Zero Emission Vehicle Incentive Program Strategy

Existing Conditions Report

May 2024

SANDAG

Acknowledgements

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Executive Summary

The San Diego Association of Governments (SANDAG) has proposed a Zero-Emission Vehicle Incentive Program (ZEVIP) as part of its 2021 Regional Plan and Sustainable Communities Strategy. This program aims to facilitate the purchase or lease of approximately 100,000 new or used light-duty vehicles between 2025 and 2035. One of the main goals of the ZEVIP is to make it easier for residents in communities that have historically been underserved (or underrepresented, or subject to discrimination) to purchase zero-emissions vehicles (ZEVs).

The Existing Conditions Assessment (Assessment) is the first element of the proposed ZEVIP and serves as the foundation for program development. The Assessment provides a comprehensive understanding of the following key considerations and drivers for a regional ZEVIP:

Existing ZEV Incentive Programs – Program managers and representatives of existing ZEVIPs were interviewed to understand best practices pertaining to program administration, social equity considerations, tracking metrics, incentive structures, outreach & education, and vehicle eligibility. Program priorities and design should consider the importance of "stacking" incentives for low- and moderate-income communities, to ensure local, state, and federal programs can be used for the same purchase for maximum cost-burden relief.

ZEV Policy Considerations – State policy documents were reviewed to understand various regulations impacting electric vehicle (EV) adoption in the coming years, including targets for 100% ZEV sales for passenger vehicles, and medium- and heavy-duty vehicles by 2035 and 2045, respectively. Regional planning documents were also reviewed to understand local EV and equity goals, recommendations, and challenges to ZEV uptake. Understanding stated goals and efforts to-date offers areas for a regional ZEVIP to improve social equity in ZEV ownership, support a used and new EV market, and electrify flexible fleets.

ZEV Market Conditions – New EV model availability was assessed using a proprietary EV Library database, which tracks the 500+ vehicles and non-road equipment offerings available. There are a total of 375 trims across all ZEV models and standard and premium packages. Current light-duty ZEV market is primarily made up of sedan and SUV offerings. Together, sedans and SUVs represent 64 percent of all light-duty ZEV models available. However, the demand for different EV body styles is trending upwards, especially as more consumers look to switch to EV.

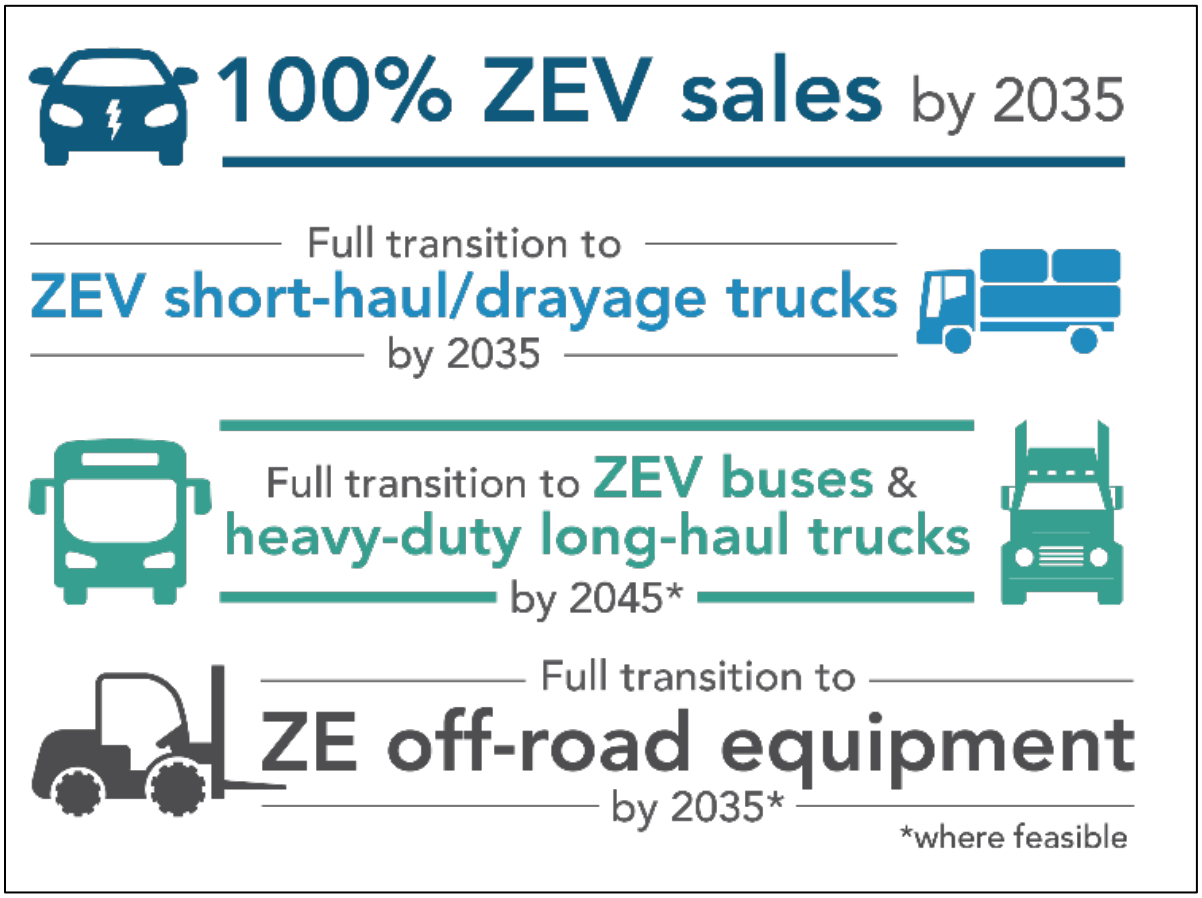
Regional Consumer Trends – Regional trends in vehicle registration in San Diego were assessed to understand the current EV landscape in San Diego including ZEV ownership, consumer demographics and preferences. Trends indicate a shift from new vehicle purchases to used purchases, as well as the retaining of vehicles for longer periods. Correlations between ZEV ownership and socioeconomic data indicate that where ZEV penetration from zip codes who fall within the top 10% income level is five times more than those who are among the bottom 10% income level.

The following Assessment provides additional detail on existing programs, policies, and market conditions and identifies needs, challenges, and preferences of the target market the ZEVIP aims to serve. An evidence-driven approach will be followed ensuring that the subsequent phases of program development fit the practical, real-world situation and enable the creation of a ZEVIP that maximizes impact and inclusivity.

1. Introduction

California has set ambitious climate targets and enacted policies to accelerate the adoption of zero-emission vehicles (ZEVs) statewide. In September 2020, Governor Newsom signed Executive Order N-79-20, targeting 100% ZEV sales for passenger vehicles by 2035, and 100% medium and heavy-duty vehicles by 2045 where feasible. The California Air Resources Board (CARB) recently enacted the Advanced Clean Cars II (ACCII)[1] regulation, requiring all new light-duty (LD) passenger vehicles sold in California to be zero-emission by 2035. California's ZEV sales have also grown rapidly in recent years, reaching nearly 346,000 passenger ZEVs in 2022, accounting for almost 19% of the total LD vehicle market.[2]

FIGURE 1: CARB ADVANCED CLEAN CARS REGULATIONS



Source: California Air Resources Board

The San Diego Association of Governments (SANDAG) is working to help the region transition to ZEVs as one of the ways to reduce greenhouse gas (GHG) emissions from passenger vehicles. SANDAG has proposed a Zero-Emission Vehicle Incentive Program (ZEVIP) as part of its 2021 Regional Plan and

[1] https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii
[2] https://www.gov.ca.gov/2023/01/20/california-zev-sales-near-19-of-all-new-car-sales-in-2022/

Sustainable Communities Strategy.[3] This program aims to facilitate the purchase or lease of approximately 100,000 new or used light-duty vehicles between 2025 and 2035. One of the main goals of the ZEVIP is to make it easier for residents in communities that have historically been underserved (or underrepresented, or subject to discrimination) to purchase zero-emissions vehicles. To date, ZEV sales have generally been most frequent in higher income households, highlighting a major goal within the program to remove the adoption gap between income and socioeconomic groups. These communities include low-income households, and under-resourced communities generally, who have not yet widely been able to participate in state incentive programs. ZEVIP has a strong outreach and engagement component to ensure the final program design matches the needs of those the program is designed to reach.

The Existing Conditions Assessment (Assessment) is the first element of the ZEVIP and serves as the foundation for program development. The Assessment provides a comprehensive understanding of the current EV landscape in the San Diego region regarding vehicle ownership, consumer demographics and preferences, and existing incentive programs, policies, and regulations. The Assessment identifies needs, challenges, and preferences of the target market the program aims to serve. An evidence-driven approach will be followed ensuring that the subsequent phases of program development fit the practical, real-world situation and enable the creation of a ZEVIP that maximizes impact and inclusivity.

[3] https://www.sandag.org/-/media/SANDAG/Documents/PDF/regional-plan/2021-regional-plan/final-2021-regional-plan/2021-regional-plan-appendix-b-2021-12-01.pdf

2. Existing ZEV Incentive Programs

A project team consisting of SANDAG, Arcadis, and ICF staff, conducted an in-depth assessment of existing ZEV incentive programs, both within and outside of California, focusing on their administration, oversight, funding sources, staffing needs, performance tracking, social equity elements, and other relevant metrics.

The initial research includes a diverse range of incentive program types, such as rebates, grants, or other initiatives from various states. The following table (Table 1) details the programs initially assessed and their corresponding websites where publicly available information was collected. As part of this initial research, the project team gathered detailed information on each program's funding mechanisms (if publicly shared), payment type (rebate, point of sale), vehicle eligibility requirements, and participation requirements. This research helped the project team build a comprehensive understanding of the necessary components and considerations of a ZEVIP.

TABLE 1: INITIAL LIST OF PROGRAMS ASSESSED

Program	Websites
Clean Vehicle Rebate Project (CVRP)	https://cleanvehiclerebate.org/en/cvrp-info
Clean Cars 4 All (CC4A) -San Diego	https://www.sdcc4a.org/Clean_Cars/Home
Clean Fuel Reward Program	https://www.sdge.com/residential/electric-vehicles/electric-vehicle-climate-credit
Access Clean California	https://accesscleanca.org/
California Hybrid and zero-emission truck and bus voucher incentive project (HVIP)	https://californiahvip.org/
Pre-owned Electric Vehicle Rebate Program	https://evrebates.pge.com/
Pre-owned Electric Vehicle Rebate Program	https://evrebates.sce.com/
California Electric Vehicle Infrastructure Project (CALeVIP) San Diego Incentive Project	https://calevip.org/incentive-project/san-diego-county
Carl Moyer VIP	https://ww2.arb.ca.gov/2022-on-road-vip-funding-tables-mail-out
VW Mitigation Trust	https://ww2.arb.ca.gov/our-work/programs/volkswagen-environmental-mitigation-trust-california/how-apply-vw-environmental
Massachusetts Offers Rebates for Electric Vehicles (MOR-EV)	https://mor-ev.org/cars-overview
Drive Clean Rebate for Electric Cars (NY)	https://www.nyserda.ny.gov/All-Programs/Drive-Clean-Rebate-For-Electric-Cars-Program
Xcel Energy EV Rebate (CO)	https://ev.xcelenergy.com/ev-rebate-co
Connecticut Hydrogen and Electric Automobile Purchase Rebate (CHEAPR)	https://portal.ct.gov/DEEP/Air/Mobile-Sources/CHEAPR/CHEAPR---New-Eligible-Vehicles
Oregon Clean Vehicle Rebate Program	https://evrebate.oregon.gov/
MAAC Electric Vehicle (EV) Access Program	https://maacproject.org/ev-access/#funders

Utilizing this information, the project team conducted additional research into select programs, and selected a handful of programs for interview. The following sections detail the outcomes of existing California incentive programs impacting the San Diego region and available to San Diego residents. The subsequent section details the programs selected for interview and the insights shared by program managers. Program managers provided more information on administration and oversight methods, program budgets, sources of funding, staffing needs, income restrictions, social equity elements, and incentive and funding structures. It should be noted that upon further discussion with SANDAG staff, tax credit programs were not included in the scope of the study, as tax credits do not relieve the up-front cost of a ZEV purchase.

Outcomes of Existing Incentive Programs

Using publicly available information, the team examined the major outcomes of selected in-state programs, including the California Air Resources Board (CARB) Clean Vehicle Rebate Project (CVRP), the Clean Cars 4 All programs, and the Clean Vehicle Assistance Program to better understand the demographics and consumer preferences of the potential applicants for SANDAG's ZEVIP.

California Clean Vehicle Rebate Project

The California CVRP is a part of California Climate Investments (CCI) and is one of the longest operating vehicle incentive projects in California that aims to promote clean vehicle adoption by offering rebates ranging from $1,000 to $7,500 for the purchase or lease of new, eligible zero-emission vehicles, including electric, plug-in hybrid electric, and fuel cell vehicles. A total of $1.2 billion in funding has been awarded to date since its launch in 2010. The CVRP program is now closed to new applications and is expected to be transitioned to a new program that helps low- and middle-income Californians access zero-emission vehicles.[4]

CVRP publishes program statistics, such as the number of rebates issued across the state, through the CVRP Rebate Statistics dashboard. The dashboard includes the number of rebates issued by fuel type between 2010 through 2022 at the county level,[5] as shown in Figure 2. CVRP data also compares vehicle affordability to applicant income level, indicating whether the incentive level provides a potential financial impact to the vehicle choice for consumers. Data for year 2023 shows that those consumers with household incomes less than or equal to 300% of the federal poverty level (FPL) purchase a car for $47,630 on average, compared to those with household incomes greater than or equal to 400% of the FPL, who purchase vehicles above $53,000 on average. Figure 3 below shows average vehicle purchase price by household income bracket for years 2019 and 2023.

According to the CVRP rebate statistic dashboard,[6] a total of 45,723 rebates and $108,773,725 have been distributed among the residents of San Diego, with 4,120 rebates given provided to low- to moderate-income qualifying applicants. This equates to around 9% of the total CVRP rebates in the San Diego region benefiting low- and moderate-income households.

