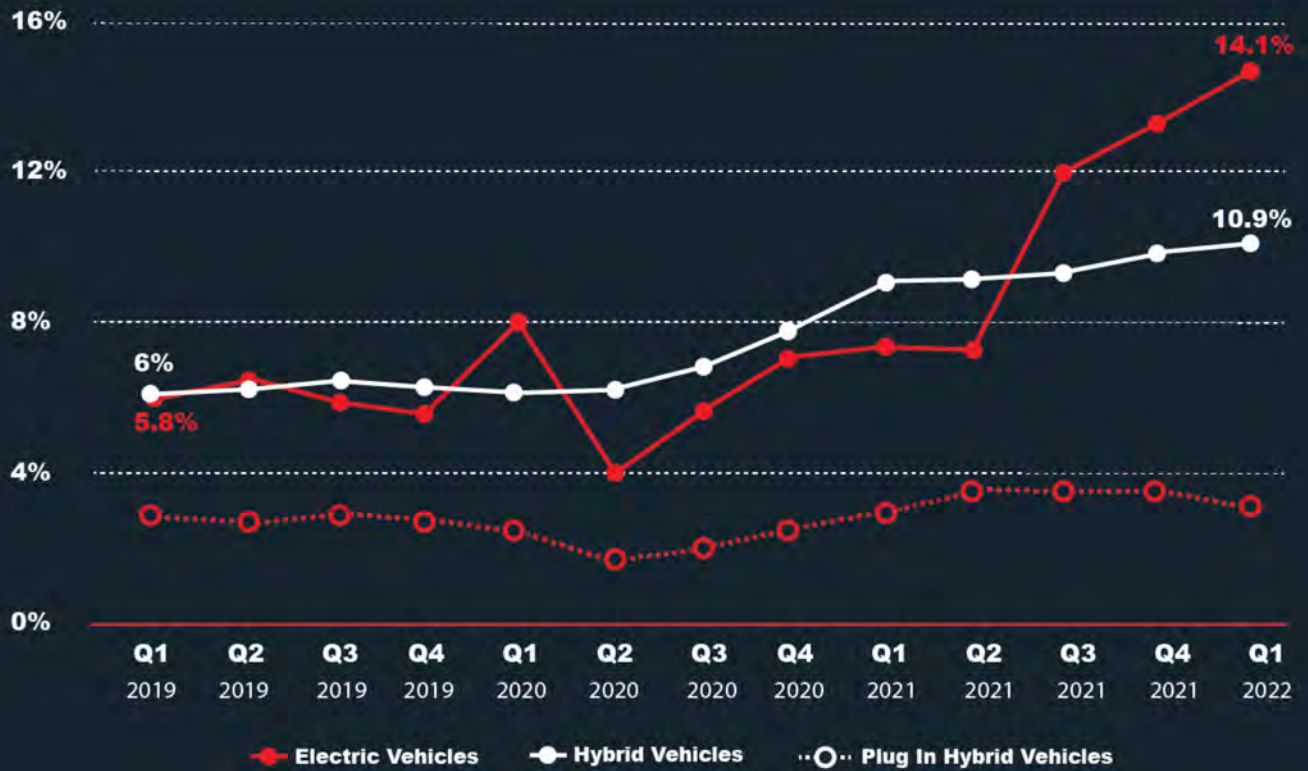


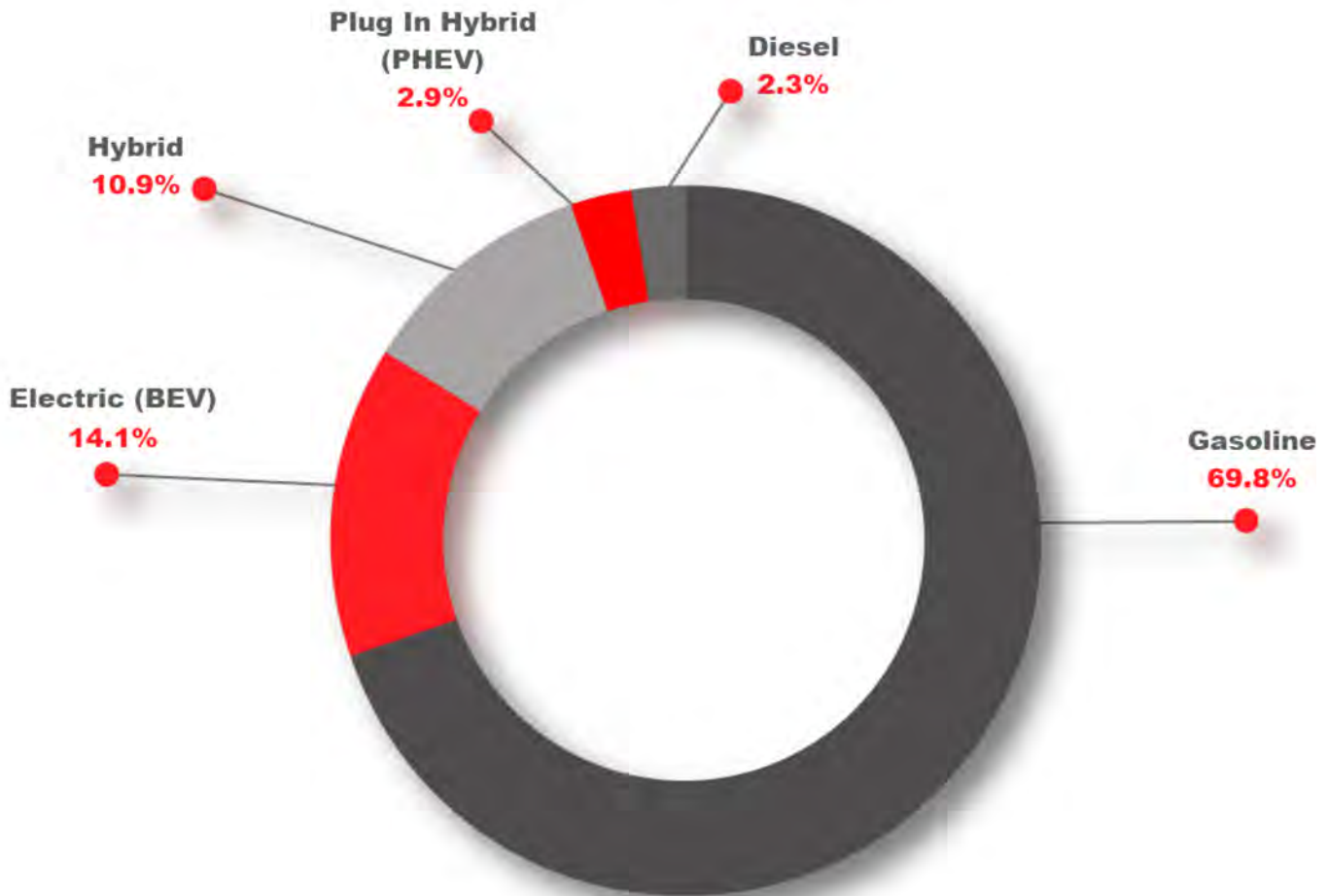
Fig. 2

Estimated Quarterly Alternative Powertrain Market Share in County



County Estimated Market Share by Powertrain Type

YTD 2022 Thru March



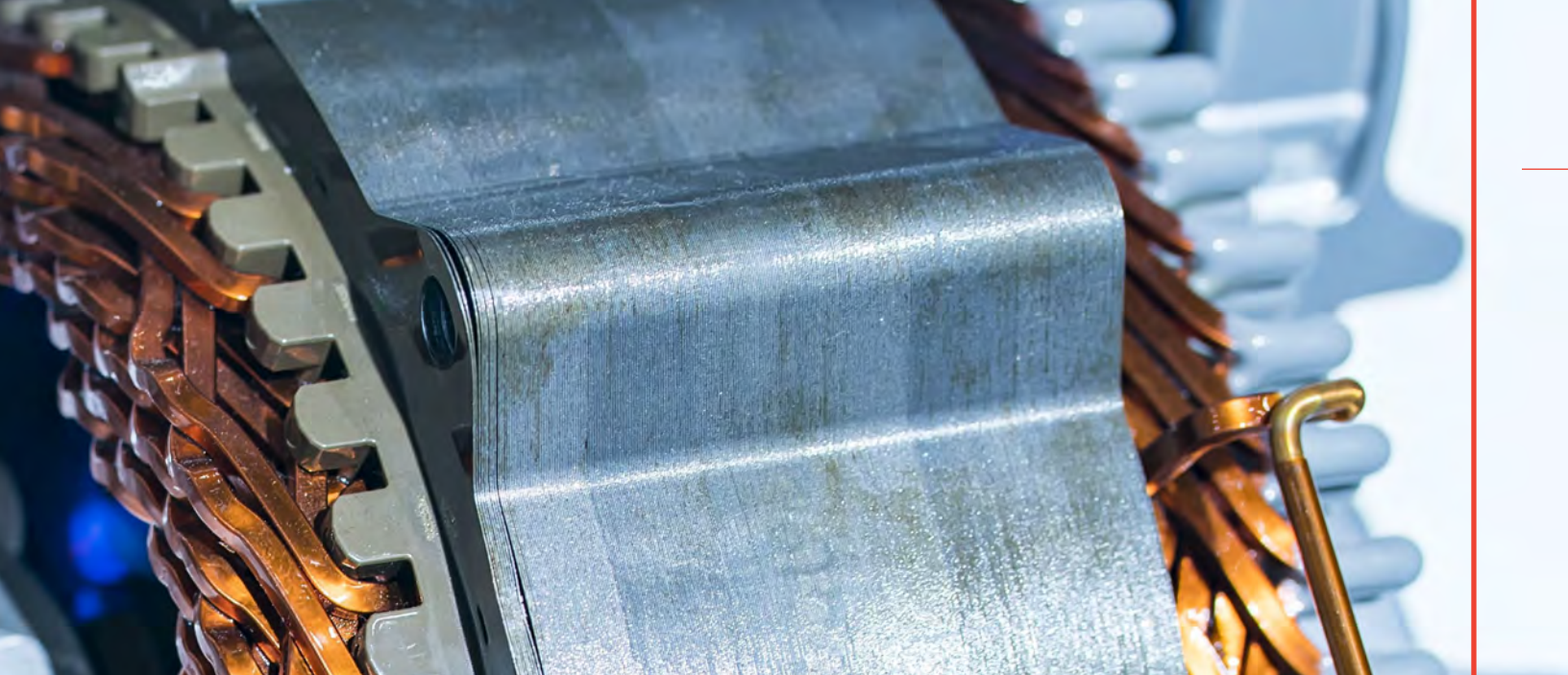
There are 900 electric vehicles added a day to California - **David Hochschild**, Commissioner at the California Energy Commission

From the pie chart above and tables to the below, it's easy to see that San Diego residents are making the transition to alternative fuel vehicles and electric (BEV) in particular. Additionally, if we look at the local registrations through March 2022 we can see that the number one model in San Diego is Tesla, a pure electric vehicle company.

TOP 10 SELLING BRANDS IN SAN DIEGO FOR

HYBRID
ELECTRIC
PLUG-IN HYBRID

YTD '22 THRU MARCH (6)



RANK	BRAND	REGISTRATIONS
1	Tesla	3530
2	Toyota	1892
3	Honda	483
4	Hyundai	471
5	Ford	466

RANK	BRAND	REGISTRATIONS
6	Kia	426
7	Lexus	312
8	Mercedes	293
9	Volvo	225
10	Audi	188



NATIONALLY

"There is no doubt we are in the electrified-vehicle decade, and our Cox Automotive experts forecast even further growth of electrified vehicles in the years ahead," said Matt Degen, editor for Kelley Blue Book. "The automotive marketplace continues to evolve and diversify more with each passing year. Hybrids are now mainstream products, and more than a dozen new EVs are slated to launch in 2022 – including the much-anticipated and potentially high-volume Ford F-150 Lightning. While consumer survey data continues to indicate that EVs are too expensive and concerns remain about range and charging availability, consideration for the segment has never been higher. As EV availability expands and capability improves, even more new-car buyers likely will make the choice to buy electrified in 2022 (8)".

The following tables illustrate the growing popularity of EVs, with a national market share of 9.7% with year-over-year growth of 79.3% (9).

Q4 ELECTRIFIED VEHICLE SALES GROWTH (9)

	Q4 2020	Q4 2021	Y-O-Y
Battery Electric Vehicle (BEV)	86,010	147,779	71.8%
Hybrids & Plug-In Hybrid EV	189,524	240,900	27.1%
All Electric Vehicles	275,534	388,699	41.1%
