Appendix C: Updated Three-Year Plan for CVRP and the ZEV Market

As required by SB 1275 and the Supplemental Report of the 2018-19 Budget Act

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Contents

Introduction

Overview

Since the introduction of the first Light-Duty Long-Term Plan in FY 2016-17, the zero-emission vehicle (ZEV) market has grown tremendously. Various events over the last few last years, including the ongoing effects of CARB's many years of ZEV and other automobile air pollution regulations, the introduction of new vehicles (there are now over 80 electric vehicle models in the U.S.) and clean transportation equity programs, have improved the ZEV market landscape. Moreover, under the direction of Governor Newsom's Executive Order N-79-20, CARB's pending proposal to greatly increase the stringency of its ZEV program, requiring 100 percent ZEV sales by 2035, will further stabilize the market. However, the global health and economic crisis disrupted the new vehicle market as a whole in 2020. Impacts to ZEV production, inventory, and dealerships coupled with decreased household income for many have made it difficult to analyze the impacts of these events on the assumptions, evaluations, and recommendations for light-duty ZEV and clean transportation programs. Major changes in the light-duty ZEV market and clean transportation equity programs, along with continuing regulatory efforts, will be required to allow for project sustainability within a limited budget and to better foster market growth from harder to reach market segments especially during times of economic uncertainty.

Statutory Goals and Requirements

SB 1275 (De León, Chapter 530, Statute of 2014) established the Charge Ahead California Initiative with the goals of placing one million zero-emission and near zero-emission vehicles in California by 2023 to establish a self-sustaining market and increasing access to these vehicles for lower-income consumers and consumers in disadvantaged communities. Among other requirements, SB 1275 requires the California Air Resources Board (CARB) to include a long-term plan for the Clean Vehicle Rebate Project (CVRP) and related programs in the FY 2016-17 Funding Plan and to update the plan every three years. The plan must include: a three-year forecast of funding needs to support the goals of technology advancement, market readiness, and consumer acceptance of advanced vehicle technologies, a market and technology assessment for each funded vehicle technology, and an assessment of when a self-sustaining market is expected and how existing incentives may be modified to recognize expected changes in future market conditions.

In addition, the Supplemental Report to the 2018-19 Budget Act requires CARB to annually update the CVRP forecast until January 1, 2030 and include as part of its forecast the total State rebate investment necessary to facilitate reaching the goal of placing in service at least five million ZEVs by January 1, 2030, including:

- Models of the impacts of various rebate scenarios' ability to maximize the effectiveness of the rebates provided based on relevant data.

- Annual recommendations for changes to the project structure and various rebate levels based on market demand to reach the 2030 goal, including the project's income eligibility requirements to target moderate and low-income customers.
- Projected sales figures of electric vehicles.
- Impacts of federal policy changes on the adoption of electric vehicles.
- Sales price difference between electric vehicles and non-electric vehicles.
- Assessment of marketing efforts of electric vehicles by automobile manufacturers.
- Survey results of consumer awareness and acceptance of electric vehicles and awareness of the benefits associated with ZEVs.

As part of the FY 2016-17 Funding Plan, staff, in consultation with stakeholders proposed a framework for the three-year plan and provided the first three-year funding needs forecast along with a market and technology assessment. Staff also proposed a suite of indicators to measure ZEV market growth over time. Although SB 1275 required CARB to update the plan every three years, staff has provided updates to all components of the plan each year since 2016. This year's plan includes an update on the ZEV market, including an updated long-term plan for CVRP.

Organization

This appendix is organized as follows:

- Evaluation of CVRP Funding Needs
- ZEV Market and Technology Assessment
- A Sustainable ZEV Market
- CVRP and ZEV Market Long-Term Funding Need Conclusions

Evaluation of CVRP Funding Needs

California's ZEV market has rebounded since late-2020 with an increase in purchases and leases for new EVs. With the advancement of the technology, the current market trend indicates that ZEV costs and fueling time are likely to be reduced, while vehicle range and model choices are expected to increase. Consumer education and awareness of EVs and their benefits have improved and as a result, the California EV market maintained a nearly eight percent market share in 2020 and saw an increase to nearly eleven percent in the first half of 2021.