[4] https://ww2.arb.ca.gov/news/californias-clean-vehicle-rebate-program-will-transition-helping-low-income-residents
[5] Center for Sustainable Energy (2023). California Air Resources Board Clean Vehicle Rebate Project, Rebate Statistics. Data last updated 7/20/2023. Retrieved October 2023 from cleanvehiclerebate.org/rebate-statistics
[6] Center for Sustainable Energy (2023). California Air Resources Board Clean Vehicle Rebate Project, Rebate Statistics. Data last updated 11/9/2023. Retrieved January 2023 from https://cleanvehiclerebate.org/en/rebate-statistics

FIGURE 2: CVRP REBATE STATISTICS

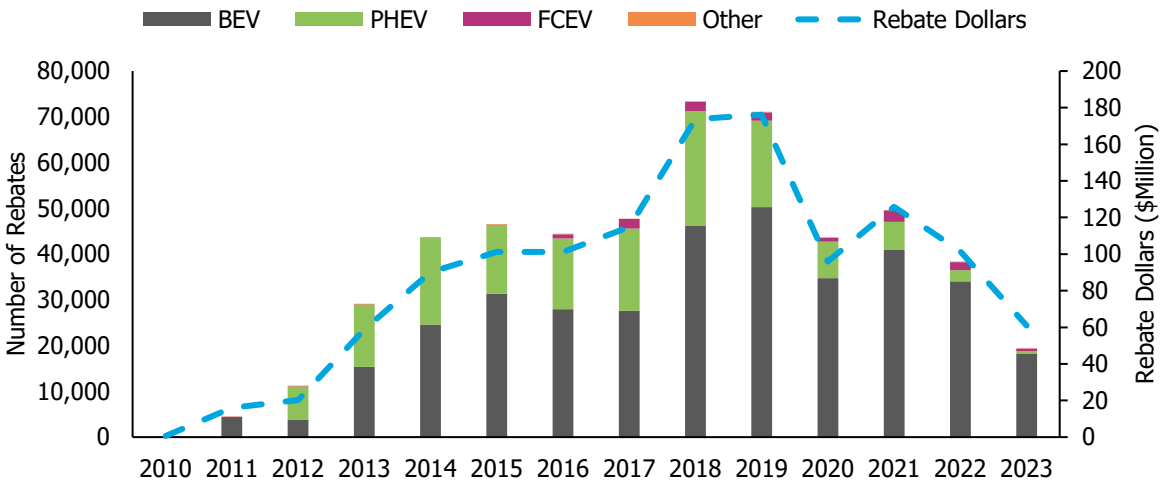
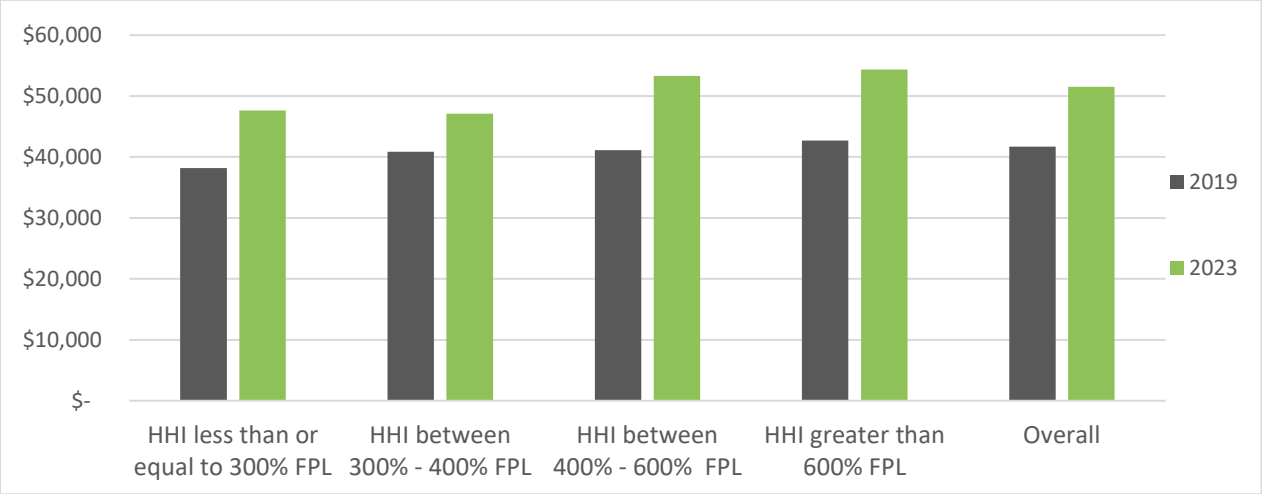


FIGURE 3: AVERAGE VEHICLE PURCHASE PRICE BY HOUSEHOLD INCOME (HHI) BRACKET



Clean Cars 4 All

The Clean Cars 4 All (CC4A) Program was officially codified with the passage of AB 630 (Cooper, Chapter 636, Statutes of 2017), which requires that CARB sets specific and measurable goals and focus the program where the greatest air quality improvements can be achieved. The program is designed to provide reliable and accessible modes of transportation to disadvantaged communities and to be equitable, with consumer protections at the forefront. The program provides grants to help residents retire their old vehicles and replace them with zero- or near-zero emission vehicles or transit cards. While administered by CARB, the program is implemented by participating air districts. Figure 4 and Figure 5 demonstrate the outcomes of the CC4A Program by air districts. Data includes total vehicles replaced, as well as scrapped and replacement vehicle characteristics. Participating air districts with data available include the South Coast Air Quality Management District (SCAQMD), the San Joaquin Valley Air Pollution Control District (SJVAPCD), the Bay Area Air Quality Management District (BAAQMD), and the Sacramento Metropolitan Air Quality Management District (SMAQMD). The San Diego County APCD CC4A Program recently launched, with no program data yet available. Since the program's inception in 2015, CC4A has incentivized the replacement

of over 17,000 vehicles.[7] In Figure 4, it should be noted that the number of battery electric vehicle (BEV) purchases within CC4A overall is a smaller percentage among incentivized vehicles compared to the number of BEV incentivized vehicles within the CVRP program. For Figure 5, data shows that CC4A is successful in attracting participants with household incomes less than or equal to 300% FPL.

FIGURE 4: CC4A VEHICLE REPLACEMENT TYPE BY AIR DISTRICT (2015 - JUNE 2023)

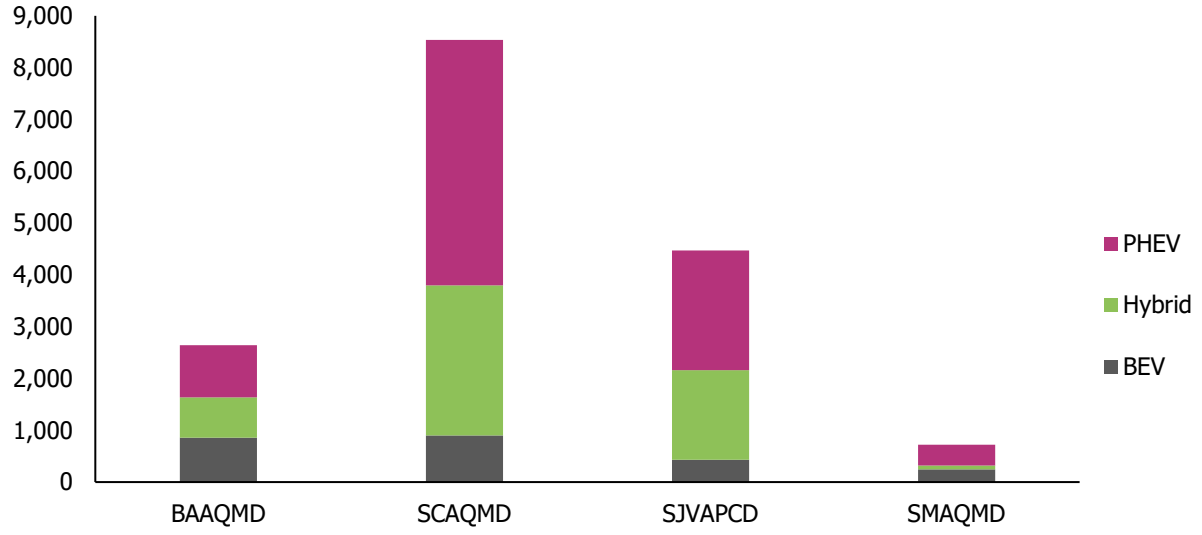
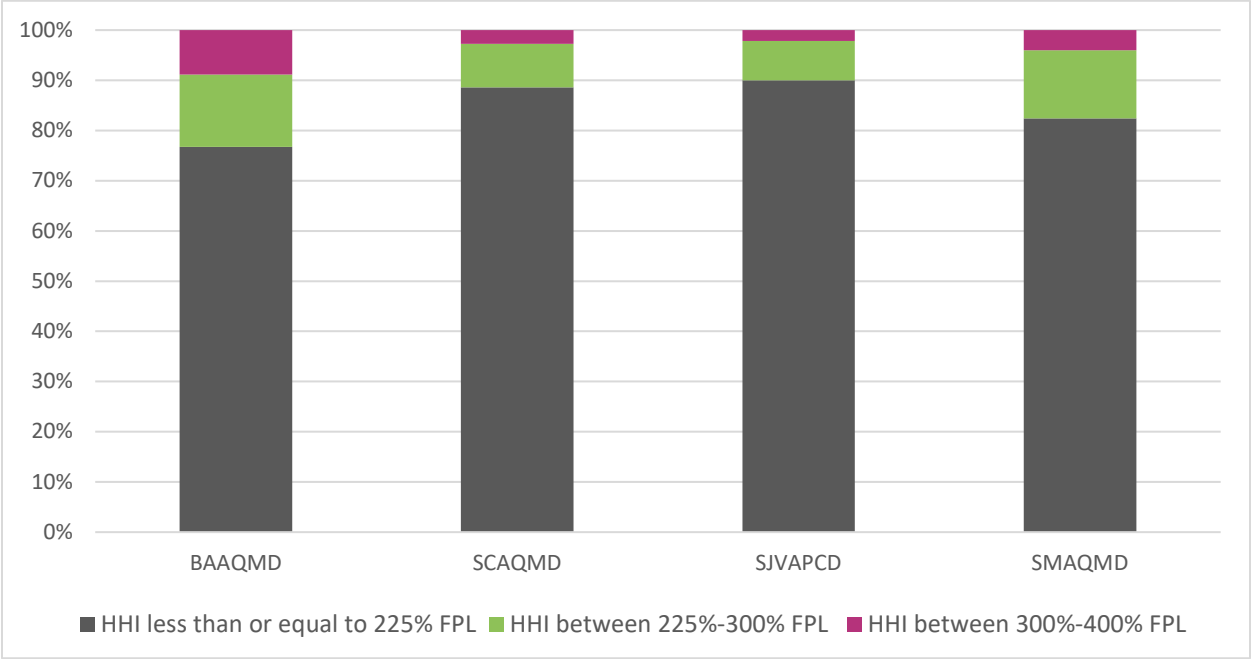


FIGURE 5: PERCENTAGE OF CC4A PARTICIPANTS WITHIN DESIGNATED HHI BRACKETS BY AIR DISTRICT (2015 – JUNE 2023)

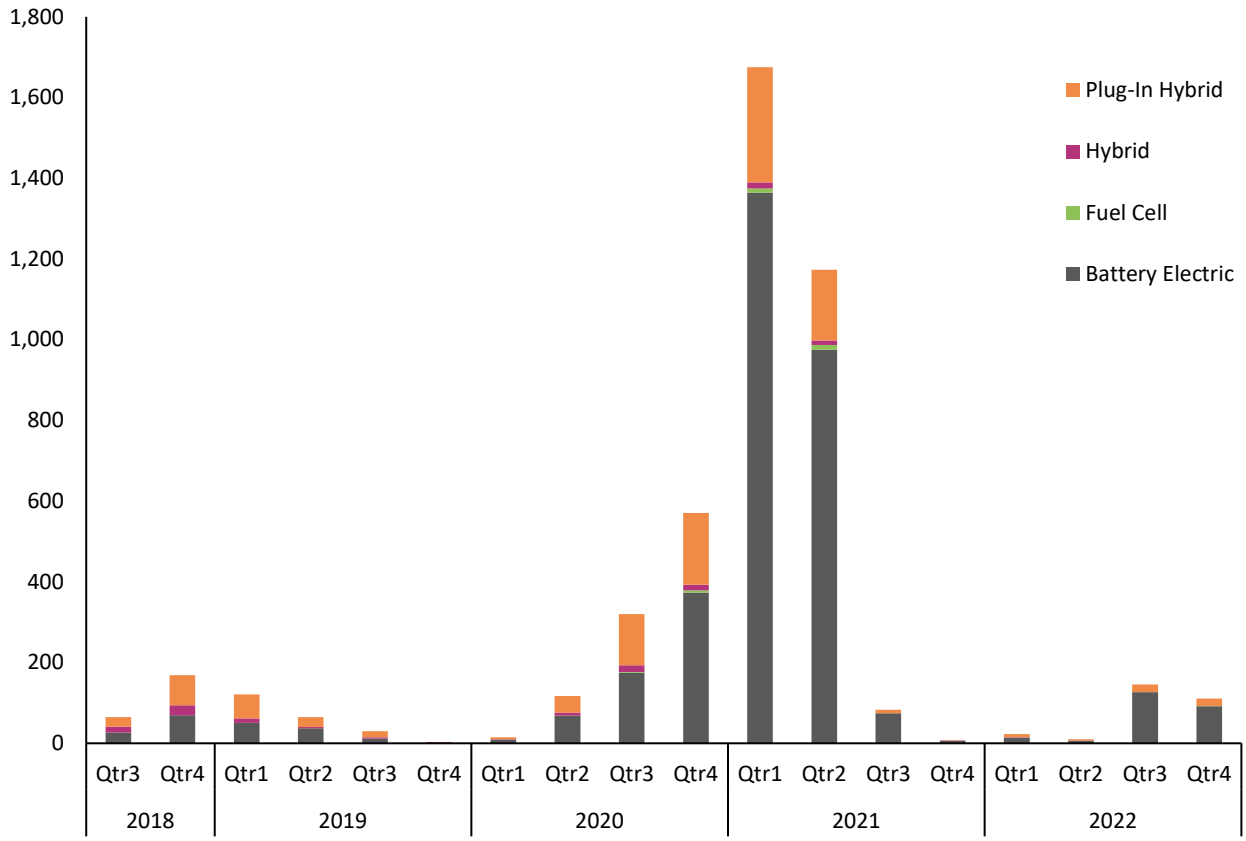


[7] California Air Resources Board (2023). Outcomes and Results for Clean Cars 4 All, participant-level data. Data last updated June 30, 2023. Retrieved October 2023 from https://ww2.arb.ca.gov/our-work/programs/clean-cars-4-all/outcomes-and-results-clean-cars-4-all

Clean Vehicle Assistance Program

The Clean Vehicle Assistance Program (CVAP) provides grants and affordable financing to help income-qualified Californians purchase or lease a new or used plug-in hybrid, fuel cell, or electric vehicle. The CVAP, administered by CARB, provides a program learnings and data transparency dashboard, which covers grant statistics, loans, and participant demographics.[8] The program was in effect from July 2018 through December 2022. Figure 6 illustrates the distribution of funded vehicles by fuel type for each quarter since the program's launch. Since July 2018, a total of 4,705 grants, amounting to $23.01 million in grant funding, have been awarded. Out of these, 3,344 grants ($16.41 million) were allocated for the purchase of new vehicles, while 1,361 grants ($6.5 million) supported the purchase of used vehicles. Awards for grants peaked in 2021, until April 2021 when CVAP announced that the reservation list was at full capacity, meaning all available funds were awarded or reserved for those who had already applied and those already approved for funding. The CVAP did not continue to serve the reservation list until June of 2022.

FIGURE 6: CVAP GRANTS BY QUARTER AND VEHICLE FUEL TYPE



[8] Clean Vehicle Assistance Program (2023). Program Learnings & Data Transparency, grant statistics and demographic data. Retrieved October 2023 from https://cleanvehiclegrants.org/program-data/

Program Manager Interview

To gain detailed insights into these programs, the project team collaborated with SANDAG staff and conducted six informational interviews. These interviews were with various program managers and leaders involved in the ZEV incentive programs studied in this report with the goal of understanding the best practices, policies, and structures of ZEV incentive programs.

The six interviews were conducted with a wide range of EV program managers to broaden the team's knowledge and insight regarding EV incentive programs. The wide range of program managers allowed the team to learn about different ways to administer EV incentives and reach target communities, among many other goals. To achieve this, interviews were conducted with leaders in non-profits including GRID Alternatives and MAAC, utility companies including SDG&E and PG&E, air districts including the San Diego County Air Pollution Control District (SDAPCD) and the SCAQMD, and lastly, the Center for Sustainable Energy (CSE) as a non-profit agency with contracts to administer numerous federal and state EV incentive programs.