All Vehicle	4,195,181	3,300,188	-21.3%
Market Share of all Electrified Vehicles	6.6%	11.8%	79.3%




2021 ELECTRIFIED VEHICLES SALES GROWTH (9)

	2020	2021	Y-O-Y
Battery Electric Vehicle (BEV)	257,872	487,460	89%
Hybrids & Plug-In Hybrid EV	525,605	969,407	84.4%
All Electric Vehicles	783,477	1,456,867	85.9%
All Vehicle	14,568,364	15,061,885	3.4%
Market Share of all Electrified Vehicles	5.4%	9.7%	79.9%

MANUFACTURERS
ESTIMATED TIMELINE
TO TRANSITION TO
ELECTRIC VEHICLES



 **2025**

-  Fiat (2025-2030)
-  Mercedes-Benz (50% Sales by 2025)
-  Jaguar

 **2026**

-  Audi
-  Mini (2026-2030)

 **2027**

-  Alfa Romeo

 **2030**

-  Bentley
-  Ford (Europe 2030, 40-50% Global Sales)
-  Nissan
-  Renault (90% by 2030)
-  Rolls-Royce
-  Volvo

 **2035**

-  Volkswagen
-  General Motors

 **2039**

-  Land Rover (Net-Zero Carbon Business)

 **2040**

-  Honda (North America, China, & Japan)
-  Hyundai

 **2050**

-  Toyota 2050 (ZEV)

CALIFORNIA MANDATE
ORDER-N-79-20

SUPPLY GAP ANALYSIS

PROJECTED OCCUPATIONAL DEMAND

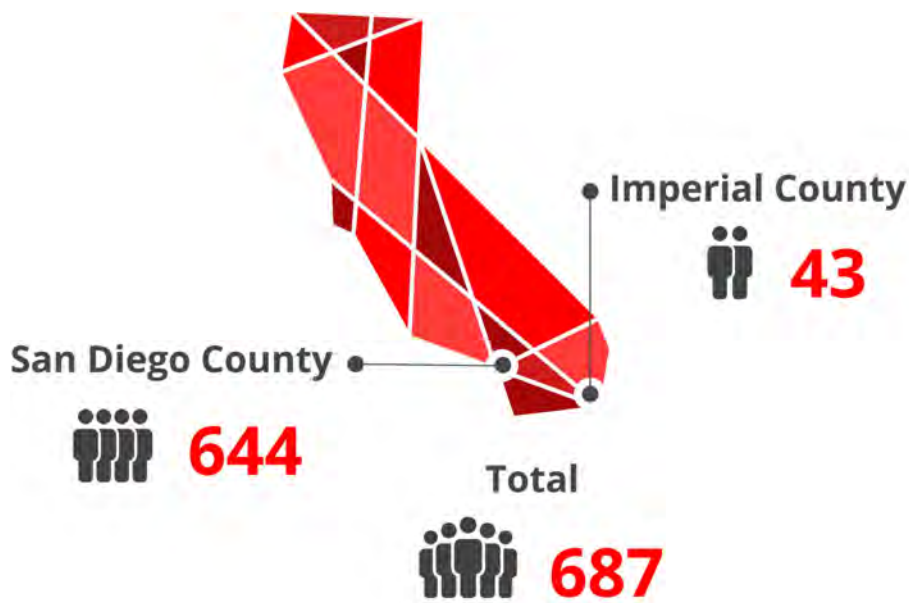
As the need for zero-emission vehicles continues to grow, so will the need for technicians to service these vehicles. To better understand the occupational demand for these technicians, this section provides labor market information in San Diego County and Imperial County for the following occupational code in the Standard Occupational Classification (SOC) (10) system:

Automotive Service Technicians and Mechanics (SOC 49-3023): Diagnose, adjust, repair, or overhaul automotive vehicles. Sample reported job titles include:

- Service Technician
- Quick Service Technician
- Mechanic
- Master Automotive Technician
- Automotive Drivability Technician
- Automobile Mechanic
- Heavy Line Technician

According to available labor market data, each year, employers in San Diego County and Imperial County will need to hire 644 and 43 workers, respectively, to fill new jobs and backfill jobs resulting from attrition (e.g., turnover, retirement) between 2021 and 2026. In other words, the San Diego-Imperial region has labor market demand of 687 annual job openings for Automotive Service Technicians and Mechanics.