The next three to five years are critical for the EV market as industry, in response to CARB regulations and growing ZEV mandates around the world, is heavily investing in development and expansion of EV production and new government policies around the world are paving the way for the big shift from old polluting technologies to cleaner ones.[1] During this time, and likely enhanced by proposed CARB regulations to further increase ZEV penetration in

[1] *https://www.iea.org/publications/reports/globalevoutlook2019/*

new vehicle sales, the California ZEV market will likely leap over the chasm between the early adopter market segment and reach the early majority market. This will lead to adjustments in price and technological features that better serve the needs of the mass market. We anticipate that at that point, we will reach a sustainable market where government incentives are no longer required for the mass market and efforts will be focused on harder to reach consumer segments and used vehicles.

In this section of the Long-Term Plan, staff evaluates the CVRP funding need over the next three years as required by SB 1275. Staff also projects forward ZEV sales and CVRP funding need out to 2030 if the ZEV market growth continues on its current trajectory to make a preliminary assessment of how the market is doing compared to the State's ZEV deployment goals of:

- 1 million vehicles by 2023
- 1.5 million vehicles by 2025
- 5 million vehicles by 2030

The forecast out to 2030 is a requirement of the Supplemental Report to the 2018-19 Budget Act. While this report focuses on the ZEV deployment goals established in SB 1275, other CARB documents, such as the Mobile Source Strategy, provide an update on progress and strategies required to meet the State's other air quality targets and greenhouse gas reduction goals. The State's climate goals impacting the ZEV market include the target set by Executive Order S-03-05 to be carbon neutral by 2045 and Executive Order N-79-20[2] which calls for 100 percent of in-state sales of new passenger cars and trucks be zero-emission by 2035. The 2020 Mobile Source Strategy has called for an even more aggressive deployment of light-duty passenger vehicles, and CARB will be proposing regulations to support these goals.[3]

Staff first describes an update to its methodology for projecting CVRP funding needs given the health and economic crisis of 2020. Staff then presents the projected funding need for CVRP for the next three fiscal years. Finally, staff presents an evaluation of effects of the CVRP changes proposed in this Funding Plan and the projections out to 2030.

CVRP Projection Methodology

Light-duty vehicle sales fell sharply during the 2020 global COVID-19 pandemic, but EV sales were a relative bright spot, indicating continued interest in these vehicles. EV sales did not decline as precipitously as vehicles with other drivetrains, but there was a meaningful decline in EV sales during the second quarter of 2020, before recovering to near 2019 levels in the