These select agencies were chosen for interview because they lead EV programs either with similar target populations, similar population sizes, or have similar organizational structure to SANDAG. These programs vary on incentive structure, funding sources, scale, and many other program features. In terms of incentive structure, EV programs most often offer either a rebate or a voucher. A rebate provides money to the customer after the vehicle purchase or lease is complete, whereas a voucher acts as a coupon to provide a discounted price at the time and place of vehicle purchase or lease. The interviewees are important stakeholders of the EV ecosystem as they are directly involved in EV policy development for either the federal, state, or local level. All have been successful in providing funding to individuals for the purpose of purchasing a new or used EV.

Program managers were initially contacted via their general EV program's contact email. After program managers agreed to meet, program managers were given a preliminary list of questions that would help guide the interview and give program managers time to prepare responses. All six interviews were conducted virtually over Microsoft Teams, and lasted from 45 minutes to 60 minutes each. Key notes from the interviews are found in a separate document enclosed with this report. Table 2 outlines the date, time, interviewed organization, associated program, and other considerations of the six informational interviews:

TABLE 2: EV PROGRAM INTERVIEWS

No.	Date & Time	Interviewed Organization	Organizational & EV Overview	Program	Program Type
1	Sep 8, 2023 – 2pm	**GRID Alternatives**	GRID Alternatives is a non-profit that manages and operates Access Clean California to connect Californians with available incentives. They are a primary implementer of a few ZEVIPs in California and across the country, and GRID staff can help assist in ensuring the ZEVIP aligns with peer incentive programs.	**Access Clean California**	Outreach/ Advocate
2	Sep 12, 2023 – 4pm	**SDG&E**	SDG&E is an investor-owned utility (IOU) for San Diego County that offered a rebate and voucher in a past program that worked closely with car dealerships. SDG&E is preparing to offer a used-vehicle incentive.	**CVAP/Clean Fuel Reward**	Voucher/ Rebate

No.	Date & Time	Interviewed Organization	Organizational & EV Overview	Program	Program Type
3	Sep 14, 2023 – 4pm	**Center for Sustainable Energy**	CSE is a non-profit administering agency for several vehicle incentives across the US. CSE staff provided insights for various CSE-led programs in California, Oregon, New Jersey, New York, and Connecticut.	**CSE-led Programs**	Voucher/ Rebate
4	Sep 20, 2023 – 10am	**SDAPCD / SCAQMD**	SDAPCD and SCAQMD are Air Districts that implement Clean Cars for All in San Diego (new program) and in South Coast (more established), respectively. Both CC4A programs have a shared purpose to retire old vehicles and replace them with zero or near-zero emission vehicles.	**SDCC4A/ Replace Your Ride**	Voucher
5	Sep 20, 2023 – 11am	**MAAC**	MAAC is a non-profit that seeks to educate equity-focused communities on available ZEVIPs. MAAC administers a small EV loan program. MAAC provides informational and educational support (e.g., financial literacy trainings), technical assistance, and low-interest loans to EV purchasers.	**EV Access Program**	Outreach/ Advocate
6	Sep 25, 2023 – 11am	**PG&E**	PG&E is an IOU that implements a used-vehicle incentive program within their service territory. SDG&E will likely replicate the PG&E program, utilizing LCFS dollars.	**Pre-Owned EV Rebate Program**	Rebate

The interview consisted of questions and answers regarding:

- Program Administration
- Social Equity Components
- Tracking Metrics
- Incentive Structure
- Outreach & Education
- Vehicle Eligibility
- Overall Considerations
- Additional Thoughts

The following paragraphs present key findings from the interviews by discussion topic. All discussion points below summarize opinions expressed by program managers.

Program Administration

Peer EV incentive programs are led by a program manager or multiple program-managing staff. The program manager leads the direction of their EV program and all program divisions. EV Program staff commonly consist of a central program manager, an operations division to manage the program website and platform, a community care division to handle applicants and applications, and a point-of-contact for dealerships, especially for voucher programs that provide a discount at the time of vehicle purchase or lease. A transparency division, such as those within CSE-led programs, can also help collect data and provide insights to keep the program on-target.

Peer EV program staffing levels can range from 5 to 20, depending on program size and number of applicants expected. Staff breakdown can consist of full-time staff and interns to support their work, similar to the staffing system established in MAAC. CC4A staff noted that their program's total administration costs aim to be about 6% of program budget for simple EV incentive programs, though administration costs can rise to 15% of program budget when vehicle scrappage is included as a required element.

CSE staff noted that programs with cash on-hand are the most successful, compared to other programs that need to request funds or receive funding in waves. A cash-on hand program has liquid funds available to them or can access at any moment, and therefore can issue payments faster to major stakeholders, such as dealerships.

Social Equity Components

The main goal of the social equity component of an EV program is to invest in people and communities that have historically been left behind by other federal, state, and local EV programs, including vehicle purchase/lease incentives, financial literacy and loan assistance, and supporting infrastructure incentives. One of the most difficult aspects of an equity-focused program is to ensure that the incentives can significantly assist in the purchase or lease process and are available at the time of purchase.

CVAP, CVRP, and CC4A are all examples of income-based eligibility programs. CVAP and CC4A are examples of EV programs that include a geography-based equity component, such as those within a disadvantaged community or within communities that are disproportionately burdened by multiple sources of pollution as defined by CalEnviroScreen. Some programs have participant income caps which make those who can afford ZEVs without incentives ineligible for participation, thereby preventing free-ridership.

Access Clean California and the MAAC EV Incentive Program do not provide direct monetary incentives, but the programs do work closely with low-income and disadvantaged communities to ensure that applicants are assisted throughout the program process; this includes identifying incentives an applicant can "stack" together to compound benefit, or identifying other related programs an applicant may be eligible to apply for, such as incentives that support the purchase or installation of charging equipment.

Program managers from Access Clean California noted that one of the many ways to maximize EV incentive use among low-income and disadvantaged communities is to create a program that makes applying and receiving an incentive a quick and easy process for users. A number of applicants from lower-income households may need to purchase a new car quickly, therefore the process for delivering the incentive needs to minimize turnaround time, which can be as fast as 3 to 5 days. In the case of CC4A, applicants are willing to wait longer (2 to 3 months) due to the higher level of incentive provided, which is up to $12,000. In cases where there is a backlog of applications, or in circumstances where funding is unavailable for a brief window, pre-qualification can improve and speed up the incentive turnaround time.

CSE program managers believed that those with HHI between 300% to 400% of the FPL are also a critical market to target for ZEVIP. People within this bracket may likely to consider a new EV purchase as a viable option as stacking state and regional incentives along with federal tax credits may help bring the vehicle costs to an acceptable range for them.

MAAC program staff discussed that every low- and moderate-income community is different, as some consumer markets have a positive view toward EVs, while others are not as receptive. When a new program launches, the new program would benefit lower-income households and disadvantaged communities the most by matching eligibility requirements with other program offerings to promote stacking of EV incentives with other programs.

Income eligibility can be done through Veri-tax, used by Access Clean California, or through the IRS. Other eligibility requirements can include location by zip codes, or CalEnviroScreen scores. MAAC staff noted that zip code or area median income eligibility can have issues, as it can disincentivize multiple families or extended families sharing a large home based outside of LIDAC or FPL limits, especially in North County where the median income is higher than other regions in San Diego County. Income eligibility can be a burdensome process, so some peer programs allow for proof of participation in other existing social programs as demonstrating eligibility for their ZEVIP.

Multiple program managers stressed the importance of financial literacy and have offered finance trainings to help applicants understand the operational costs of owning an EV. Applicants should know associated costs with purchasing or leasing a new or used EV. In other circumstances, applicants may need help building credit, or stepping through the program process. For example, MAAC works to provide secured loans not based on credit score, and with a low-interest rate, in order to provide financial assistance throughout ownership. Additionally, outreach programs help potential applicants secure an incentive while in the process of developing credit to provide flexibility on the credit timeline, which can take longer than 90 days.

Tracking Metrics

GRID Alternatives program managers noted that administration staff can track program success by setting goals for website visits, phone calls, applications received per month, incentives distributed, applicant to incentive distributed ratio, average incentive amount, purchased vehicle statistics (such as make and model), geographic applicant statistics, percent of applicants per equity consideration (such as income, or SB535 Disadvantaged Community), incentive essentiality, and growth over time.

SDG&E staff noted that they can provide unique program weblinks to various CBOs to track the number of applicants who enter the program website through the CBO's weblink compared to the general web address. SDG&E staff have also used post-purchase surveys to collect feedback from those who utilized the program, to better understand the purchase experience, include likes, dislikes, and challenges. Clean Cars 4 All offers surveys to those who receive incentive funding 12 months, 24 months, and 30 months after purchase.

Some program administrators work with the DMV to track VIN information throughout the program. VIN number checks can prevent a vehicle purchased with an incentive from being resold immediately afterwards, assuming programs specify the vehicle cannot be resold within a certain time window after purchase, typically 20-30 months.

Incentive Structure

Many program managers noted that a voucher incentive structure (point-of-sale rebate) is preferred by applicants within the low- to moderate- income consumer market. Rebates and tax credits may not be as effective for lower-household income applicants, as they generally prefer not to or are unable to pay the full price of the car at the time of purchase. The voucher or rebate can also be coupled with viable financing opportunities, and/or stacked with other rebates and programs to leverage mechanisms for add-on benefit. This is especially important to relieve the cost-burden for low- and moderate-income households who would benefit from multiple incentives and loan programs to purchase or lease a ZEV.

The incentive amount should be based on the goal and direction of the program. Higher value incentives have been found to increase participation by low- and moderate-income households, though participation in incentive programs by these communities is still low. However, by having higher incentives, a program with a limited budget cannot offer as many incentives to the wider public. To balance these needs, the goals of the program must drive the incentive value. For instance, if a program's goal is to reduce

greenhouse gas emissions in the region, a program may want to replace as many high-emitting vehicles as possible and offer a lower incentive to do so; but, if a program's goal is to address equity the program may want to substantially relieve the cost-burden for a select demographic, and offer a much higher incentive to accomplish this goal. The incentive amount should be set based upon funds available and how many applicants the program can assist. The incentive structure can be two-tiered to maintain simplicity, featuring a base incentive, and a higher equity-based incentive.

MAAC staff noted, in terms of equity considerations, a needs-based model is preferred to a first-come, first-served incentive model. The first-come, first-served approach often creates a scarcity mindset and attracts numerous applicants who either do not meet the program's requirements or ultimately do not accept its terms.

Outreach & Education

Program managers mentioned that CBOs can be a significant asset in helping a new EV program, such as the ZEVIP, find applicants, as CBOs are a trusted source for information for potential applicants. CBOs can also help reduce confusion around eligibility. Some CBOs, especially smaller ones, should be compensated to hire staff to work on vehicle programs. In addition, some EV programs utilize pop-up events to conduct outreach and engagement, and track interactions to demonstrate education efforts. Outside of CBOs and pop-up events, marketing (online), emails, and social media can be used to spread the word.

CSE staff mentioned that it is important to have clear, consistent, and predictable communication to maintain the longevity of the program. Some outreach programs hold workshops for people at different stages of EV purchase (contemplation, purchase-ready etc.) and target different audiences.

Some peer programs include a system to conduct focus groups and surveys to receive feedback on initial launch. Program outreach staff can also integrate past participant success stories into marketing to show EV possibilities and build trust.

Vehicle Eligibility

For CARB-funded programs such as CC4A, CARB utilizes the carpool sticker list for eligible vehicles, found at https://ww2.arb.ca.gov/eligible-carpool-sticker-list.

If used vehicles are eligible under the future ZEVIP program, a best practice is to include vehicle eligibility requirements to protect the purchaser, including maximum milage restrictions, model year limits, or maximum MSRP allowed. If a model year requirement is to be set for used vehicles, the model year limit is typically set at 8 years old in other programs to protect purchasers from purchasing an EV that either has a battery with an expired warranty or will need a replacement battery soon after purchasing. Currently, the used EV market is limited, due to the limited number of Evs in circulation, but is likely to expand in the future as more Evs are on the road. Beginning in 2023, the federal tax credit opened eligibility to qualifying used vehicles from licenses dealers, indicating a trend toward supporting the used EV market.

CC4A staff noted that scrapping vehicles as part of the eligibility requirement may add complexity to program administration and cost. Program participants also may raise concerns about scrapping their vehicle, which may increase the level of administration support needed.

MAAC mentioned that higher incentives can be beneficial for those purchasing larger vehicles (6+ seats) as otherwise some larger families cannot afford an EV that is right-sized for them. MAAC continued that higher incentives can also be considered for those with limited access to charging to compensate for higher costs to use public charging, which is often the case for people living in multifamily housing or rental properties with limited access to home charging.

Overall Considerations

- Program priorities set the foundation of any ZEVIP, such as establishing who the program is trying to reach and what the program will help applicants do. When established, the program needs to be simple for users and car dealers. Due to the extensive number of projected applicants in the ZEVIP, the incentive may be best administered in only two tiers; for example, a base incentive with an added tier for equity-focused communities, or to bifurcate incentives between DAC and non-DAC applicants.
- Program silos and changing requirements make it hard for applicants to access and navigate between multiple EV incentive programs. Exploring partnerships with existing programs or aligning with the requirements of other current programs is a benefit to applicants.
- Financial education and financing are key supplementary strategies to include in the EV incentive program, as well as resources on stacking incentives.
- The program administrator can leverage existing relationships within communities to spread the word about the program to potential applicants, and invest in maintaining and developing these relationships, especially those with local roots.
- In addition to aligning with other existing EV incentive programs, the ZEVIP program can aim to include participants from demographics who are currently left out of other programs (e.g. multi-family homes), and additional vehicle types (e.g. 6+ seat EV models as they become available).
- The program administrator should consider the dealer experience regarding within the program to attract and retain dealer participation. Engaging with a dealership network (as opposed to individual dealerships) can help identify and address dealer needs, including the turnaround time for reimbursement, and solidify legal terms to prevent dealers from taking advantage of the program with an MSRP markup.

Additional Thoughts

- During program development, coordinate closely and sync eligibility requirements with peer EV incentive programs to ensure programs can be stacked.
- SANDAG can create and publish easy-to-apply guides on YouTube and through other mechanisms and provide automated technical assistance where possible.
- Ensure the program maintains consistent reliable funding or clear intervals of funding availability to reduce uncertainty for applicants receiving incentive funds.
- Understand the relationship between ZEV ownership and access to EV charging infrastructure. Consider options for coordinating SANDAG ZEVIP with SANDAG EV charger incentive program investments, especially for residents at multi-family properties.
- To limit free-ridership, the program should include a participant income cap. It can also be designed as a needs-based program rather than first-come, first-serve. This way incentives can go to qualified applicants who meet certain criteria before other applicants.