Labor Market Demand for *Automotive Service Technicians and Mechanics* (Projected Annual Job Openings Between 2021 and 2026)





Additional ICE & BEV Forecasting through 2045

According to the recently published report, "Driving California's Transportation Emissions to Zero", California will see an influx of new jobs in ZEV and associated sectors at the same time that jobs related to fossil-fuel burning internal combustion engine vehicles (ICE) substantially decline. The workforce contractions are a result of several ZEV trends, all of which are beneficial to consumers, businesses, and the government. These trends include shrinking fleets and gains in fuel economy that can shape the market independently of policy (11).

Workforce Impacts Related to ICE Engines:

The greatest number of job reductions will occur in jobs related to internal combustion engine (ICE) maintenance, which are estimated to decline from over 400,000 FTEs in 2020 to less than 100,000 by 2045.

BY SECTOR	ESTIMATED ANNUAL FTEs		
	2020	2045	2020-2045
New ICEV Sales			
Auto Repair & Maintenance	275,990.51	55,767.30	-220,223.22

ZEVs incur **lower maintenance costs** than ICEVs across all major vehicle categories. This translates to less spending on maintenance therefore, fewer maintenance jobs.

Workforce Impacts Related to Battery Electric Vehicle (BEV) Sales, Fuels, and Maintenance The adoption of BEVs is projected to create over 4.8 million FTE job-years in California over the next 25 years through labor related to sales, consumption of electricity as a transportation fuel, and maintenance.

In the later years, a significant amount of job growth is generated from labor-intensive maintenance industries for the ever-growing BEV and FCEV fleets.

BY SECTOR	OCCUPATION	FTE JOBS 2020-45
New BEV Sales	Vehicle & Mobile Equipment Mechanics, Installers, & Repairers	296,001.41
BEV Maintenance	Vehicle & Mobile Equipment Mechanics, Installers, & Repairers	330,851.10

Public Hearing to Consider the Proposed Advanced Clean Cars II Regulations.

According to a report which proceeded the approved regulation on August 25, 2025, the California Air Resources Board (CARB) projects that California will experience a contraction in automotive repair and maintenance workers of over 127,800 between 2026 and 2040 (12). Their projections see the largest declines of over 5 figures starting in 2030.

EDUCATIONAL SUPPLY

Educational supply for an occupation can be estimated by analyzing the number of awards in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes (13). There are two TOP codes and three CIP codes related to Automotive Service Technicians and Mechanics seen below.

RELATED TOP AND CIP CODES FOR AUTOMOTIVE SERVICE TECHNICIANS AND MECHANICS (13)

AUTOMOTIVE SERVICE TECHNICIANS & MECHANICS	
TOP 0948.00:	Automotive Technology
TOP 0948.40:	Alternative Fuels and Advanced Transportation Technology
CIP 47.0604:	Automobile/Automotive Mechanics Technology/Technician
CIP 47.0612:	Vehicle Emissions Inspection and Maintenance Technology/Technician
CIP 47.0614:	Alternative Fuel Vehicle Technology/Technician

There are currently seven community college programs supplying awards for *Automotive Service Technicians and Mechanics*: Cuyamaca College, Imperial Valley College, MiraCosta College, Palomar College, San Diego College of Continuing Education, San Diego Miramar College, and Southwestern College. Additionally, there is one non-community-college institution that provides awards for this occupation, United Education Institute-Chula Vista.

COLLEGES SUPPLYING AWARDS FOR AUTOMOTIVE SERVICE TECHNICIANS AND MECHANICS

COMMUNITY COLLEGES



CUYAMACA COLLEGE



IMPERIAL VALLEY COLLEGE



MIRACOSTA COLLEGE



PALOMAR COLLEGE



**SAN DIEGO COLLEGE OF
CONTINUING EDUCATION**



SAN DIEGO MIRAMAR COLLEGE



SOUTHWESTERN COLLEGE

NON COMMUNITY COLLEGES



UNITED EDUCATION INSTITUTE-CHULA VISTA

According to the California Community Colleges Chancellor's Office LaunchBoard (14), the number of unduplicated students who earned an award for Automotive Technology (0948.00) programs in program years 2017-18, 2018-19, and 2019-20 were 288, 297, and 449, respectively. This is a three-year average of 344 students (labor market supply) for the San Diego-Imperial region.

SAN DIEGO-IMPERIAL COMMUNITY COLLEGE STUDENTS (UNDUPLICATED) WHO EARNED A DEGREE OR CERTIFICATE IN AUTOMOTIVE TECHNOLOGY (0948.00)

Program Year	Number of Unduplicated Students who Earned an Award
2017-18	288
2018-19	297
2019-20	449
3-Year Average	344

According to available labor market data, the non-community-college institutions supply **48** awards for this occupation. The total supply for the San Diego-Imperial region is **392**.

DEMAND VS. SUPPLY

Comparing labor demand with labor supply suggests that there is supply gap for this occupation in the San Diego-Imperial region.

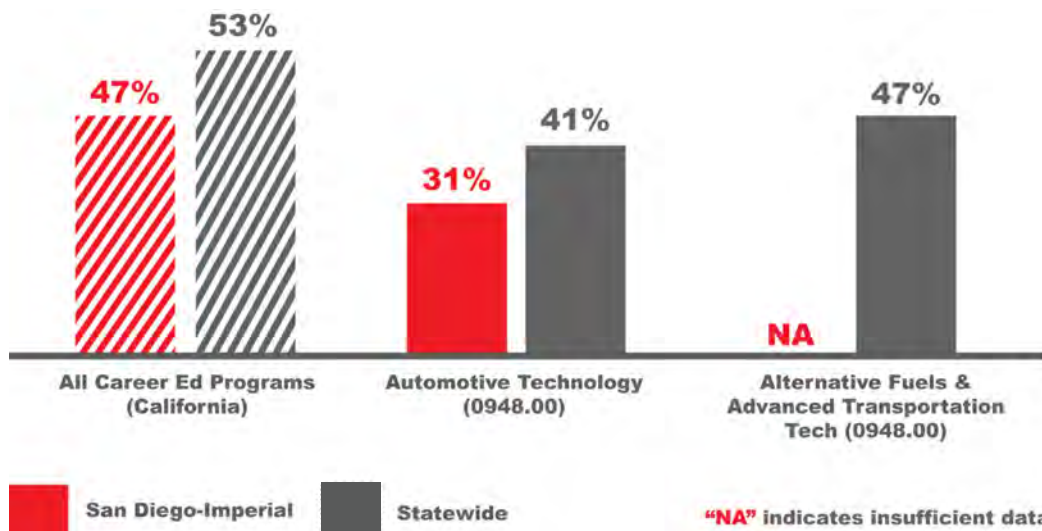
LABOR DEMAND (ANNUAL OPENINGS) COMPARED WITH LABOR SUPPLY (AVERAGE ANNUAL AWARDS)

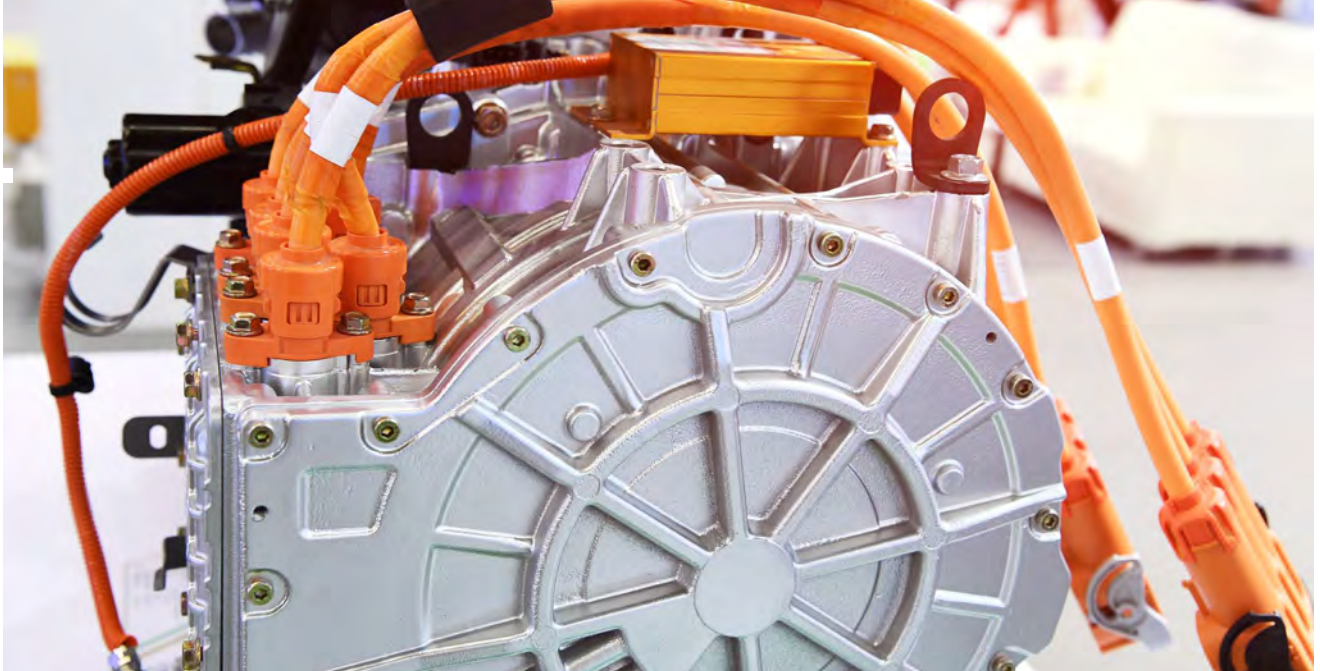
Community Colleges & Other Postsecondary Educational Institutions	Demand (Annual Openings)	Supply (Annual Avg. Supply)	Supply Gap or Oversupply
San Diego - Imperial	687	392	295