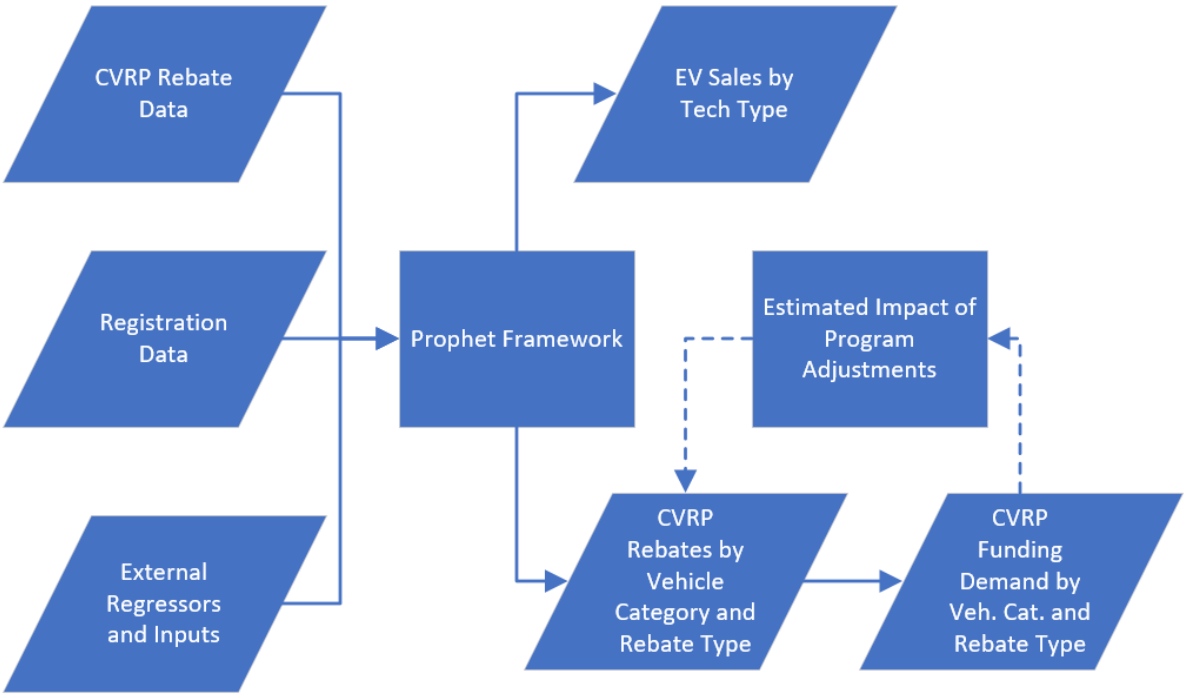
[2] Executive Order N-79-20 *https://www.gov.ca.gov/wp-content/uploads/2020/09/9.23.20-EO-N-79-20-Climate.pdf*

[3] California Air Resources Board. *Proposed 2020 Mobile Source Strategy*. September 2021. *https://ww2.arb.ca.gov/sites/default/files/2021-09/Proposed_2020_Mobile_Source_Strategy.pdf*

latter part of the year.[4] CVRP Rebate totals also declined during 2020 but have returned to and exceeded 2019 levels during the last quarter of 2020 and the first quarter of 2021.

To estimate the future budgetary need of the CVRP and progress toward state goals, the CVRP administrator, the Center for Sustainable Energy (CSE), uses Prophet, an open-source forecasting framework[5], to develop EV sales and rebate forecasts. The Prophet framework allows CSE to account for factors external to the program and to estimate the impact of various market conditions, such as the recovery from the pandemic-related decline in EV sales and rebates. Prophet also allows for exclusion of anomalous events, which can then be excluded from the model in order to mitigate outsized impact on the forecasts. The projections methodology is summarized in Figure 1, and inputs and assumptions used in the model are summarized in the following section.

Figure 1. Simplified Projections Methodology Diagram



[4] Alliance for Automotive Innovation (2021). Advanced Technology Vehicle Sales Dashboard. Data compiled by the Alliance for Automotive Innovation using information provided by IHS Markit (2011–2018) and Hedges & Co. (Jan 2019–Oct 2019). Data last updated 5/26/2021. Retrieved 6/3/2021.

[5] *https://facebook.github.io/prophet/*

Projections Inputs and Assumptions

The forecasts use CVRP rebate data from the life of the program through July 2021, and EV sales data through January 2021 from IHS Markit. Two external factors are included in the model. A COVID-19 pandemic regressor is included, which dampens sales and rebate forecasts starting in April 2020, and allows for a steady recovery to pre-pandemic levels from July 2020 through November 2021.[6] A waitlist regressor[7] is also included to estimate the impact of waitlists on rebate demand.

The BEV rebate and sales forecasts excludes a relatively anomalous time period from June 2018 through May 2019. This period was characterized by a temporary sharp increase in overall BEV rebate and sales volumes due to pent-up demand unleashed by the release of the Tesla Model 3.

Vehicle categories and rebate types are modeled separately. With the exception of FCEV, all categories and types are forecast as linear models, and are capped at 170,000. FCEV was specified as a logistic growth model to stabilize the forecast. The FCEV forecasts also include a 38 standard rebate minimum, and a 50-rebate cap on FCEV increased rebates for fleets operating in DACs.