3. ZEV Policy Considerations

Policy Drivers

California has established numerous policies to accelerate statewide adoption of ZEVs, such as ZEV production mandates for automakers, financial incentives for consumers, and investments for charging and fueling infrastructure. For example, in September 2020, Governor Newsom signed Executive Order N-79-20, targeting 100% ZEV sales for passenger vehicles by 2035 and 100% of all medium and heavy-duty vehicles to ZEV by 2045 where feasible. The order also includes directives for accelerating the deployment of charging infrastructure, increasing the number of ZEVs in public fleets, and promoting consumer awareness and adoption of EVs. Executive Order N-79-20 lays the foundation for implementing policies to achieve these targets. To date, California has implemented several regulations that address all vehicle modes, including light-, medium-, and heavy-duty vehicles, as well as transit vehicles. Table 3 provides a summary of the most significant light-, medium- and heavy-duty ZEV transitional regulations currently in effect.

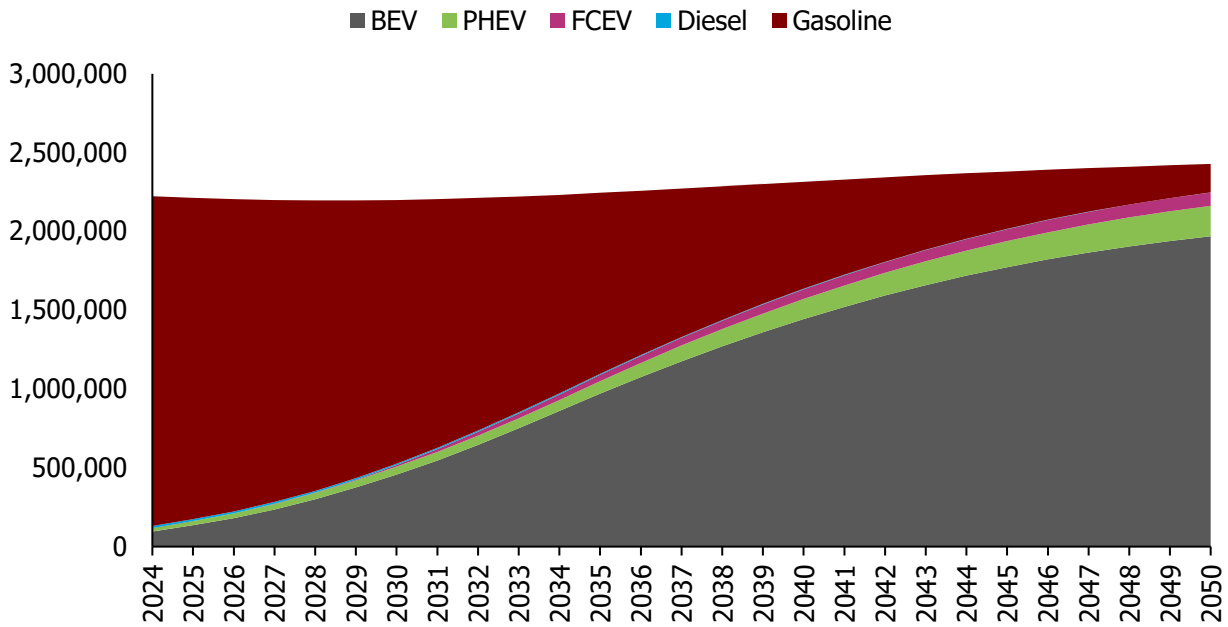
TABLE 3. CALIFORNIA REGULATIONS SUPPORTING ZEV DEPLOYMENT

Regulation	Description
Advanced Clean Cars II	The Advanced Clean Cars II regulation will reduce light-duty passenger car, pickup truck, and SUV emissions from the 2026 model year through 2035. The regulations amend the Zero-Emission Vehicle Regulation to require an increasing number of ZEVs, including battery-electric, hydrogen fuel cell electric, and plug-in hybrid EVs. By 2035, the regulation requires 100% of new passenger vehicles sold in the state to be ZEVs. These amendments support California Governor Newsom's executive order that all new passenger vehicles sold in California must be zero emissions by 2035. The Low-Emission Vehicle Regulations were also amended to include increasingly stringent standards for gasoline cars and heavier light-duty trucks.
Clean Miles Standard & Incentive Program	Senate Bill No. 1014, also known as the California Clean Miles Standard and Incentive program, aims to reduce GHG emissions from ride-hailing services (e.g., transportation network companies or TNCs like Uber or Lyft) by establishing emission reduction targets and encouraging the use of ZEVs. Transportation network companies are mandated to develop GHG emission reduction plans beginning January 1, 2022, and every two years thereafter. The regulation provides various pathways the companies may use to meet the vehicle electrification and GHG emission reduction targets. These targets can be met through vehicle electrification, increasing vehicle occupancy, decreasing deadheading, investing in active transportation infrastructure such as sidewalks and bikeways, and facilitating connections to transit.
Advanced Clean Trucks Regulation	The ACT regulation requires manufacturers of medium- and heavy-duty vehicles to sell increasing percentages of ZEVs in California. By 2035, medium- and heavy-duty ZEV sales would need to be 55% of Class 2b – 3 truck sales, 75% of Class 4 – 8 straight truck sales, and 40% of truck tractor sales.
Innovative Clean Transit Regulation	The ICT regulation, adopted in December 2018, requires public transit agencies to transition to a 100% zero-emission bus (ZEB) fleet by 2040. All transit agencies that own, operate, or lease buses with a gross vehicle weight rating (GVWR) greater than 14,000 lbs. must comply with the regulation. The ZEB purchase requirements vary depending on the transit agency's size.
Advanced Clean Fleets Regulation	Starting in 2024, the regulation requires fleets operating in California to transition to zero emission technology with the goal of transitioning all drayage trucks to zero emission by 2035 and the rest of the medium- and heavy-duty vehicles to zero emission by 2045. In addition to

Regulation	Description
	the fleet requirements, the regulation also requires all manufacturers may sell only zero-emissions medium- and heavy-duty vehicles in California starting in 2036.

The state recently enacted the ACC II regulation, requiring all light-duty passenger vehicles sold in California to be zero-emission by 2035. By setting incremental light duty ZEV sales fractions, the ACC II regulation will significantly change the regional light-duty vehicle technology mix over time. To demonstrate the impact of the ACC II regulation, CARB's Emissions FACtor (EMFAC) model is leveraged to provide a baseline technology mix projection for light-duty vehicles in the region. The ACC II sales fractions were applied to the EMFAC2021 vehicle population projections to account for the increase in ZEVs from the regulatory mandates. Figure 7 shows the projected light duty vehicle technology mix for the San Diego region, accounting for ACC II. The projection for the regional light-duty vehicle technology mix estimates that by 2030, there will be over 456,000 BEVs, over 50,000 plug-in hybrid electric vehicles (PHEVs), and over 10,000 FCEV; by 2035, the ZEV population will increase to over 971,000 BEVs, over 78,000 PHEVs, and over 40,000 FCEVs. With 100 percent of light-duty sales being ZEV after 2035, the projection shows that ZEVs will represent 92 percent of the total light-duty vehicle population by 2050. The ACC II Environmental Justice (EJ) strategy also allows vehicle manufacturers to earn EJ credits when they can improve access to ZEVs in overburdened and lower-income communities, such as providing reduced price zero-emission vehicles for community mobility programs, producing affordable zero-emission vehicles, and retaining used vehicles in California to support the state's complimentary policies and incentives.

FIGURE 7. PROJECTED SAN DIEGO COUNTY LIGHT-DUTY VEHICLE POPULATION BY FUEL TYPE



The state has enacted other policies targeted towards reducing transportation GHG emissions. One notable example is the Clean Miles Standard for transportation network companies (TNC), which establishes vehicle electrification requirements and GHG reduction plans for TNCs. The Clean Miles Standard allows TNCs to achieve GHG emissions reduction through VMT reduction measures, with a 90% eVMT target and 100% GHG reduction target by 2030.

These efforts are also in alignment with CARB's most recent 2022 Scoping Plan for Achieving Carbon Neutrality (Scoping Plan), which outlines a transformative strategy to combat climate change and improve

air quality as outlined by Assembly Bill 32. The Scoping Plan proposes a course of action to achieve statewide carbon neutrality by 2045, offering recommendations that are sensitive to time and monetary value of benefits from transitioning to zero-emission vehicles. The Scoping Plan echoes much of what has already been adopted into the regulatory environment, but also proposes novel solutions to further reduce transportation emissions, such as sustainable housing developments near new transit facilities and reallocation of combustible fuel taxes towards improving multimodal alternatives.

In striving towards similar environmental and technology goals, the federal government has also recently signed two of the most significant laws for transportation electrification, the Bipartisan Infrastructure Law (BIL) and the Inflation Reduction Act (IRA). The BIL is directed towards supporting the development of charging and fueling infrastructure networks, with $62 billion distributed across different programs facilitating a cleaner and more equitable transportation sector. The IRA is directed towards easing the burden of purchasing zero-emission vehicles, offering tax credits between $7,500 for light- to medium-duty ZEVs and up to $40,000 for heavy-duty ZEVs. In addition, IRA offers credit equaling 30% of the sale price, up to a maximum of $4,000 for a used ZEV purchase.

Regional ZEV Readiness and Priorities

In addition to the forementioned federal and state policies and plans that will affect the ZEV adoption landscape in the San Diego region, the team has also reviewed other documents that help to identify gaps in regional readiness for ZEVs and recommends policy priorities to address in the development of the SANDAG ZEVIP framework. This review includes the SANDAG 2021 Regional Plan and Sustainable Communities Strategy, Accelerate to Zero Emissions (A2Z) San Diego Regional EV Gap Analysis and EV Strategy, County of San Diego EV Roadmap, County of San Diego Regional Decarbonization Framework, and SANDAG Social Equity Baseline Report.

Regional Plan Review

Regional Plan and Sustainable Communities Strategy, SANDAG, 2021

The SANDAG 2021 Regional Plan has outlined the regional vision for the future, anchored in the 5 Big Moves: Complete Corridors, Mobility Hubs, Transit Leaps, Flexible Fleets, and Next OS. The 5 Big Moves are designed to promote the increased use of ZEVs and encourage multi-modal transportation. Complete Corridors and Mobility Hubs are planned to have amenities and infrastructure to support more ZEVs on the road, while Transit Leap and Flexible Fleet Solutions offer an alternative to driving. These strategies support the regional goal to go beyond the state mandated 19% reduction, compared to 2005 levels, in per capita GHG emissions by 2035, with a regional goal to achieve a 20% reduction in the same period. The 2021 Regional Plan identifies a 2030 target of 450,000 EVs on the road in San Diego County, which would need to be supported by 40,000 chargers.

A new strategy included in the 2021 Regional Plan and SCS is the regional EV incentive program, which SANDAG estimated could cost more than $600 million by 2035, setting the tone for the development of the SANDAG ZEVIP. The 2021 Regional Plan also recommends "selecting the scenario that maximizes GHG reductions, while setting the incentive levels that are comparable to other MPOs while still meeting SANDAG's regional objectives, priorities, and budgetary targets".[9] It is expected that the EV incentive

[9] 2021, SANDAG Regional Plan, Appendix D, SANDAG

program will not continue past 2035 due to executive order N-79-20 requiring all new cars and passenger trucks sold in California to be ZEVs by this year.

San Diego Regional Electric Vehicle Gap Analysis, Accelerate to Zero (A2Z) Collaborative, 2021

State, county, and local government in the San Diego region have instituted individual plans, policies, and incentives to increase the uptake of ZEVs. The San Diego Regional Electric Vehicle Gap Analysis notes that if current incentives remain, ZEVs and ICE should reach cost-parity by 2022.[10] However, the Gap Analysis also notes that in 2021, existing incentives were insufficient to address the upfront cost premiums of ZEVs compared to a standard ICE model. This is especially true for low- and moderate-income communities, and it's the most significant barrier to ZEV adoption in the region according to the report. Additionally, the report highlights concerns that the used ZEV market is not well supported in California. With limited incentives for used vehicles in the state, these ZEVs could move to other states that offer incentives and thus, have a larger used ZEV market.

County of San Diego EV Roadmap, 2022

The Electric Vehicle Roadmap (EV Roadmap) serves as the County of San Diego's plan to increase EVs and EV infrastructure, updated annually to report implementation progress. The 2022 EV Roadmap identifies six goals to support the shift towards EVs:

1. Further reduce the County's fleet of gas-powered vehicles;
2. Accelerate installation of EV charging stations at public locations in county facilities;
3. Promote and incentivize county employee EV ownership;
4. Incentivize and/or require EV charging infrastructure in new and existing private multi-family residential and/or non-residential development;
5. Fund EV expert/consumer advocate as a regional resource;
6. Collaborate with regional partners to support public and private fleet electrification.

The County of San Diego expects to add an additional 103 EVs to the County fleet, as well as over 100 EV charging stations for fleet and public use. The EV Roadmap also outlines progress towards completing the Green Fleet Action Plan and collaborating with SANDAG to develop the ZEVIP.

San Diego Regional Decarbonization Framework (RDF): Technical Report, County of San Diego, California, 2022

The RDF Technical Report assesses regional and local policies and plans, and highlights key areas to leverage additional GHG reductions. The study's analysis of the transportation sector shows a low uptake of EVs in 2020 in areas like El Cajon, Imperial Beach, Lemon Grove, and National City, where EVs were less than 1% of the total vehicle share.[11] The Framework also breaks down the A2Z target of 771,000 vehicles across these jurisdictions to provide an example of how local targets could be set to measure equitable uptake of EVs throughout the region.[12] The RDF provides example splits of vehicle population based on population share, VMT share, and vehicle ownership share. The plan then identifies suggested

[10] 2021, San Diego Regional Electric Vehicle Gap Analysis, Accelerate to Zero
[11] 2022, San Diego Regional Decarbonization Framework: Technical Report, County of San Diego, Table 3.4
[12] 2022, San Diego Regional Decarbonization Framework: Technical Report, County of San Diego, Table 3.5

implementation strategies for the County as well as regional jurisdictions to consider in order to increase the uptake of EVs:

1. Set public EV charger target;
2. Set fleet adoption target;
3. Set-aside public parking/spots for clean vehicles;
4. Encourage EV charging infrastructure at development projects;
5. Require new development to be "EV-ready";
6. Require EV charging infrastructure to be installed at developments;
7. Offer consumer incentives to purchase EVs;
8. Provide readily-accessible information to property owners and vehicle owners;
9. Train workforce to support EV ecosystem;
10. Collaborate to share information across region;
11. Engage in state-level advocacy to bring implementation funds to San Diego County.[13]

Included in this set of strategies are numerous opportunities to partner with other jurisdictions and agencies to advance EV adoption in the region. For example, it is recommended to partner with jurisdictions who have made the least progress towards their goals to understand barriers and share lessons learnt.

San Diego Regional Zero Emission Vehicle Strategy, A2Z, 2023

The 2021 A2Z Gap Analysis identifies an EV population target of 771,000 across San Diego by 2030, higher than the Regional Plan Target. The A2Z San Diego Regional ZEV Strategy has 10 primary strategies to achieve fleet electrification, increase charging infrastructure, and ZEV accessibility and equity:[14]

1. Increase percentage of zero emission vehicle miles traveled (VMT)
2. Achieve equitable/accessible siting of ZEV chargers and fueling stations in all San Diego communities
3. Increase ZEV awareness and adoption
4. Support workforce development
5. Accelerate deployment of publicly accessible ZEV infrastructure
6. Lower policy and financial barriers to ZEV adoption
7. Deploy ZEV infrastructure for multi-unit dwellings (MUDs) and higher density residential and/or commercial areas
8. Ensure sufficient local grid capacity for projected ZEV demand
9. Encourage and support fleet transition to zero emissions
10. Support innovative ZEV pilot projects

[13] 2022, San Diego Regional Decarbonization Framework: Technical Report, County of San Diego, Table 3.6
[14] 2023, San Diego Regional Zero Emission Vehicle Strategy, Accelerate to Zero

While multiple strategies have targeted equitable deployment of ZEVs and infrastructure, the first strategy explicitly references providing and promoting a ZEV rebate and/or incentive as a key tactic. It is also noteworthy that a key gap identified when developing the EV Strategy was a lack of vehicle incentives and the disaggregated and confusing information regarding vehicle, charger, and incentive availability, as well as other factors necessary to consider or complete an EV purchase. These regional gaps and priorities will be reflected throughout the design of the ZEVIP.