STUDENT OUTCOMES

According to LaunchBoard data, 31% of students in the San Diego-Imperial region earned a living wage after completing a program related to Automotive Service Technicians and Mechanics (TOP 0948.00), compared to 41% statewide and 53% of students in Career Education programs across the state (Exhibit 8). This also reflects a 2% increase across the board since 2017-18.

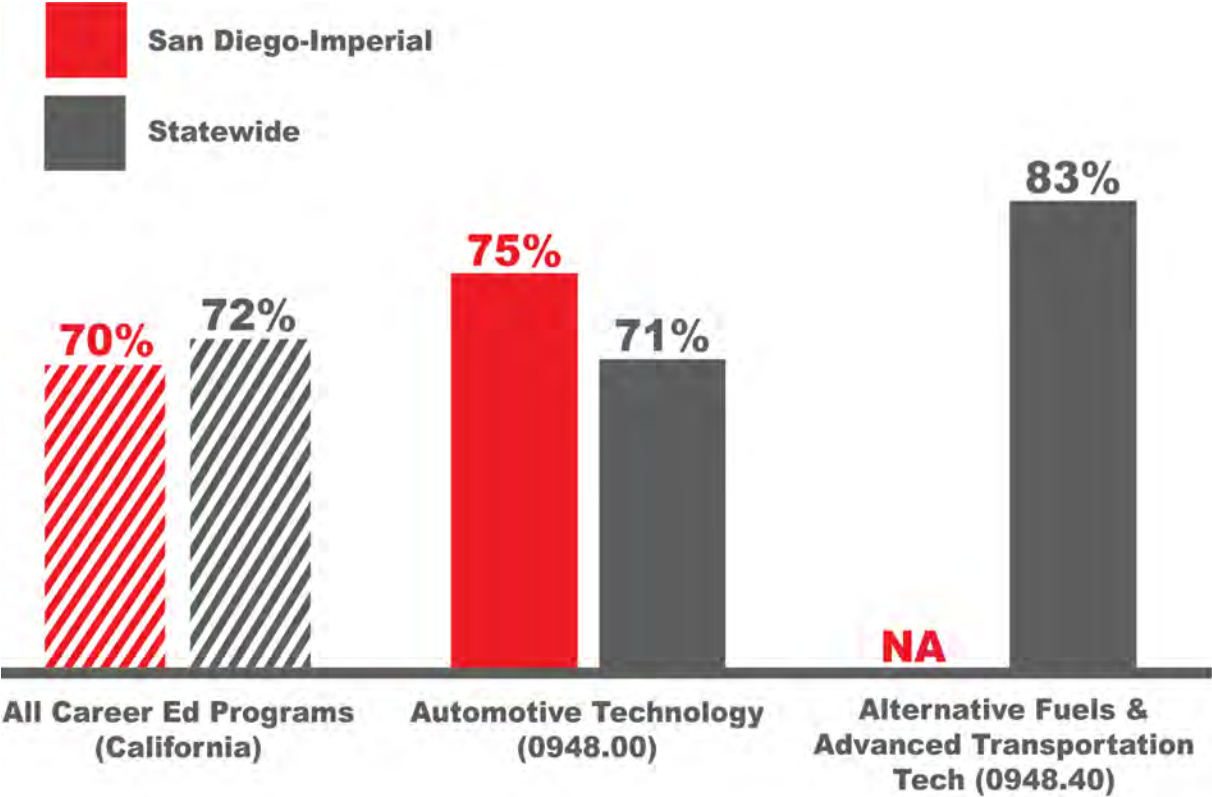
THE PROPORTION OF STUDENTS WHO EARNED A LIVING WAGE BY PROGRAM, PY2018-19 (15)





LaunchBoard data also shows that 75% of students in the San Diego-Imperial region obtained a job closely related to their field of study after completing a program related to *Automotive Service Technicians and Mechanics* (TOP 0948.00), compared to 71% statewide and 72% of students in Career Education programs throughout the state. San Diego was able to increase its performance by 7% since the 2016-17 academic year, now outperforming in this area.

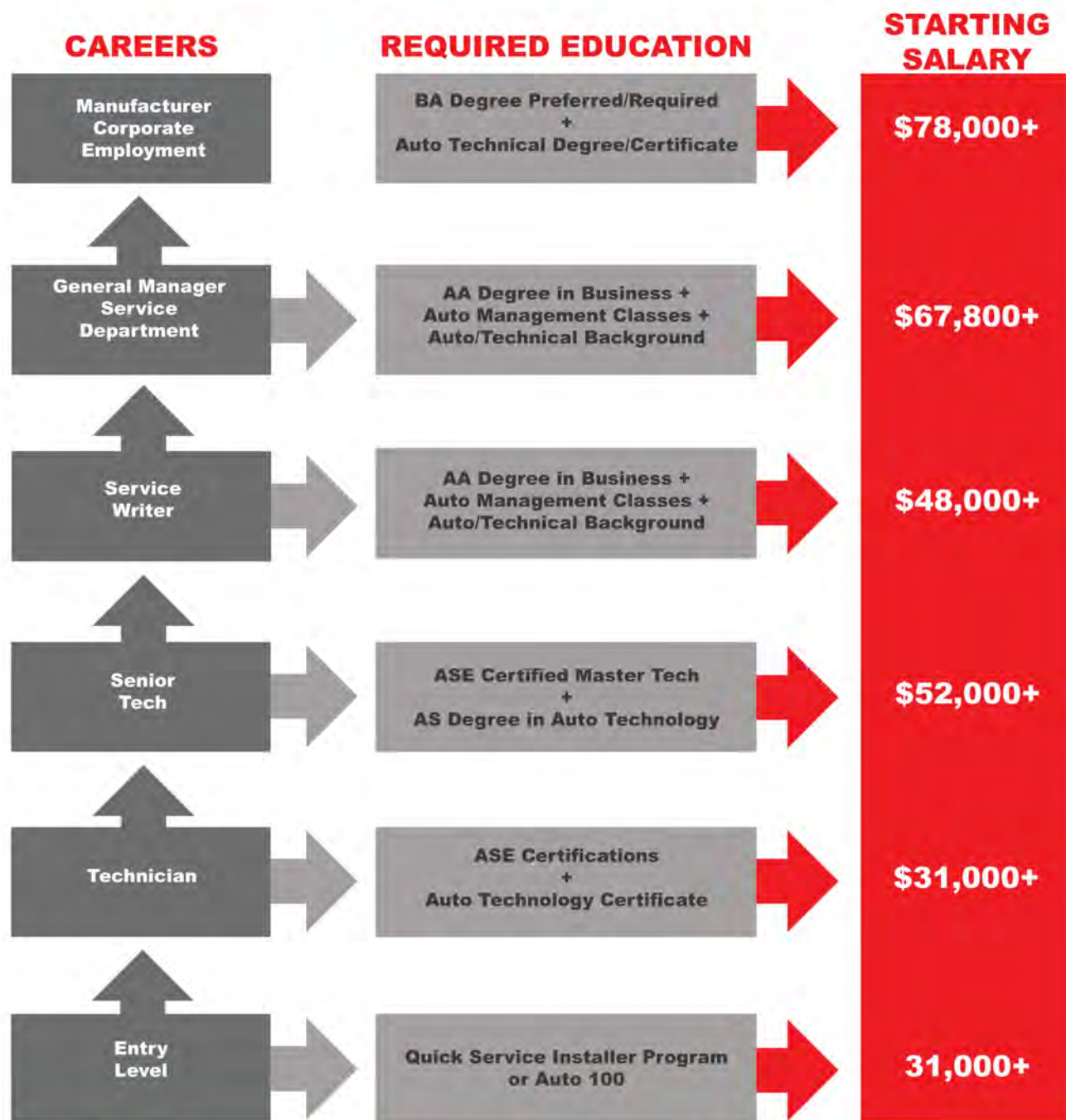
PERCENT OF STUDENTS IN A JOB CLOSELY RELATED TO FIELD OF STUDY BY PROGRAM, PY2017-18 (16)



NA indicates insufficient data

AUTO TECHNICIAN CAREER PATH

Most Employers prefer to hire employees who have completed a vocational or community college automotive technical program



Salary information based on feedback from various Service Managers throughout Southern California. These Salaries represent the lowest figures provided.