The Clean Fuel Rewards program was included as a separate adjustment to account for the impact of an additional incentive up to $1,500. Sales and rebate forecasts are adjusted based on price elasticity of demand between -1 and -3.9 with a best guess of -2.5[8] and an

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[6] Some market analysts expect the recovery to begin in 2021, others expect supply-chain related delays to stretch recovery into 2022 or 2023. November was selected as the last month of 2021 before the typically high-application-volume December month.
Hilgert, R., & Whiston, D. (2021, April 15). What We Expect for the Automotive Industry After COVID-19. Morningstar. *https://www.morningstar.com/articles/1033388/what-we-expect-for-the-automotive-industry-after-covid-19*
S&P Global, as quoted in Winton, N. (2021, May 11). China, U.S. Lead Global Auto Sales Recovery; Lagging Europe Steers Electric Charge. Forbes. *https://www.forbes.com/sites/neilwinton/2021/05/11/china-us-lead-global-auto-sales-recovery-lagging-europe-steers-electric-charge/?sh=63e5c0f77aab*

[7] Center for Sustainable Energy. (2019, October). Summary of CVRP Rebate Eligibility and Funding Availability Over Time. *https://cleanvehiclerebate.org/sites/default/files/attachments/CVRP_Disruptions_Fact_Sheet.pdf*

[8] Hafstead, M. A. C., Look, W., Keyes, A., Linn, J., Burtraw, D., & Williams, R. C. I. (2019). An Analysis of Decarbonization Methods in Vermont. Resources for the Future.; Muehlegger, E., & Rapson, D. S. (2018). Subsidizing mass adoption of electric vehicles: Quasi-experimental evidence from California. UC Davis.; Narassimhan, E., & Johnson, C. (2018). The role of demand-side incentives and charging infrastructure on plug-in electric vehicle adoption: Analysis of US States. Environmental Research Letters, 13(7), 074032.; Tal, G., & Nicholas, M. (2016). Exploring the Impact of the Federal Tax Credit on the Plug-In Vehicle Market. Transportation Research Record: Journal of the Transportation Research Board, 2572(1), 95–102.; Wee, S., Coffman, M., & La Croix, S. (2018). Do electric vehicle incentives matter? Evidence from the 50 U.S. states. Research Policy, 47(9), 1601–1610.

illustrative average vehicle price of $39,000.[9] CFR incentives of $1,500 for BEVs and $1,303 for PHEVs were assumed.

In April 2021 the all-electric range minimum was changed from 35 miles based on the urban dynamometer driving schedule to 30 miles based on the EPA's test cycle. This led to the exclusion of several vehicle models from eligibility. To adjust for the change, PHEV rebate forecasts were reduced by 64%–74%, and BEV rebates were increased by up to 2% to account for some substitution of PHEVs for BEVs among projected future participants.[10]

Finally, to account for increased uncertainty due to the rapid growth and variability in BEV increased rebate applications during the first quarter of 2021, error bounds for the first forecast year (June 2021–July 2022) were increased by 37.5% for the low bound, and 50% for the high bound.

CVRP Funding Need for Next 3 Years

Table 1 shows the projected CVRP funding need over the next three budget cycles, including the funding needed to support the current waitlists for standard and increased rebates, assuming no changes to the program. The estimated total three-year funding need, including the first-year waitlist, ranges from $356 million to $911 million. The total funding need for FY 2021–22 ranges from $123 million to $251 million. This amount includes:

- $34 million–$56 million to fund the waitlist, which started on May 19, 2021 and is estimated to end on September 30, 2021
- $59 million–$117 million for Standard and Fleet Rebates during the remainder of FY 2021-22 (spanning October 2021 through June 2022)
- $30 million–$78 million for Low-income Increased Rebates during the remainder of FY 2021-22

[9] Tamerius, J. (2020). Applicant Income and After-Rebate Vehicle Price Trends. Center for Sustainable Energy. *https://cleanvehiclerebate.org/eng/content/applicant-income-and-after-rebate-vehicle-price-trends*

[10] Based on an analysis of CVRP Rebate Application data and CVRP Consumer Survey Data.