Social Equity Baseline Report, SANDAG, 2023

The Social Equity Baseline Report was developed to assess social equity as it pertains to race and ethnicity in the early stages of implementing the 2021 Regional Plan. The Report recognizes the historical disparities transportation projects have had on social equity communities and seeks to minimize the negative impact that planned projects may have on these communities going forward.[15] While the report does not explicitly mention the transition to ZEVs, important findings from this study show that by race, the highest percentage of households with no vehicle are Black-identifying, and by geographic area, communities including National City, La Mesa, and El Cajon have the highest percent of households with no vehicle.

ZEV Priorities and Key Themes

The following themes were distilled from the local and regional documents on vehicle electrification and may guide the development of a ZEVIP to enable ZEV adoption and greenhouse gas reductions across the region.

Enhance Social Equity in ZEV Adoption: Relieve the cost-burden of ZEVs for communities of concern. Track and measure how efforts are addressing ZEV equity, including through the inclusion of more incentives and rebates based on income. Couple cost reduction with ZEV awareness tactics that inform target communities of the benefits of ZEVs and the availability of incentives/rebates.

Support the New and Used ZEV Market: 2021 levels of incentives are insufficient in lowering the upfront cost premiums of ZEVs compared to ICE vehicles. To lower this cost barrier for low-and moderate-income communities, streamlined incentives applicable to both new and used vehicles should be explored.

Electrify Rideshare Companies: ZEV fleet transition plans for TNCs are a key flexible fleet strategy for San Diego. Support the electrification of flexible fleets to address gaps in mobility access, especially within rural and tribal communities. Invest in TNCs, and pursue TNC partnership, in rural, and non-in-fill areas, currently underserved by transit.

[15] 2023, Social Equity Baseline Report, SANDAG

4. ZEV Market Conditions

New EV Model Availability

The ICF EV Library[16] is a proprietary EV model database that tracks more than 500 electric vehicles and non-road equipment offerings available, including BEV and PHEV options for light-, medium-, and heavy-duty vehicles. The EV Library tracks other vehicle attributes, such as stated electric range, price, and vehicle efficiencies, which is updated monthly to capture the latest EV models available and changes to equipment attributes. Figure 8 shows the current number of BEV and PHEV models by body style. Note that the EV Library tracks ZEV offerings to the trim level, meaning that the database can also distinguish between, for example, the short- and long-range Tesla Model 3. The data available from the EV Library shows that there is a total of 154 light-duty ZEV models, of which approximately 74 percent are BEV models and 26 percent are PHEV models.

FIGURE 8. SUMMARY OF NUMBER OF ZEV MODELS BY BODY STYLE (EV LIBRARY)

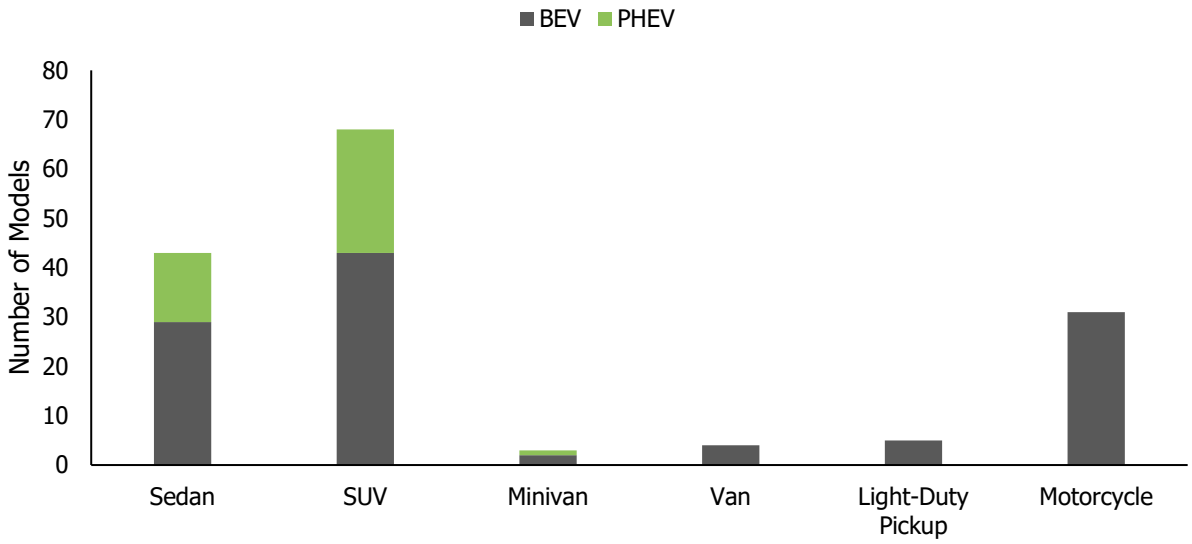
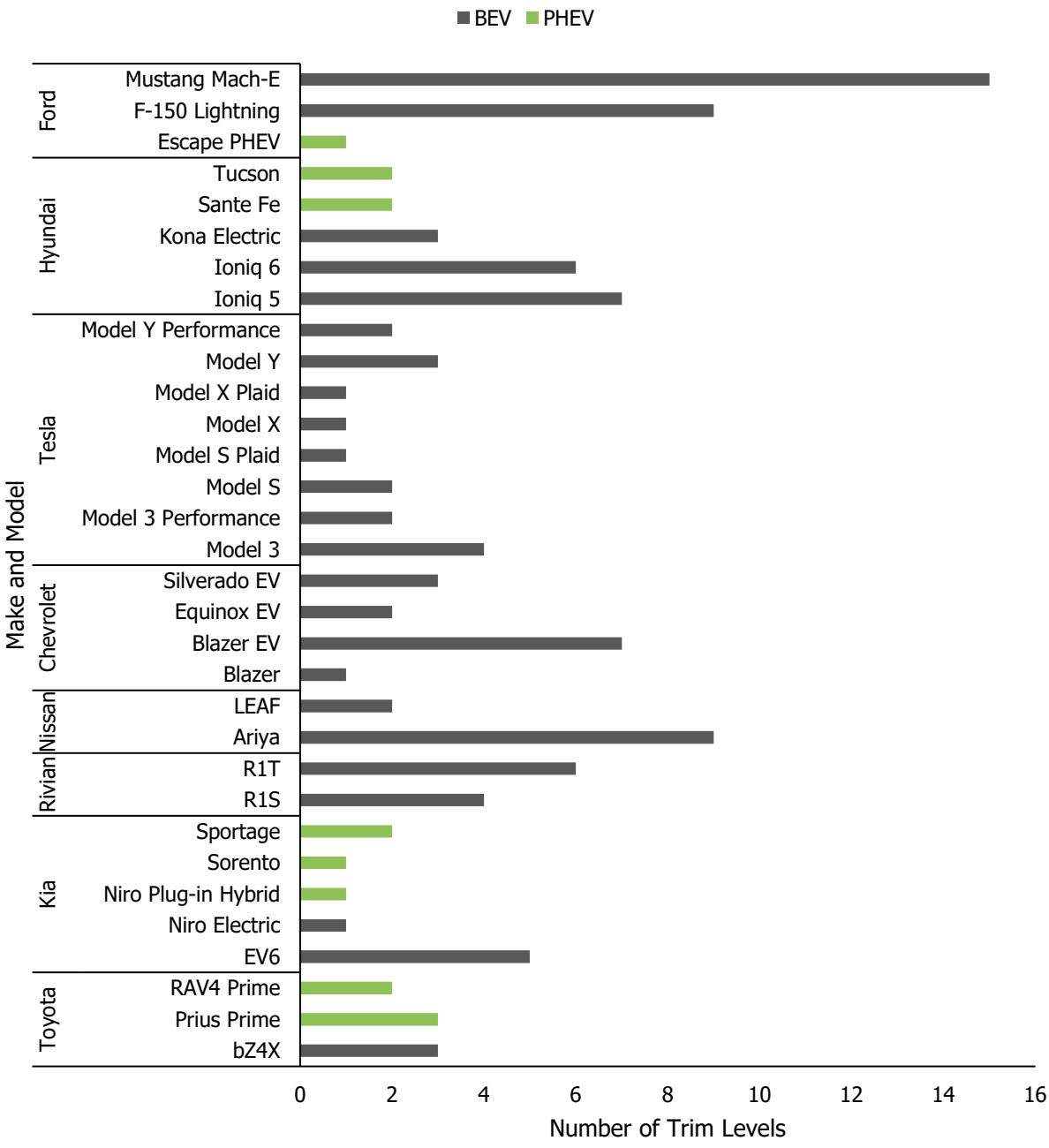


Figure 9 illustrates the number of trims by vehicle make and model from some notable manufacturers, such as Ford, Tesla, and Kia. To interpret the chart, note that the vertical axis has two levels, one for the auto manufacturer and another for the ZEV models available; the horizontal axis counts the number of trim levels available for each make and model combination. For example, the Ford Motor Company has three ZEV models available: Mustang Mach-E, F-150 Lightning, and Escape PHEV. However, each of these models has a different number of trims that are available. Following this example, the Ford Mustang Mach-E has a total of 15 different trim levels available for purchase. The different trims available for the Ford Mustang Mach-E cater to different consumer preferences and use-cases, such as RWD or AWD drivetrains, standard or extended range, and performance models suitable for pursuit-rated vehicles. This sample of the available light-duty ZEV offerings shows that although each manufacturer has between 2 to 5 primary model

[16] The data here reflects known offerings as of Oct 2023.

archetypes, the models are offered in a variety of standard and premium packages (trims) that can have different specifications, with a total of 375 trims across all models.

FIGURE 9. SAMPLE OF AVAILABLE ZEVS BY MAKE AND MODEL (EV LIBRARY)

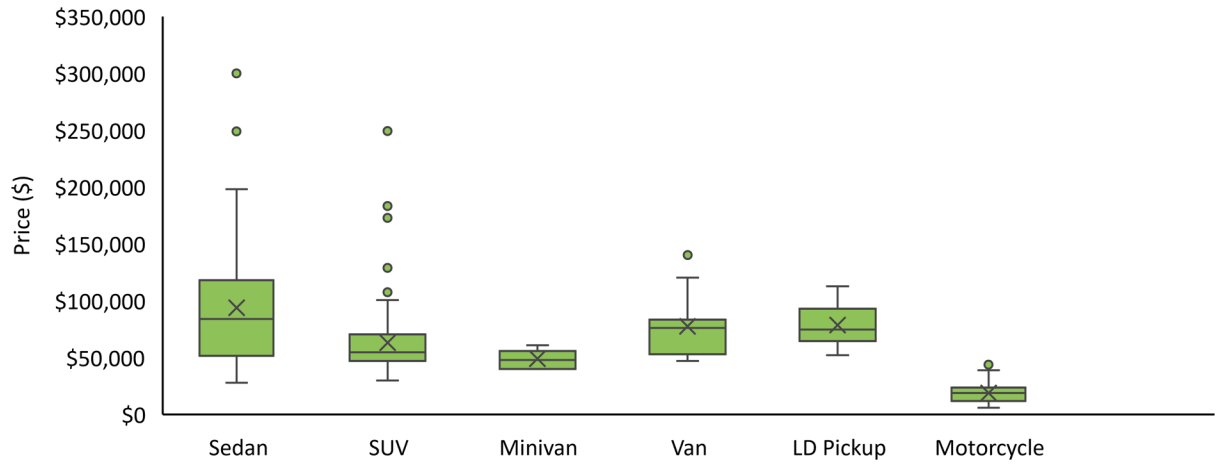


The ZEV market data shown in Figure 8 and Figure 9 demonstrate that the current light-duty ZEV market is primarily made up of sedan and SUV offerings. Together, sedans and SUVs represent 64 percent of all light-duty ZEV models available. Qualitatively, both sedan and SUV body styles have trended well in the personal vehicle market due to their high utility for single- and multi-family households for the price. Also, when BEVs and PHEVs were first deployed to market, manufacturers initially offered EV options in the body

styles believed to be most profitable for the quantity produced (i.e., sedans and SUVs), which partially explains the high fraction of EV options in smaller sizes. However, the demand for different EV body styles is trending upwards, especially as more consumers looking to switch to an EV are also looking for EV counterparts to larger vehicles, such as light-duty pickups and vans. The larger EV body style offerings made available to date also have comparable technical specifications and prices to sedans and SUV options, suggesting a potential to witness more offerings in larger body styles to maintain a competitive EV market.

As noted previously, the EV Library database is periodically updated to log new ZEV offerings available and track changes to vehicle attribute data. Figure 10 shows the range in available ZEV prices by body style; the chart consolidates the trim-level ZEV data into a "box and whisker" plot, providing a statistical summary of the range in prices observed by body style. Important to note is that the data in Figure 10 is not sales weighed, meaning it reflects the actual statistical spread observed in model-trims available. To interpret the chart, note that each body style has a box with an "X" for the average price and a horizontal line for the median price observed. Additionally, the chart shows outliers in each category. For example, in the sedan category, the 2024 Cadillac Celestiq has an MSRP of $300,000; in the SUV category, the Bentley Motors Bentayga Flying Spur Azure Hybrid has an MSRP of $249,100. These outliers, namely luxury ZEVs with exceptionally high prices, increase the average ZEV price observed in the market. Therefore, if luxury ZEV offerings were excluded from the dataset (as they would be in a ZEV incentive program), actual average ZEV prices for the different body styles in Figure 10 should be lower. In fact, price valuations from companies like Kelly Blue Book—an automotive research company—reported in July 2023 that average sales price of BEVs was $53,469, tens of thousands of dollars lower than the average listed prices of ZEVs found in the EV Library.[17]

FIGURE 10. SUMMARY OF ZEV MSRP RANGES BY BODY STYLE (EV LIBRARY)



As noted earlier, there are emerging consumer preferences and policy actions suggesting that the new ZEV market could start to see increased production of ZEVs in larger body styles. For example, the U.S. EPA's New Proposed Rulemaking (NPRM) suggests higher BEV penetration rates for model years 2027 and later for light- and medium-duty vehicles. Specifically, the EPA NPRM proposes new technology penetration rates for different body styles, qualifying that original equipment manufacturer (OEMs) are free to choose the zero-emission technologies believed to demonstrate compliance with the standards. Table 4 shows that the EPA NPRM projects an increased number of EV models in all listed body styles, particularly for light-duty

[17] https://www.kbb.com/car-advice/how-much-electric-car-cost/

pickups, sedans, and vans, which serves as some consensus that the light-duty EV market will begin to cater to demand for larger vehicle equivalents.