Nationally, the majority of people employed as Automotive Service Technicians and Mechanics have a 'postsecondary non-degree award' as their highest level of educational attainment.

CALIFORNIA EDUCATIONAL ATTAINMENT FOR AUTOMOTIVE SERVICE TECHNICIANS AND MECHANICS

EDUCATION LEVEL	PERCENTAGE
Less Than High School Diploma	21%
High School Diploma or Equivalent	34%
Some College, No Degree	28%
Associate's Degree	12%
Bachelor's Degree	5%

INDUSTRY CERTIFICATIONS

The industry-standard certifications are from the National Institute for Automotive Service Excellence (ASE). There are currently 58 ASE certifications tests, covering almost every aspect of automotive repair and service. Please see <https://www.ase.com/test-series> for more information on the individual ASE tests.

While ASE certifications are the industry standard for educators and independent shops, manufacturers and new car dealers place more value on their own internal manufacturer training and continuing education.



INDUSTRY SECTOR PATHWAY

Secondary Courses (Technical)	Community College Programs	Pathway Options	Employment Opportunities
<p>Most H.S. Level Programs Organize Their Courses as Follows:</p> <p>Intro to Auto 1</p> <ul style="list-style-type: none"> • Overall Systems • Basic Theory • Some Tires <p>Intro to Auto 2</p> <ul style="list-style-type: none"> • Electronics/Electrical • Brakes <p>Intro to Auto 3</p> <ul style="list-style-type: none"> • Suspension Chassis • Steering <p>M.L.R. Preparation</p> <ul style="list-style-type: none"> • MLR 1, MLR2, MLR3 <p>Additional Opportunities:</p> <p>AYES Opportunity ASE Preparation ASE Student Certificate</p> <p>Secondary (Academic)</p> <p>Math</p> <ul style="list-style-type: none"> • Measuring • Conversions • Angles <p>Reading Standard Documents & Instructions Communications Oral/Written Computer Applications Interpreting Diagrams & Charts Information Retrieval & Data</p>	<p>Most College Level Programs Organize Their Courses as Follows:</p> <p>ASE 1-9 ordered</p> <ul style="list-style-type: none"> • Engine Repair • Auto Transmissions • Man. Transmissions • Suspension • Brakes • Electrical • A/C • Engine Performance • Diesel/Heavy Duty <p>Advanced Course Opportunities Include:</p> <p>Electric & Hybrid Technologies Alternative Fuels/CNG/LNG Emissions Testing On-Board Computer Systems Software Tech Networking Auto Machining</p> <ul style="list-style-type: none"> • Frame Repair • Paint • Welding & Cutting 	<p>Which Path? More Education or Enter Workforce</p> <p>Community College Prep Programs</p> <p>Business Education</p> <ul style="list-style-type: none"> • Business Plan • Supervision • Customer Service • Inventory Mgt. • Financial Mgt. <p>Transfer Preparation</p> <ul style="list-style-type: none"> • Math • Physics • Gen. Ed • CSU/IGETC <p>4-Year Transfer/Degree</p> <ul style="list-style-type: none"> • Business Management • Electrical Engineering • Mechanical Engineering • Software Engineering • Environmental Engineer 	<p>Entry Level:</p> <p>Lube-Tech Tire & Battery Service Porter (Lot) Parts Counter/Delivery Inspection Auto Body Tech Glass Installer Upholstery/ Interior Audio/Sound/Network Tuner Small Engine Repair Assemblers Emissions/Smog Check Tech HVAC Tech</p> <p>Middle Skill:</p> <p>Service Manager Shop Foreman Team Leader/Master Tech Quality Control Service Writers Cylinder Block Spec Cylinder Head Machining Machining (CNC) Motorcycle Mechanic Disassemblers Retail Dealer</p> <p>High Skill:</p> <p>Owner/Entrepreneur Data Acquisition/Analysis Tech Factory Engineering Tech Teacher Software Engineering High-Performance Engineering</p>



WARNING / 警告 / 경고
HIGH VOLTAGE INSIDE
• DO NOT remove these covers and/or connectors.
内部高電圧
• このカバー及びコネクタは絶対に取り外さないで下さい。
내부에 고전압 발생
• 이 커버 및 코넥터는 절대로 제거하지 마십시오.
內有高压电
• 請勿必要打拆此蓋子和線下此连接器。
內有高压電
• 請勿必要打拆此蓋子和線下此连接器。

“ Much of California’s Transition to ZEV’s will happen by “greening many existing occupations, rather than creating new, niche “green” occupations. This presents the state with a golden opportunity to create not only new, high-quality jobs, but to also ensure that many existing industries and occupations transition to better practices ⁽¹¹⁾.

WAGES

According to available labor market information, the entry-level and median hourly earnings for Automotive Service Technicians and Mechanics is \$14.82 and \$21.43, respectively (Exhibit 12). The median advertised salary for Automotive Service Technicians and Mechanics is approximately \$21.43 (17).

EXHIBIT 12: WAGES FOR AUTOMOTIVE SERVICE TECHNICIANS AND MECHANICS



LIVING WAGES

- MIT Living Wage Calculator, Calculation for San Diego County \$23.06 (14)
- City of San Diego, Compliance Department, Office of Labor Standards Enforcement \$17.91 (15)
- Insight Center, Family Needs Calculator for San Diego \$18.43 (16)

Students trained as *Automotive Service Technicians and Mechanics* may also be qualified for the following occupations found in the SOC system. The following exhibit provides an overview of their wages.

EXHIBIT 13: WAGES OF OCCUPATIONS RELATED TO AUTOMOTIVE SERVICE TECHNICIANS AND MECHANICS

SOC CODE	OCCUPATIONAL TITLE	ENTRY-LEVEL HOURLY EARNINGS (25th PERCENTILE)	MEDIAN HOURLY EARNINGS
49-1011	First-Line Supervisors of Mechanics, Installers, and Repairers	\$29.16	\$37.04
49-3042	Mobile Heavy Equipment Mechanics	\$23.15	\$29.48
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	\$23.13	\$29.16
49-3021	Automotive Body and Related Repairers	\$20.68	\$28.52