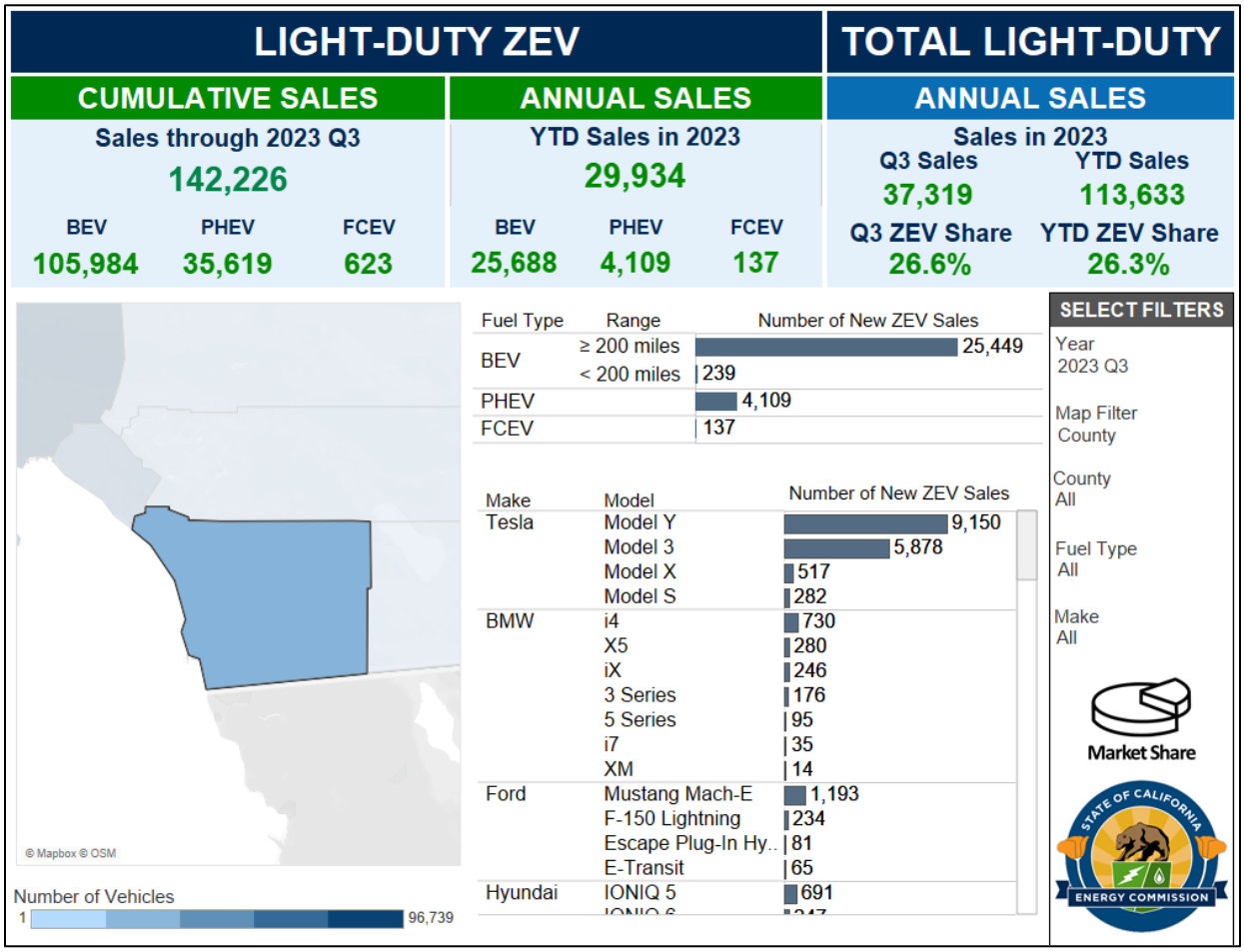
TABLE 4. FLEET BEV PENETRATION RATES, BY BODY STYLE, UNDER EPA NPRM STANDARDS

	2027 (%)	2028 (%)	2029 (%)	2030 (%)	2031 (%)	2032 (%)
Sedans	45	53	61	69	73	78
Crossovers/SUVs	38	46	56	59	61	62
LD Pickups	11	23	37	45	55	68
Vans	35	55	73	92	97	98
MD Pickups	7	1	3	4	15	19

New EV Markets

For regional trends in new ZEV sales, the California Energy Commission's (CEC) Zero-Emission Vehicle and Infrastructure Statistics dashboard records new ZEV sales across the state. The CEC new ZEV sales database can be used to track the number of new light-duty ZEV sales by make and model. Figure 11 shows a snapshot of the cumulative ZEV sales through the third quarter of 2023, reflecting that the San Diego region's new ZEVs are primarily BEVs from OEMs such as Tesla, Chevrolet, Volkswagen, and Ford.

FIGURE 11. CEC NEW LIGHT-DUTY ZEV SALES IN SAN DIEGO COUNTY

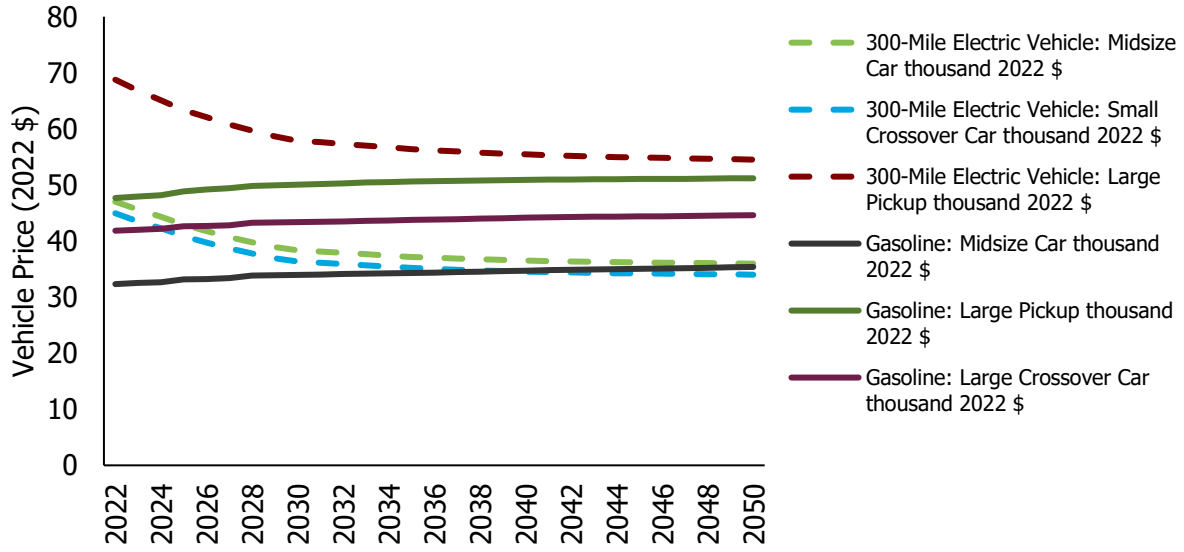


The CEC new ZEV sales dashboard provides a substantial level of new regional ZEV market data, with county- and zip-code level granularity to cross-reference against local-level socioeconomic data. The EV Library can be complementary to the CEC new ZEV sales statistics, providing estimates for the manufacturer's suggested retail price (MSRP) or sticker-value of ZEVs by make and model. As mentioned in the previous section, the EV Library tracks BEV and PHEV offerings at the trim-level, which can highlight the differences in price between ZEVs with different range or battery capacity specifications. Table 5 provides a sample of the EV Library's data on Chevrolet's upcoming battery-electric Blazer SUV as of November 2023; there are at least 8 known trim levels for the Chevrolet Blazer EV, which drives the sticker-value between $56,715 through $65,995 (excluding dealer markups). The new ZEV market is rapidly evolving, and it is anticipated that multiple versions or trims of ZEVs in different light-duty body styles will find their way to the market, especially considering state and federal policies supporting ZEV adoption.

TABLE 5. EXAMPLE OF AVAILABLE TRIMS FOR CHEVROLET BLAZER EV[18]

Make	Model	Model Year	All-Electric Range (miles)	Starting MSRP
Chevrolet	Blazer EV 2LT	2024	279	$56,715
Chevrolet	Blazer EV RS RWD	2024	320	$60,215
Chevrolet	Blazer EV SS AWD	2024	294	$65,995

FIGURE 12. U.S. EIA AEO2023 PROJECTIONS FOR NEW LIGHT-DUTY BEV PRICES



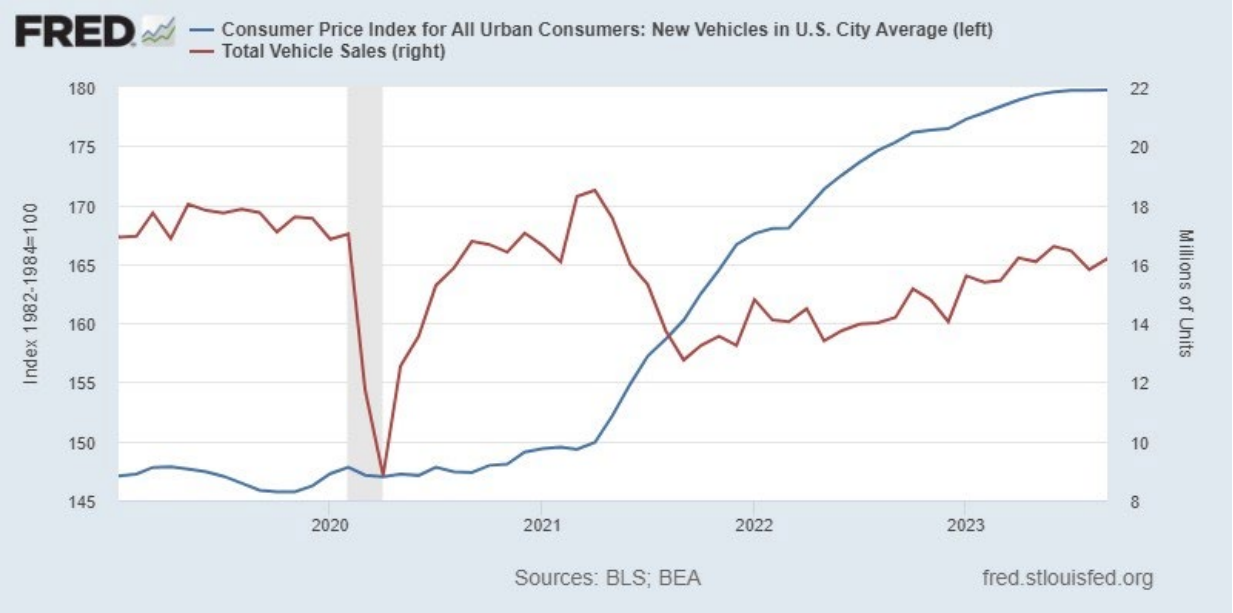
Additionally, the U.S. Energy Information Administration (EIA) publishes the Annual Energy Outlook (AEO), which provides projections about the transportation sector, including market share and prices of light-duty EVs. According to the AEO2023, which explores long-term transportation energy trends in the U.S. to project the market through 2050, costs for EV battery manufacturing are expected to decline because of improvements in battery technologies, as well as an increase in production volumes. In the AEO2023 analysis, projected battery costs drop 51% to 56% below what they were in 2022, settling at a retail price equivalent of $105 per kilowatt hour (kWh) to $118/kWh in 2050. Based on these projected battery cost

[18] https://www.chevrolet.com/electric/blazer-ev

drops, the AEO2023 estimates that EV purchase price will likely decrease enough to achieve cost-parity with gasoline-powered between 2029 through 2038 (depending on vehicle class). Figure 12 shows sample projections of various 300-mile BEVs and gasoline vehicles in different body styles. It should be noted that the EIA acknowledges there are a number of uncertainties that significantly impact EV market share or prices, including raw materials supply chains, future emissions and fuel economy regulations, and even changes in consumer attitudes towards ZEVs. Also important to state here is that the U.S. EIA AEO2023 price projections for BEVs by body style differ from the statistics observed in the EV Library. This is likely due to the extensive consumer choice and transportation demand modeling the U.S. EIA conducted to simulate the impacts that declining costs of vehicle components, EV sales shares at the census-division level, and consumer purchase decisions have on overall EV prices over the projection period.[19]

In 2020, the COVID-19 pandemic led to major economic disruptions, from which many manufacturers are still recovering. To demonstrate this, Figure 13 shows consumer price index and total vehicle sales data between 2019 through 2023. According to the Federal Reserve Economic Data (FRED), new vehicle purchases sharply decreased during the first quarter of 2020—around the same time many major cities announced stay-at-home orders—down from 17 million units per month to 8.8 million units per month. New vehicle sales declined as workers were laid off and imports of car parts were stopped at major ports. Since the stay-at-home orders have been lifted, the consumer price index (or relative inflation) of car prices has slowly increased, likely due to the backlog in parts and inventory that the market has yet to recover from. The trends in FRED's new vehicle sales and consumer price index suggest that despite the U.S. EIA's projections about future ZEV prices, the residual effects of supply chain shortages and demand-driven price changes remain significant issues. It is unclear if these trends indicate continued inflation of car prices over the long-term, especially if interest rates are subject to change over the short term. These aspects are valuable to consider when designing a regional incentive program.

FIGURE 13. FRED NEW VEHICLE SALES AND CONSUMER PRICE INDEX SINCE THE COVID-19 PANDEMIC



[19] Technical Note 3: Electric vehicle (EV) deployments from https://www.eia.gov/outlooks/aeo/narrative/

Used EV Markets

The prospect of the used ZEV market has mixed potential, offering both commendable advantages and potential drawbacks for prospective buyers. On the positive side, the market provides an opportunity for environmentally conscious consumers to embrace electrification without bearing the brunt of a new EV's purchase price. The availability of pre-owned EVs widens accessibility and aligns with the policies driving national and statewide adoption of ZEVs. Of course, the pre-owned EV market prompts buyers to consider depreciation and degradation of EVs, which there is not a lot of data for, especially for major system components. Trends in ZEV vehicle attribute data, such as traction battery replacement costs or time between major maintenance repairs, remains largely unknown. Other challenges, such as battery degradation and uncertainty about the vehicle's previous usage patterns pose significant hurdles. Potential buyers must navigate through these complexities, balancing the prospect of reduced emissions with the difficulty of assessing the electric car's overall health and performance history. For these reasons, outreach and educational programs are critical to make available for eligible applicants in ZEV incentive programs.

A paper published in the Transport Policy journal by Schloter contributes to existing research in the economics of electric vehicles by analyzing the depreciation of EVs along several countries and segments and compares it to gasoline vehicles by empirical analysis of publicly available data of 24,000 used vehicle sales.[20] The results show that vehicles have a degressive depreciation relationship over the age of the vehicle. The term "degressive depreciation relationship" refers to a pattern where the rate of depreciation decreases as the vehicle ages. In other words, the value of the vehicle drops at a decreasing rate over time. This is different from a linear depreciation, where the vehicle would lose the same percentage of its value each month or year. Schloter's study found that EVs have a higher depreciation of 1.16% per month (13.9% per annum) compared to gasoline vehicles with 0.87% per month (10.4% per annum). It is also noteworthy that as EV depreciation is an emerging field with limited data and prior knowledge, the observed trends from different studies may vary based on regions of study, vehicle types, and market characteristics. For example, Recurrent and Kelly Blue Book—research companies that have access to higher quality ZEV valuation data—have found that BEVs have demonstrated better value retention, with vehicles from manufacturers like Tesla only depreciating 10 percent in three years as compared to a gasoline equivalent that would depreciate 20 percent in one year.[21,22] Therefore, when projecting used EV market and vehicle economics, it is not only critical to separate EV depreciation trends from those of conventional vehicles, but also to take into account of value retentions of different EV models.

Other quantitative assessments of the pre-owned EV market look more closely at the U.S. and the different depreciation rates across EV model options. For example, a study by iSeeCars analyzed more than 6.9 million car sales to identify EV models with the greatest loss in value.[23] According to the study, nationwide data shows some indication that EVs can depreciate more than the average ICE/gasoline vehicle, primarily when accounting for the $7,500 federal tax credit and other state and local credits that were applied to these vehicles when they purchased new. However, the loss in valuation is not equal to the subsidy provided by the federal government, so the comparison is partially flawed in that study. Another contributing factor to EV depreciation is that the technology of EVs changes at a rapid pace, where conflation of vehicle package and battery technology improving rapidly over time means pre-owned EVs fall behind the curve in today's market. However, Tesla defies this trend, demonstrating that its EV options depreciate far less than its competitors' options.[24] Tesla's resilience to depreciation is attributed to regular remote updates

[20] https://www.sciencedirect.com/science/article/abs/pii/S0967070X22002074
[21] https://www.recurrentauto.com/research/used-electric-vehicle-buying-report
[22] https://www.kbb.com/car-advice/how-to-beat-car-depreciation/
[23] https://www.iseecars.com/off-lease-car-deals-study?_isctk=l29mzi
[24] https://www.carparts.com/blog/electric-vehicle-depreciation-101-why-do-evs-lose-their-value-faster-than-gas-cars/

throughout the vehicle's service life, reducing obsolescence-related value loss. Tesla's exclusive brand image, coupled with a widespread supercharger network and less reliance on buyer incentives, further contributes to their vehicles' robust value preservation compared to other EVs.

Navigating the pre-owned vehicle market also takes time for prospective buyers to ensure that any degradation to major system components is acceptable for the vehicle age and price. Previous driving behavior and charging patterns have one of the biggest impacts on system battery capacity and range. According to a comprehensive analysis presented by Energy5, vehicle electric vehicle charging times are greatly influenced by battery capacity, which tends to decrease with age.[25] For example, while a new battery can achieve an 80% charge in 30-60 minutes using a fast charger, a battery aged 3-5 years may take 1-2 hours, and one aged 6-10 years might require 2-4 hours for the same charge level. Batteries exceeding 10 years may face significant degradation, potentially rendering them unsuitable for recharging and signaling the need for replacement. The issue becomes more pertinent when considering that even transferrable warranties can expire after a certain period of time or mileage is exceeded. Most OEMs do provide some level of warranty protection, often providing extended coverage thanks to federal law mandating a minimum of eight years or 100,000 miles of coverage.[26]

One other insight into pre-owned EV attributes on Consumer Reports sheds light on the gradual loss of battery capacity over time, with current EVs experiencing an average of around 2% range loss per year. While batteries can be serviced and individual cells replaced, there's a risk that, after many years and several hundred thousand miles, the entire battery pack may require replacement due to significant degradation. The associated cost, ranging from $5,000 to $15,000, is comparable to an engine or transmission replacement in a traditional gas car.[27]

With these considerations in mind, as well as recent new and used car price inflation, one resource available to track listed prices for light-duty vehicles in the San Diego region is the San Diego Union-Tribune's new and used cars for sale directory. The SanDiegoDRIVES.com webpage allows prospective consumers to view new and used car listings by type, dealer location, and price. Notably, it also provides listings of pre-owned EVs selling within the San Diego region, offering some perspective on current market conditions. Figure 14 shows the range in pre-owned EV prices by vehicle model year.[28] The data represent 445 pre-owned EV options as of Oct 24, 2023, and includes offerings from major OEMs such as Tesla, Nissan, Chevrolet, and Audi, as shown in Table 6. The used EVs for sale data reflect that the SANDAG region has a surplus of Tesla models in comparison to other manufacturers' models, which partially explains the moderate average listed price of used ZEVs available. Considering that aforementioned ZEV valuation reports find that Tesla models are slower to depreciate, these price ranges observed in the regional used ZEV market seem to demonstrate this effect.

[25] https://energy5.com/the-shocking-truth-why-age-matters-when-it-comes-to-electric-car-battery-recharge-time
[26] https://cars.usnews.com/cars-trucks/advice/ev-battery-warranty#:~:text=This%20situation%20may%20have%20something,eight%20years%20or%20100%2C000%20miles
[27] https://www.consumerreports.org/cars/hybrids-evs/what-happens-to-the-old-batteries-in-electric-cars-a1091429417/
[28] https://drives.sandiegouniontribune.com/search?ctype=Used

FIGURE 14. USED EV LISTED PRICES IN SAN DIEGO BY MODEL YEAR

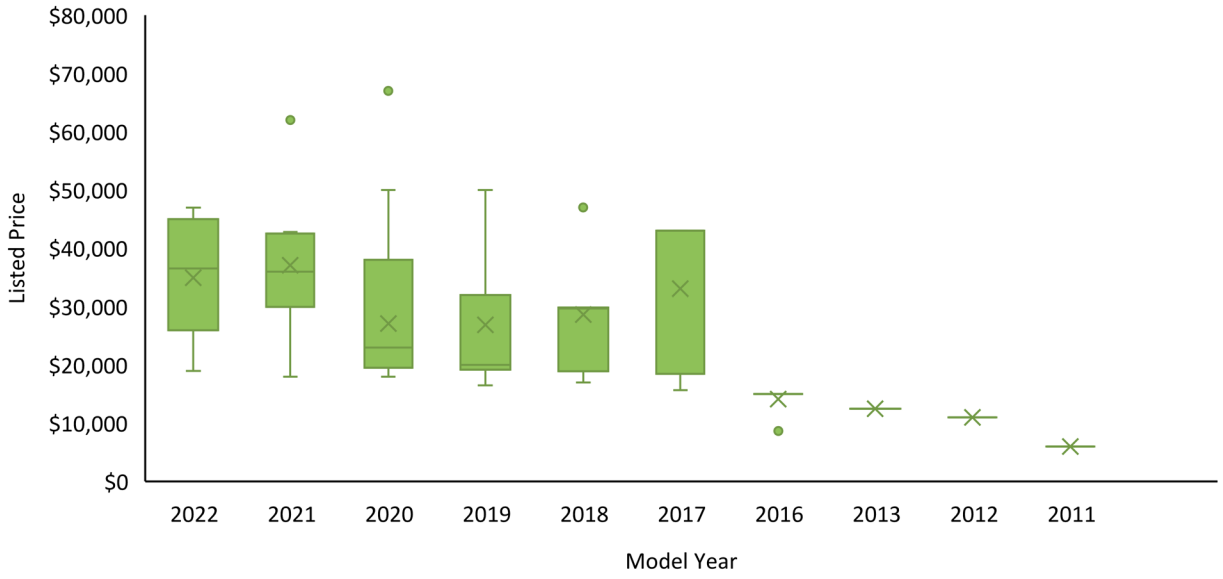


TABLE 6. SUMMARY OF USED EVS FOR SALE IN SAN DIEGO BY MAKE

Make	Number of offerings	Avg. Listed Price
TESLA	226	$ 39,031
NISSAN	86	$ 19,562
AUDI	23	$ 28,669
MINI	31	$ 20,486
CHEVROLET	49	$ 18,996

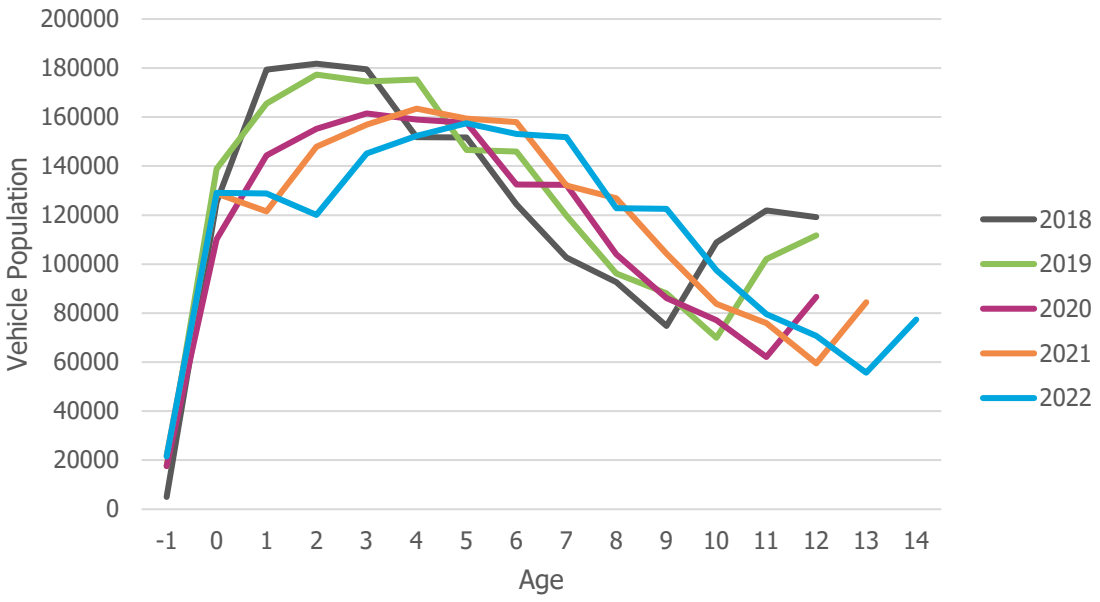
5. Regional Consumer Trends

In addition to relevant market data, the project team has also explored additional data sources that could guide vehicle purchasing behavior and develop aspects of the vehicle incentive program in the San Diego region.

Regional Vehicle Purchase Trends

To understand regional trends in vehicle ownership, the team leveraged the California Department of Motor Vehicles vehicle registration data categorized by zip code, model year, fuel type, make, and duty (light/heavy) in San Diego every year from 2018 to 2022. This data was used to understand how the ownership of light-duty vehicles registered in a San Diego County zip code has changed over time, especially before and after the pandemic. The following chart denotes the prevalence of vehicles by age.[29] As shown in Figure 15, before the pandemic, vehicles with 0 to 4 years old are the most prevalent in San Diego County. However, the peak has slowly migrated to age 3 to 7 in 2022, suggesting a shift from new vehicle purchases to used purchases, while retaining older vehicles for longer time as compared to pre-COVID.

FIGURE 15. VEHICLE REGISTRATION IN SAN DIEGO FROM 2018-2023.



Year-over-year data also provides insight on the number of non-gasoline fueled vehicles over time in San Diego County. As shown in Figure 16, the most common type of non-gasoline powered vehicle is hybrid gasoline, with registered vehicles increasing every year through 2022. Flex-fuel is the second most-common fuel type of non-gasoline vehicle, though registrations have been decreasing since 2018. Battery electric has seen a sharp increase since 2020.

[29] New vehicles that are registered for the newer model year compared to the data acquisition year are marked with age of -1.

FIGURE 16. NUMBER OF ALTERNATIVE FUELS VEHILCES REGISTERED IN SAN DIEGO

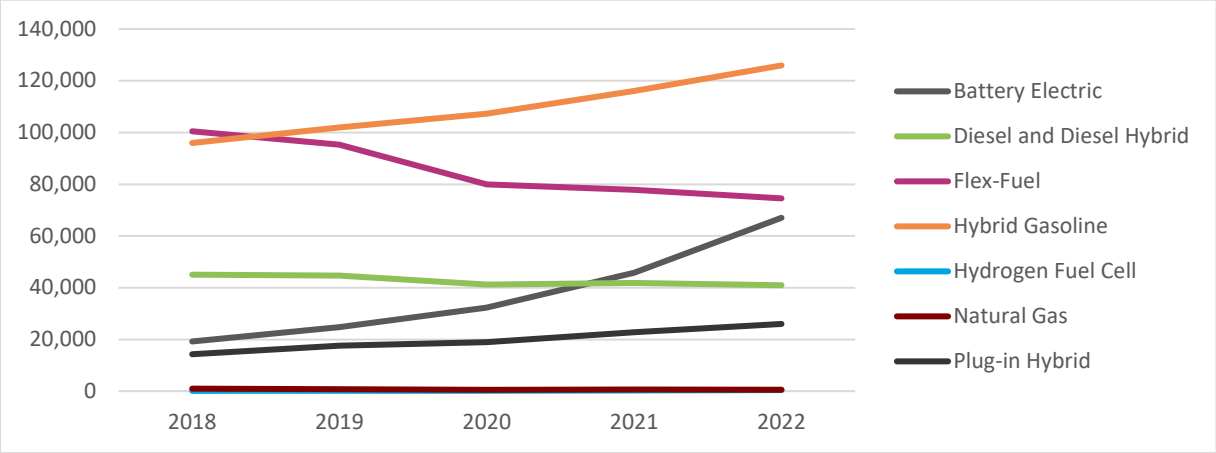
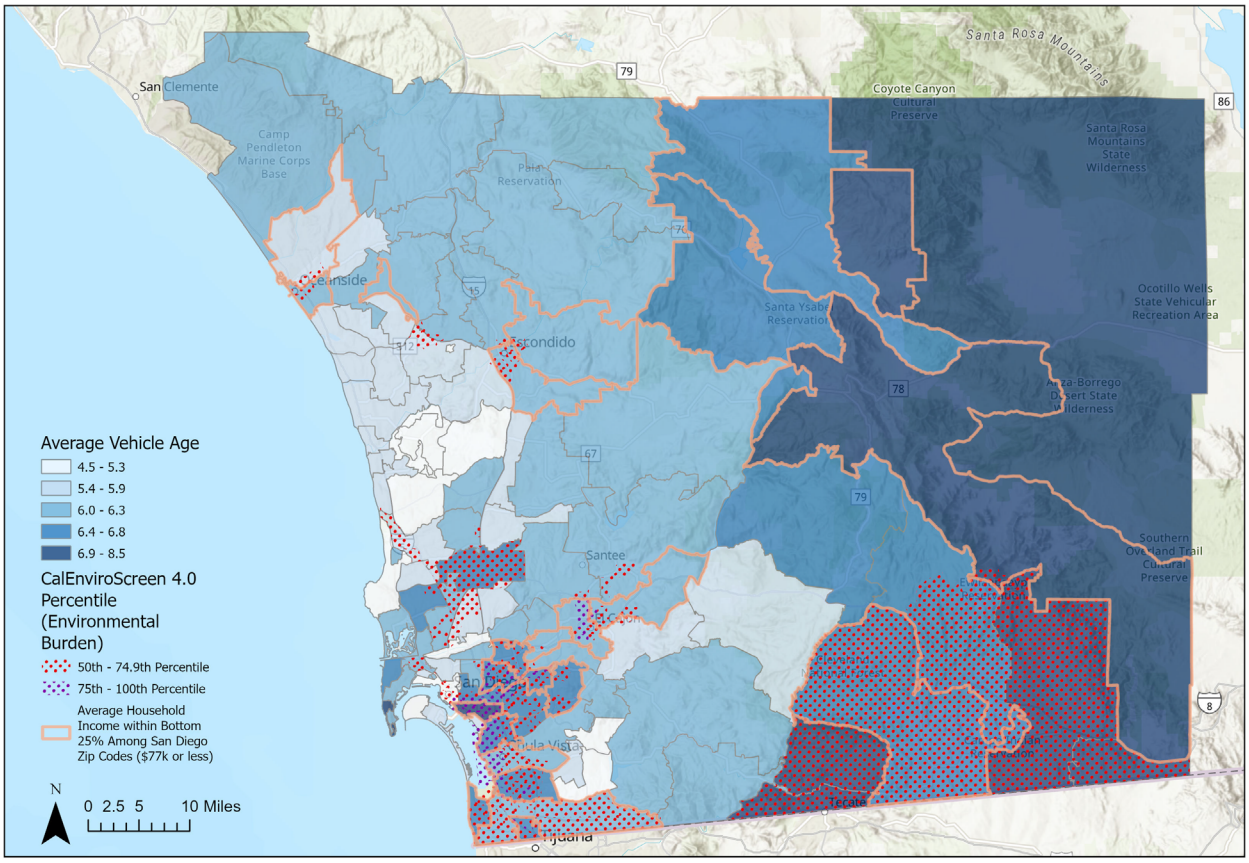


FIGURE 17: AVERAGE VEHICLE AGE TO LOW-INCOME AND ENVIRONMENTALLY BURDENED COMMUNITIES



Average Vehicle Age to Sociodemographic Characteristics

The vehicle registration data was then aggregated by zip code to examine regional vehicle ownership disparities, coupled with other information such as household income and CalEnviroScreen 4.0. Income data was retrieved from the United States Census Bureau 2022 American Community Survey (ACS) results for the San Diego region. The ACS features various products that describe the socioeconomic conditions within the region, including tables for household income and poverty status[30], as well as demographics and housing[31]. In addition to income, the team has also evaluated the vehicle ownership trends in communities disproportionately burdened by pollution using the Office of Environmental Health Hazard Assessment (OEHHA) CalEnviroScreen 4.0. Other incentive programs have successfully leveraged CalEnviroScreen to identify zip codes that fall within the top 25th percentile to better target disadvantaged communities.