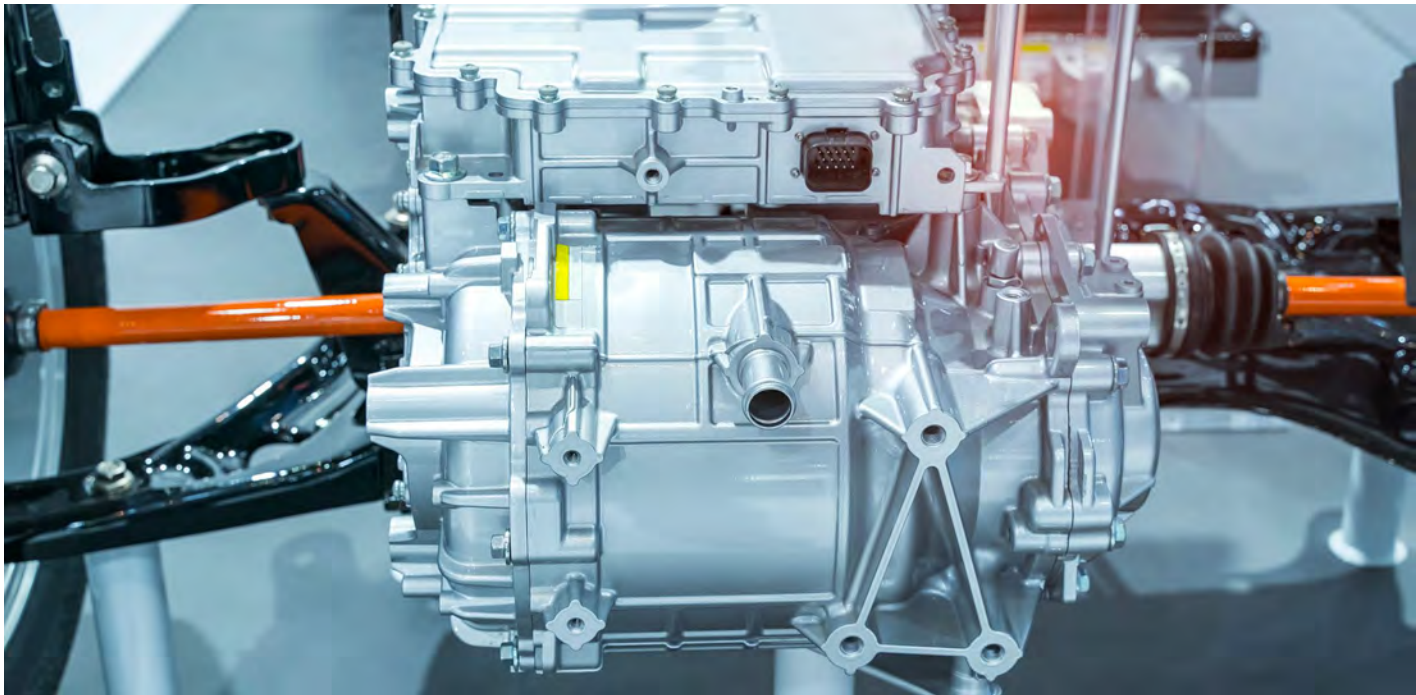
KNOWLEDGE, SKILLS AND ABILITIES

SOFT SKILLS	TECHNICAL SKILLS	SPECIALIZED SKILLS
Problem Solving	Tires	Hybrid
Customer Service	Batteries	HVAC
Sales	Suspension	Electric Motors, Wiring and Modules
Troubleshooting	Brakes	High Voltage Batteries
Management	Computer Systems	High Voltage Safety
Communications	ASE	Software Diagnosis and Uploading
Operations	Preventative Maintenance	ADAS
Driving	Electrical Systems	
Trust	Hydraulics	
Leadership	Diagnosis	

EMPLOYER MAKE-UP

109 New Car Dealers in San Diego County Supporting brands such as Toyota, Volkswagen, Volvo, Mazda, Ford, Acura, Audi, Honda, Kia, BMW, Chrysler-Jeep-Dodge-Fiat, Hyundai, Subaru, Chevrolet, Mitsubishi, Infiniti, Jaguar-Land Rover, Lexus, Cadillac-Buick-GMC, Mercedes-Benz, Mini, Bentley-Bugatti-Lamborghini-Rolls Royce-McLaren, and Porsche (21).

There are also multiple ZEV start-ups and related companies in San Diego. Some of these companies include American Lithium Energy, Transportation Power, Inc. (Meritor), Aptera Motors, Nuvve, Symbio North America, Tesla (sales + multiple service centers), and multiple micro-e-mobility start-ups.





Top Posted Job Titles (17):

- Automotive Technicians
- Lube Technicians
- Automotive Mechanics
- Service Technicians
- Mechanics
- Automotive Service Advisor
- General Service Technicians



Top Posting Companies (17)

- Pep Boys
- Valvoline
- Bridgestone Corporation
- CarMax
- Toyota
- Nissan North America
- LKQ
- Penske Automotive Group
- BMW of Encinitas
- Sonic Automotive



EMPLOYER SURVEY RESPONSES & INTERVIEW THEMES

Multiple industry advisors and local employers were interviewed and/or surveyed on a series of questions as well as asked about the Knowledge, Skills, and Abilities (KSAs) for this occupation. Below represent some common themes and figures.

1. **83%** of respondents agree that they see an increased need for more formal education, most indicating an associates degree.
2. **66%** fo respondents agree that ASE Certifications are *somewhat important* when choosing who to hire, while **16%** responded with it is *very important*, and **1** employer did not respond.
- 3: **100%** of respondents indicated there are not currently any industry certifications other ZEV related certifications they look for.
- 4: **100%** of respondents indicated they are experiencing a shortage of technicians.
- 5: **100%** of respondents agree that they expect the demand for technicians servicing EV and other zero emission vehicles to increase in the next 5-10 years.

"GM is expecting to be produce 1 Million EV vehicles per year in the year 2025"

"I expect an increase in demand for qualified technicians. Many of today's technicians are reaching retirement age and others are just not interested in switching over from ICE repairs to EV repairs"

"My suggestion is to start now or sooner than the 5 years as aging techs in dealerships now are retiring and we need 100% trained techs now to start the wave of EV"

Most employers interviewed or surveyed agreed that they would like to see colleges provide more courses in high voltage safety, basic and advanced electrical, electrical trouble shooting, and ADAS. Additionally, employers indicated that they would like to see more critical thinking and logic, specifically for those who hope to pursue a career in EVs.

EMPLOYER PROVIDED SALARY INFORMATION

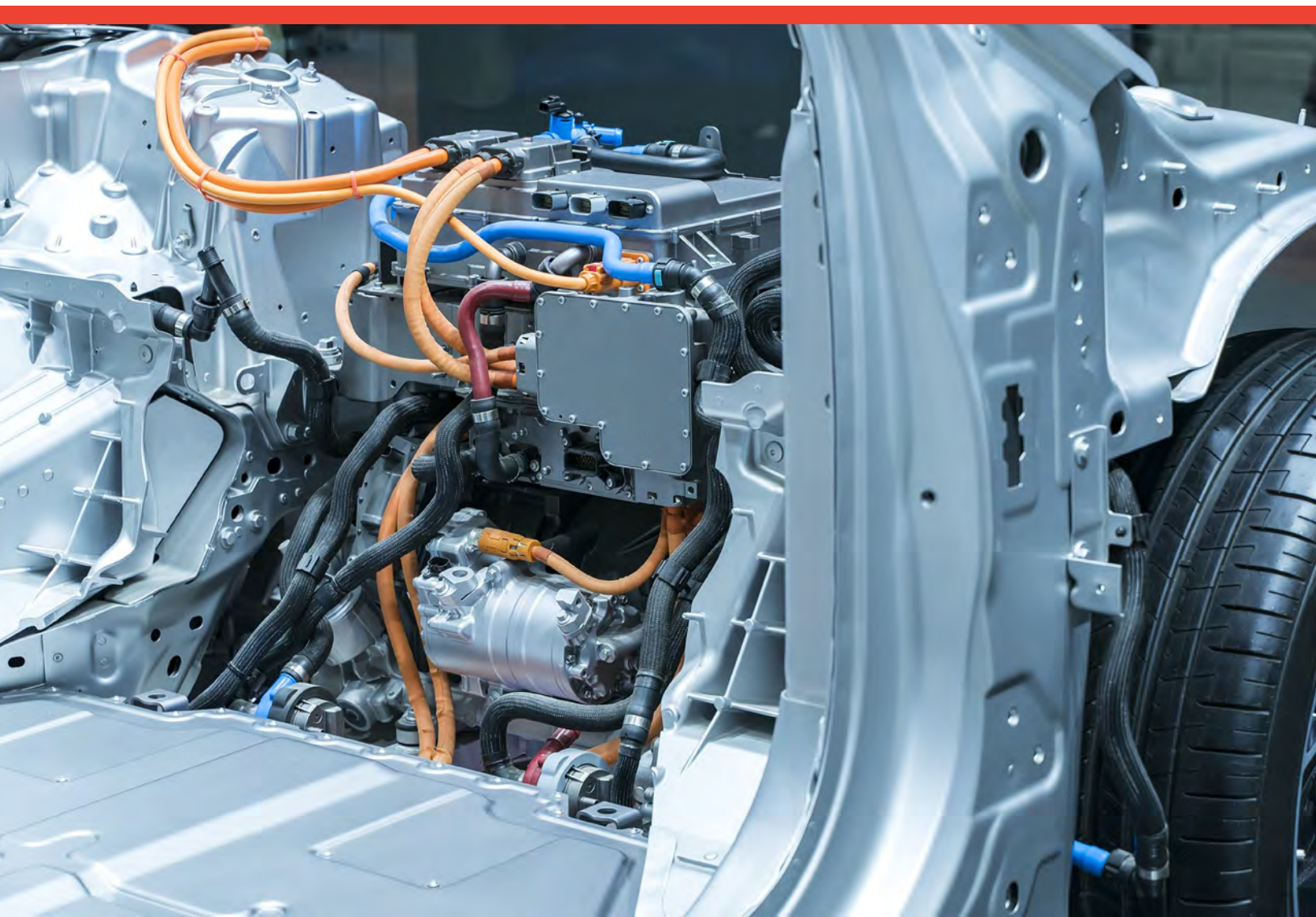
EXPERIENCE LEVEL	SALARY RANGE
Entry Level Technician (not a porter)	\$31,200 - \$72,000
Full-Time Technician (1-2 years)	\$52,000 - \$200,000
Service Writer	\$48,000 - \$225,000

The salary information is based on employer responses and include the lowest reported to the highest reported for each level of experience.