The map, illustrated in Figure 17, depicts the average vehicle age overlaid with CalEnviroScreen data, which is depicted by census tracts. These tracts represent the 50th and 75th percentiles of environmental burden within California. Additionally, the map includes data on average household income, focusing on the bottom 25% in the San Diego region. Recent vehicle ownership trends demonstrate that new vehicle purchases more often occur in higher-income communities in recent years, while residents in lower-income communities tend to hold on to their vehicles longer. These trends are more significant in historically underserved communities and rural communities, which have among the highest average vehicle ages of the region.

Research from the National Center for Sustainable Transportation (NCST) observed the relationship between EV purchases (new and used) and sociodemographic factors.[32] The NCST research observed more high-income buyers purchasing new and used EVs than low-income buyers across California. However, of purchased EVs, across all income brackets, Hispanic and African American buyers were more likely than Asian and non-Hispanic, white buyers to purchase a used EV, purchasing seven new EVs for every one used EV purchased.

Disparities in ZEV Adoption

In addition to overall vehicle age, the team has also examined how socioeconomic data correlates with ZEV ownership. According to a recent study from the International ZEV Alliance (ZEVA), despite accelerated adoption and supporting infrastructure, accessibility gaps in electrified transportation persist.[33] ZEV ownership correlates with income and education levels, with high-income zip codes reporting up to seven times more ZEV ownership than lower-income areas in California. As shown in Figure 18, similar trends were also observed in San Diego County, where ZEV penetration from zip codes who fall within the top 10% income level is five times more than those who are among the bottom 10% income level.

The project team also applied forementioned socioeconomic and CalEnviroScreen 4.0 data by San Deigo zip code to measure disparities in regional ZEV adoption and inform how to set incentive levels and allocation of funds. Figure 18 shows ZEV ownership rates compared to income percentiles within San Diego

[30] U.S. Census Bureau. (2022). Income in the Past 12 Months (in 2022 Inflation-Adjusted Dollars). American Community Survey, ACS 1-Year Estimates Subject Tables, Table S1901. Retrieved October 3, 2023, from https://data.census.gov/table/ACSST1Y2022.S1901?q=San+Diego+County&t=Income+and+Poverty.
[31] U.S. Census Bureau, "ACS Demographic and Housing Estimates," 2022. American Community Survey, ACS 1-Year Estimates Data Profiles, Table DP05, 2022, accessed on October 3, 2023, https://data.census.gov/table/ACSDP1Y2022.DP05?q=San+Diego+County.
[32] Muehlegger and Rapson. (2018). Understanding the Distributional Impacts of Vehicle Policy: Who Buys New and Used Alternative Vehicles? A Research Report from the National Center for Sustainable Transportation.
[33] https://zevalliance.org/ej-zevs-jan23/

zip codes and demonstrates a clear positive correlation between higher income levels and high ZEV vehicle ownership. As shown in Figure 19, the map below begins to highlight environmentally burdened communities with low ZEV ownership rates. In general, communities within and south of Downtown San Diego, such as Barrio Logan, National City, and portions of Chula Vista, are within the 75th percentile of environmental burden and bottom 25% of income and feature low ZEV ownership rates, as well as high average vehicle ages. Rural areas of San Diego County also share low ZEV ownership rates and high average vehicle ages. Alternatively, Encinitas, Carlsbad, and Rancho Santa Fe, which have higher household income levels, have the highest ZEV ownership rates and lowest average vehicle ages in San Deigo County.

FIGURE 18. ZEV OWNERSHIP COMPARED TO INCOME STATISTICS BY SAN DIEGO ZIP CODE

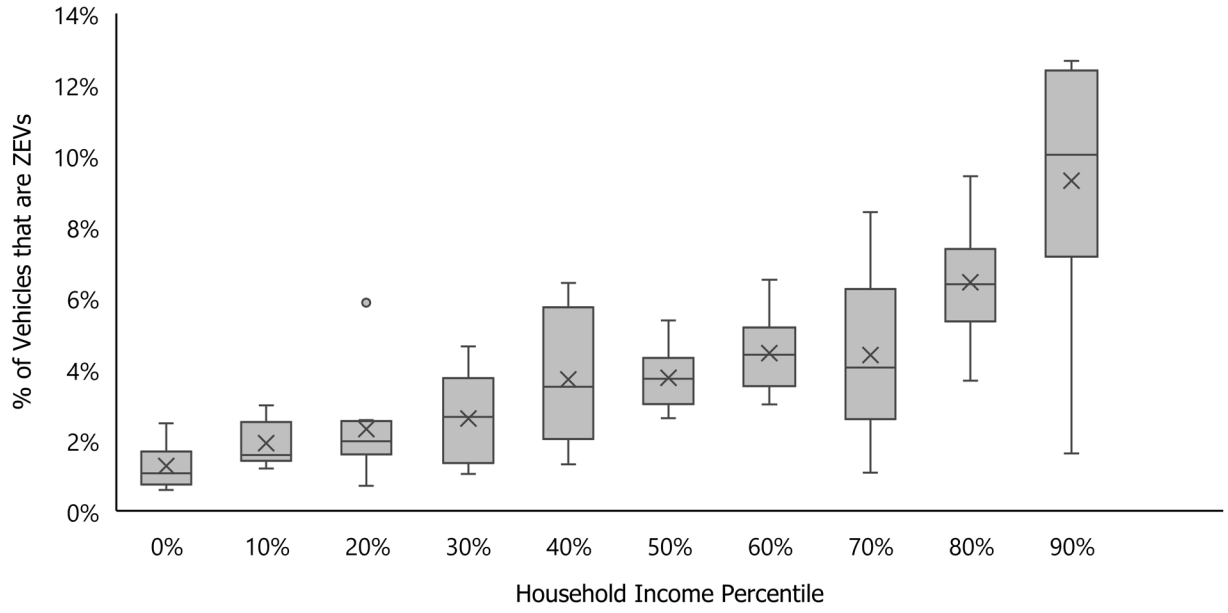
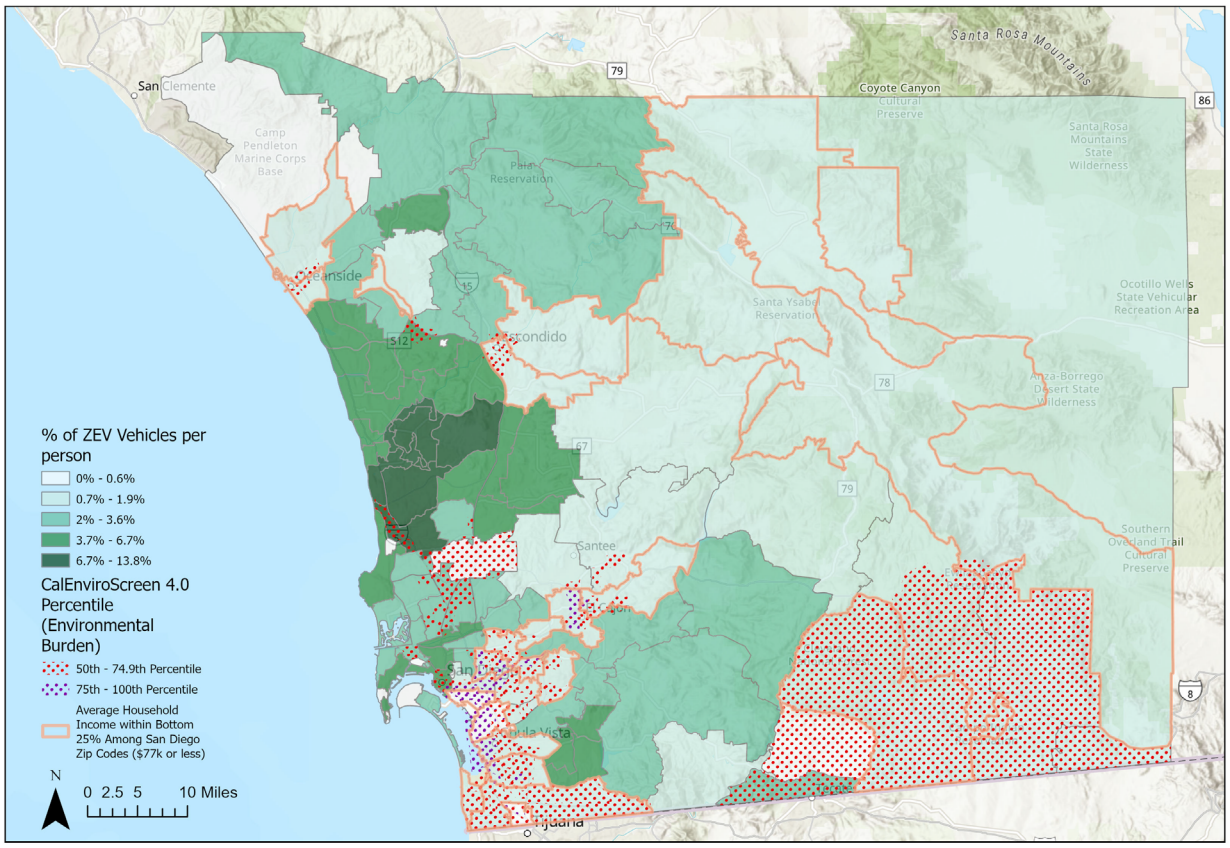


FIGURE 19: ZEV OWNERSHIP TO ENVIRONMENTAL BURDENED COMMUNITIES



ZEV Ownership to Sociodemographic Characteristics

SANDAG ARCADIS ICF

6. Data Gaps and Next Steps

The research on market conditions for new and used ZEVs, the derived consumer trends, the findings on available models, and the incentive program landscape have been consolidated into this Existing Conditions Assessment. The Assessment addresses the need to refer to qualitative findings, such as input from stakeholder engagement, as well as quantitative data and analyses, especially databases that disseminate relevant ZEV attributes and socioeconomic indicators. With that considered, there are notable gaps in ZEV attribute trends over time, and there is room to explore other research methodologies or analyses to better understand vehicle purchasing behavior. Additionally, there may be other resources that can help contribute to developing aspects of the ZEVIP for the San Diego region.

For example, better consumer preference data would be valuable for the regional incentive program. Although the federal and State-level electrification rules discussed previously will increase ZEV sales requirements, it is not yet clear what kind of ZEV models will best meet consumer expectations. Consumer expectations may also vary regionally, which means different subregions may benefit from targeted policies. Looking outwards where some level of understanding has been achieved in consumer preference, existing studies and recent research can help fill in the region's current knowledge gap. Studies conducted by the International Council on Clean Transportation (ICCT) in 2016 and studies by Jenn et al. in 2018 offer historical precedents to how analyzing consumer preference data can lead to more successful incentive programs. Alternatively, consumer preference data could be collected through more localized outreach, particularly in communities with currently lower EV adoption rates.

The existing literature provides some insight on the impact of incentives on EV adoption, such as S. Hardman's review, which discusses the relationship between demographics and vehicle types for shaping effective policies.[34] Established models, such as tiered incentive structures, can make it easier to account for which vehicles and applicants are eligible for support, however this style of incentive structure could narrow the potential pool of applicants, slowing ZEV adoption where resources are otherwise available. Determining a tiered incentive structure also poses its own set of challenges; beyond budget constraints, factors influencing the dollar amount of incentives need exploration. Analyzing the incentive type and timing's effects on applicant behavior is essential. Scientific journals, such as the Transportation Research Library and Environmental Economics and Management, regularly present findings about ZEV market share and incentive impacts from public and private sources. In recent years, studies published by J. R. DeShazo and colleagues on designing policy incentives, shed light on lessons from California's plug-in EV rebate program.[35] Other studies that could be considered in subsequent literature reviews could look at more explicit examples measuring preferences for EV financial incentives among consumers or applicants. Additionally, studies like those conducted by T. L. Sheldon and R. Dua assessing the effectiveness of programs like "Replace Your Ride" in California contribute valuable insights into incentive program efficacy.[36] The insights from these studies should be applied to regional electrification efforts, updating the regional ZEV initiatives to track the reach of funds to priority populations. In doing so, the region can readjust eligibility requirements or program goals to advance goals consistent with ongoing efforts.

In the next steps, the team will conduct public outreach and engagement to solicit feedback on current findings related to existing regional conditions, filling in any qualitative and/or quantitative data gaps where

[34] S. Hardman, "Understanding the impact of reoccurring and non-financial incentives on plug-in electric vehicle adoption – A review," Transp. Res. Part Policy Pract., vol. 119, pp. 1–14, Jan. 2019, doi: 10.1016/j.tra.2018.11.002
[35] J. R. DeShazo, T. L. Sheldon, and R. T. Carson, "Designing policy incentives for cleaner technologies: Lessons from California's plug-in electric vehicle rebate program," J. Environ. Econ. Manag., vol. 84, pp. 18–43, Jul. 2017, doi: 10.1016/j.jeem.2017.01.002
[36] T. L. Sheldon and R. Dua, "Assessing the effectiveness of California's 'Replace Your Ride,'" Energy Policy, vol. 132, pp. 318–323, Sep. 2019, doi: 10.1016/j.enpol.2019.05.023

possible, and consolidating the current findings with public feedback to design and develop the ZEVIP Program Strategy. The process will consist of administering a series of questions intended to close regional knowledge gaps about: current EV ownership, prospective EV purchase plans, opinions of EVs and incentive programs, vehicle quotes and running costs, and overall household EV statistics. Collecting this type of regional EV ownership data will gauge the level of awareness and provide a basis for how to make the incentive program more tailored to the needs of the community. The Program Strategy will also include program elements, funding considerations, and design guidelines that enable more low- and moderate-income consumers to consider a ZEV purchase or lease. The topics should cover program structure, incentive distribution methods, eligible vehicle technologies, recommended incentive levels, budget allocation for low-income applicants, incentive options for other electric mobility options, and recommended performance monitoring metrics.