EV EDUCATION **STRATEGY** RECOMMENDATIONS

It is our opinion that programs should start innovating or risk obsolescence. The aforementioned studies and those included in the appendix predict the largest occupational decline resulting from Zero-Emission Vehicles will be automotive service mechanics. While the time horizon projections vary, most suggest these contractions will happen over the next few years and continue through 2045. Colleges and programs will need to start paying close attention to the labor market conditions, especially from 2024 moving forward, and adjust their programming appropriately.

All colleges with automotive programs were surveyed about their automotive programs and if they currently have or plan to incorporate electric vehicles training or hybrid systems training into their curriculum. The following page provides a high-level snapshot of the information collected.



WHAT ARE SAN DIEGO COLLEGES DOING IN THE EV SPACE?

MiraCosta College

- Current EV course or program?
- Plans to develop or are developing an EV program?
- If funding was available would you apply?
- Advisory Committee Recommendation?

Palomar College

- Current EV course or program?
- Plans to develop or are developing an EV program?
- If funding was available would you apply?
- Advisory Committee Recommendation?

Miramar College

- Current EV course or program?
- Plans to develop or are developing an EV program?
- If funding was available would you apply?
- Advisory Committee Recommendation?

San Diego Continuing Ed

- Current EV course or program?
- Plans to develop or are developing an EV program?
- If funding was available would you apply?
- Advisory Committee Recommendation?

Cuyamaca College

- Current EV course or program?
- Plans to develop or are developing an EV program?
- If funding was available would you apply?
- Advisory Committee Recommendation?

Southwestern College

- Current EV course or program?
- Plans to develop or are developing an EV program?
- If funding was available would you apply?
- Advisory Committee Recommendation?

Imperial Valley College

- Current EV course or program?
- Plans to develop or are developing an EV program?
- If funding was available would you apply?
- Advisory Committee Recommendation?

ADVISORY COMMITTEES

Programs should consider immediately adding new members to their advisory committees that include expanded pathways (like local EV manufacturing), Zero Emission Platforms, or Plug-in Hybrid advisors to help with the proposed transition.

PROFESSIONAL DEVELOPMENT

It is recommended that investments be prioritized to develop faculty capacity and expertise in this subject area through OEM training, private training, and other opportunities that will help inform curriculum development. Automotive technology is rapidly changing and becoming increasingly more technologically advanced, which requires continuous program improvement to stay relevant.

MARKETING

Both high school feeder and community college programs are reporting concerns over current and future enrollments. Additionally, with contractions in California's population fueled by migration as well as lower birth and fertility rates, this issue will only be exacerbated over time. Programs should start to create new enrollment strategies to keep programs filled and relevant.

NEW APPROACHES

Starting a ZEV/EV program provides new opportunities to market automotive programs and attract students who otherwise might choose a different path. The transition to electrification also helps remove the stigma of low pay, low tech, and dirty work environments. Each day the auto industry becomes more intertwined with the tech industry, increasing autonomy, connected vehicles, the Internet of Cars (IoC), and new cleaner propulsion, providing more outreach and pathways opportunities.

Automotive programs should consider slowly transitioning to a more technology-based marketing design. Younger generations or "digital natives" are interested in pursuing technology-forward programs over the analog ones of years past, which is what our high school partners at San Diego Unified report as a concern for enrollment in their automotive programs. This concept was also echoed at recent advisory committee meetings at San Diego Miramar College. Additionally, younger generations are increasingly more environmentally conscious. According to a recent study, 87% of Gen Zers report being concerned for the environment. Starting and marketing a program through these lenses could help attract and retain different populations who want to help advance the adoption of a more environmentally friendly transportation ecosystem.



Light-duty vehicles—cars, SUVs, minivans, and pickup trucks—are currently responsible for 70% of transportation emissions in California. Transition to a zero-carbon transportation system depends on a rapid shift to ZEVs, which could include a mix of battery-electric vehicles (BEVs), plug-in hybrid vehicles running primarily on electricity (PHEVs), and hydrogen fuel cell electric vehicles (FCEVs)

(11)

Colleges should also explore marketing comprehensive career pathways at multiple educational levels. There are many automotive career track opportunities for the mechanically inclined and interested. Programs should look for opportunities to create materials or interviews that can illustrate these. An example could include a local employer, like TransPower/Meritor, an EV manufacturer that hires technicians to work on their products and prototypes. While many pathways will lead to dealerships and independents, many could also lead to the manufacturing and start-up side of the industry.

Another suggestion is to build and develop new partnerships and pathways for automotive technology students. Local manufacturers such as TransPower/Meritor and Symbio North America need transportation techs and mechanically inclined employees to help develop tomorrow's workforce. New approaches to traditional automotive programs could help programs grow into this new transportation system.

HIGH SCHOOL PARTNERSHIPS

Colleges should consider cultivating more in-depth partnerships with their local feeder programs, since they provide a critical pipeline of students. For example, colleges could help these programs write K12 Strong Workforce Proposals to become ASE accredited or to purchase lab equipment such as Switch Vehicles (EV trainers and curriculum) to better align curriculum and build more robust student pipelines.

ASE Alignment:

Many of the recommendations below align with an ASE Certification number. There are 58 ASE certification tests, which cover most aspects of the automotive repair and service industry. The following represent the ASE Certs utilized in the recommendations.

Automobile & Light Truck Certification Tests (A1 - A9)

- Suspension & Steering (A4)
- Brakes (A5)
- Electrical/Electronic Systems (A6)

Auto Maintenance and Light Repair Certification Test (G1)

- Auto Maintenance and Light Repair

Advanced Engine Performance Specialist Certification Test (L1)

Light Duty Hybrid/Electric Vehicle Specialist Certification Test (L3)

Advanced Driver Assistance Systems (ADAS) Specialist Certification Test (L4)

CURRICULUM

The recommendations below are suggestions and should be vetted by local advisory committees, curriculum committees, and any relevant factory partnerships or associations.

Programs should consider a staggered roll-out rather than a shotgun approach. This approach should help mitigate some risk, allow programs to test success, and make improvements over the next 5-10 years, ensuring the program is in line with industry trends and forthcoming regulations.

CREDIT OPTIONS

The following courses can be considered as part of the certificate offered by a college, which aligns with the aforementioned ASE certifications:

Course Recommendations

Introduction to Automotive Technology (G1)

Automotive Suspension, Steering, and Wheel Alignment (A4)

Automotive Brake Systems (A5)

Automotive Electrical/Electronic Systems (A6)

Automotive Heating & Air Conditioning (A7)

Introduction to Hybrid/Electric Vehicle (L3)

Additional Courses to be added in a stackable format:

Advanced Driver Assistance Systems (L4)

Advanced Electrical/Electronics Diagnostics (Knowledge of circuit boards, processors, chips, electronics, and computer hardware and software, including applications and programming)

Automotive Customer Service (Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction)

Time Management

Work Ethics

Team Building

NON-CREDIT/NO-CREDIT OPTIONS

These options are intended for campuses that do not offer for-credit but have identified a need in supporting the Alternative Fuel industry segment:

Course Recommendations

General Safety

High Voltage Safety

Automotive Brakes Systems

Automotive Suspension, Steering and Wheel Alignment (A4)

Automotive Electrical/Electronic Systems (A6)

Automotive Heating & Air Conditioning (A7)

Introduction to Hybrid/Electric Vehicle (L3)

Customer Service

Time Management

Work Ethics

FEE-BASED/CONTRACT EDUCATION OPTIONS

There will be a market opportunity for upskilling technicians already working in the field who are not supported by a manufacturer. While this will not be immediate, independent shops will eventually need to understand the technology. Additionally, there are opportunities to train first responders, tow truck drivers, and similar occupations on EV safety, which has been a continued request from SANDAG. Courses could include certifications:

Course Recommendations

Introduction to Hybrid/Electric Vehicle (L3)

General Safety

High Voltage Safety

Automotive Electrical/Electronic Systems (A6)

SAMPLE STUDENT LEARNING OUTCOMES

SLO Recommendations

Diagnose and repair high voltage battery system concerns

Test internal combustion engine for proper operations (Hybrid systems)

Test drive for proper operations

Diagnose and repair power electronics

Diagnose and repair hybrid supporting system



REPORT

ENDNOTES

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3. Executive Department State of California, 2020, Executive Order N-79-20 - <https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf>
4. California Air Resources Board, ZEV Collaboration - <https://ww2.arb.ca.gov/zev-collaboration>
5. Loren McDonald, 2019, Historical Sales Data: IHS Markit/Auto Manufacturers Alliance, Advanced Technology Sales Dashboard. EVAAdoption.com
6. New Car Dealers Association San Diego County, 2022-Q1, San Diego Auto Outlook, Comprehensive Information on the San Diego County New Vehicle Market <https://www.ncda.com/wp-content/uploads/2022/04/San-Diego-Auto-Outlook-Q1-2022.pdf>
7. Q2 2022 data update: Cumulative data from 2011 - 2022. Posted August 2022. Data source: California Energy Commission (2022). Sourced from: https://www.veloz.org/wp-content/uploads/2022/08/EV-Market-Dashboard_220818.png
8. Kelly Blue Book, 2022, Electric Vehicle Sales Hit New Record in Fourth Quarter of 2021, According to New Kelley Blue Book Report - <https://mediaroom.kbb.com/2022-01-28-Electric-Vehicle-Sales-Hit-New-Record-in-Fourth-Quarter-of-2021,-According-to-New-Kelley-Blue-Book-Report>
9. Cox Automotive, 2022, Strong Finish: EV Sales Mark New Record in Fourth Quarter of 2021 - <https://www.coxautoinc.com/market-insights/strong-finish-ev-sales-mark-new-record-in-fourth-quarter-of-2021/>
10. The Standard Occupational Classification (SOC) system is used by federal statistical agencies to classify workers into occupational categories for the purpose of collecting, calculating or disseminating data. bls.gov/soc
11. Brown, A. L; Sperling, D.; Austin, B.; DeShazo, JR; Fulton, L.; Lipman, T., et al. (2021). Driving California's Transportation Emissions to Zero. UC Office of the President: University of California Institute of Transportation Studies. <http://dx.doi.org/10.7922/G2MC8X9X> Retrieved from <https://escholarship.org/uc/item/3np3p2t0>
12. California Air Resources, 2022, Public Hearing to Consider the Proposed Advanced Clean Cars II Regulations - <https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2022/acii/isor.pdf>
13. TOP data comes from the California Community Colleges Chancellor's Office MIS Data Mart (datamart.cccco.edu) and CIP data comes from the Integrated Postsecondary Education Data System (nces.ed.gov/ipeds/use-the-data)
14. "California Community Colleges Strong Workforce Program," California Community Colleges, calpassplus.org/LaunchBoard/SWP.aspx.

15. California Community Colleges Strong Workforce Program, California Community Colleges Among completers and skills builders who exited, the proportion of students who attained a living wage. [calpassplus.org/ LaunchBoard/SWP.aspx](https://calpassplus.org/launchboard/SWP.aspx) - *Most recent year with available data is Program Year 2018-19. Among students who exited the community college system and who did not transfer to any postsecondary institution, median earnings following the academic year of exit.*

16. California Community Colleges Strong Workforce Program, Percentage of Students in a Job Closely Related to Field of Study. [calpassplus.org/LaunchBoard/SWP.aspx](https://calpassplus.org/launchboard/SWP.aspx) Most recent year with available data is Program Year 2017-18. *Percentage of Students in a Job Closely Related to Field of Study: Among students who responded to the CTEOS, the percentage reporting employment in the same or similar field as their program of study.*

17. Emsi Q1 2022; QCEW, Non-QCEW, Self-Employed

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19. City of San Diego, Compliance Department Office of Labor Standards Enforcement, 2022, Living Wage Rates -<https://www.sandiego.gov/sites/default/files/lwowagerates.pdf>

20. Insight Center, Family Needs Calculator - <https://insightcced.org/family-needs-calculator/>

21. New Car Dealers Association San Diego County - <https://www.ncda.com/dealer-locations/>

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APPENDIX A

JOB POSTING EXAMPLES

EXAMPLE 1: TESLA

Example of Tesla posting Qualified motor mechanic, Diagnostic Technician, and/or Master Technician. Factory Trained Master or Diagnostic Technician Status/OEM Training. Knowledge of methods, techniques, parts, tools, and materials used in the maintenance and repair of vehicles including testing, diagnosis, HVAC service, hydraulic, brakes, testing, and repair of electronic systems and modules. Knowledge of extensive skill and experience using diagnostic scan tools, following diagnostics, and operating scopes. Hybrid Experience a Bonus. Valid driver's license and insurance required. HVAC Licensing that meets local standards is preferred. Good verbal English capabilities.

EXAMPLE 2: LION ELECTRIC

- Performs maintenance and repair activities on Lion Electric vehicles
- Perform routine maintenance checks and adjustments on such things as fluid levels, hoses, brakes, tires, and electrical components
- Diagnose, service and repair various systems that are found on Lion Electric vehicles:
 - Brakes
 - Cooling system
 - Drivetrain components
 - Electrical motors, wiring, and modules
 - High voltage batteries
 - Heating and air conditioning
 - Steering and suspension system
 - Software diagnosis and uploading
 - Ability to read schematics and troubleshoot fault codes
 - Ability to install various types of camera systems

Desired Experience, Education, Skills and Knowledge:

- 3+ years experience as a Diesel or Heavy Vehicle Mechanic
- Ability to use standard desktop load applications such as Microsoft Office and Internet functions
- Understanding of computer testing technologies
- Understanding of Electric Vehicles (EV) systems and technology
- Ability to lift heavy parts and equipment
- Excellent communication and customer service skills
- Must have or be able to obtain a Class B license
- Must have a valid driver's license and maintain a good driving record

EXAMPLE 3: RIVIAN

- 2 + years of automotive service experience - Repair, Diagnostic and other auto tech work.
- These openings range from entry-level up to Master Certified Technicians.
- Automotive Technology or Technician Degree or equivalent experience / Certificate (nice to have)
- 2+ years of EV experience preferred (nice to have)
- OEM specific technician training is a plus
- Must possess a valid driver's license
- Knowledge of EV Powertrains and HV systems (nice to have)
- Strong written and communications skills
- Strong organization skills with attention to detail
- Experience using a variety of test tools including a PICO-scope, PCAN, Kavaser Memorator, and breakout box is a plus
- Bumper-to-bumper diagnosis and repair experience, including electrical diagnostics experience. High voltage systems experience is preferred
- Experience mentoring and coaching other technicians preferred

APPENDIX B

EXAMPLE LEADING PROGRAMS

Cerritos College: CENTER FOR ADVANCED TRANSPORTATION TECHNOLOGY

College Website: <https://www.cerritos.edu/auto/slider-descriptions.htm>

Lead Faculty: Joe Mulleary (Department Chair)

Rio Hondo College: Alternative Fuels

College Website: <https://www.riohondo.edu/altfuels/>

Lead Faculty: John Frala

APPENDIX C

EQUIPMENT

The below equipment are some examples of what is being used at multiple colleges to augment hands-on training throughout California.

L.A.B Corporation: Lucas-Nulle training systems

Website: <https://www.lucas-nuelle.us/2765/apg/367/Products/Automotive-%7C-Hybrid-EV.htm>

Rep: David Bjurlin. Cell 480-319-1168. Email: David@labcorp.edu Web: www.LABCorpEdu.Com

(Southwestern College purchased these units)

Switch Vehicles

Website: <https://theswitchlab.com/>

Owner: Peter Oliver. Phone 707-829-5746

LJ Create: Hybrid & Electric Vehicle Systems Panel Trainer

Website: <https://ljcreate.com/automotive-technology/hybrid-vehicle-systems-panel-trainer/>

Rep: Joe Ray. Phone 760-412-9652. Email: joe@kleineducational.com

PHASE 01

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