Table 1. Projected CVRP Funding Demand over Next Three Years

Year	Rebate Type	Projected Funding Demand (millions)			Projected Rebates (thousands)		
		Min.	Median	Max.	Min.	Median	Max.
Waitlist: 5/19/21 – 9/30/21	Standard and DAC-Fleet Increased	$21	$27	$32	10	13	16
	Lower-Income Increased Rebates	$13	$18	$24	3	4	5
	Total Need	$34	$45	$56	13	17	21
Oct 2021 – Jun 2022	Standard and DAC-Fleet Increased	$59	$86	$117	28	41	57
	Lower-Income Increased Rebates	$30	$61	$78	7	13	17
	Total Need	$89	$147	$194	35	55	74
Jul 2022 – Jun 2023	Standard and DAC-Fleet Increased	$72	$117	$173	34	55	84
	Lower-Income Increased Rebates	$51	$101	$125	11	22	28
	Total Need	$123	$217	$298	45	77	111
Jul 2023 – Jun 2024	Standard and DAC-Fleet Increased	$50	$119	$207	23	56	100
	Lower-Income Increased Rebates	$60	$123	$155	13	27	34
	Total Need	$109	$242	$363	36	83	134
3-Year Average		$107	$202	$285	39	71	107
3-Year Average including waitlist in first year		$119	$217	$304	43	77	114
Three-year total, including waitlist in first year		$356	$650	$911	130	231	340

Impact of Proposed CVRP Program Changes

Consistent with the Budget Act of 2021, staff are considering several mechanisms for phasing down the incentive that will help to ensure the program remains within the $515 million budget allocation for as much of the next three years as possible. These mechanisms would be triggered by reaching EV sales goals of 1 million and 1.25 million based on data provided by the California Energy Commission's (CEC's) Zero Emission Vehicle and Infrastructure Statistics webpage.[11] Those mechanisms include:

- Reducing the income caps for standard rebate participants: Income caps would be adjusted by tax filing status. Staff proposes two new income cap levels per filing status. For single filers, the current $150,000 gross annual income cap to be eligible for the standard rebate would be reduced to $135,000 and $120,000. For head-of-household filers, the current $204,000 cap would be reduced to $175,000 and $160,000. For joint filers the current $300,000 cap would be reduced to $200,000 and $185,000. Reducing the income cap would have a moderate to large impact on the budget, projected rebates, and EV sales. Staff used reduced income cap numbers

[11] California Energy Commission (2021). California Energy Commission Zero Emission Vehicle and Infrastructure Statistics. Data last updated July 30, 2021. Retrieved August 7, 2021 from https://www.energy.ca.gov/zevstats

previously proposed by the Legislature and members of Charge Ahead California when developing this proposal. Staff believes that this policy change helps direct limited program funding to those who need it most.

- Bifurcating the MSRP Cap between cars and SUVs/vans/pickups, and reducing the MSRP cap for cars to $45,000: In the FY 2020-21 Funding Plan, the Board approved staff's proposal of a framework to bifurcate eligible vehicles into "Cars" and "Large Vehicles" based on EPA vehicle class. The Large Vehicles category includes minivans, pickups, and SUVs, while the Cars category includes all other light-duty vehicle classes (e.g., hatchbacks, sedans, wagons, two-seaters). Staff is proposing a reduction in the current MSRP cap of $60,000 to $45,000 for all vehicles that fall under the Cars category. This would exclude the BMW i3 REx (which has been phased out by BMW[12]) and the Polestar 2. The release of future affected vehicles may increase the impact of this rebate reduction. The limited number of vehicles with model minimum MSRPs between $45,000 and $60,000 (the current cap) would yield small budget savings, with a small number of projected rebates excluded from the program, some of which would be lost from the market due to the loss of the rebate. This change would not apply to vehicles that fall under the Large Vehicle category as they are newer to the market so they would retain a $60,000 model minimum MSRP cap. As stated in previous updates to the long-term plan for light-duty vehicles, staff is making a change to this program lever to ensure that funding is not going to luxury vehicles and to encourage vehicle manufacturers to produce more affordable EVs.

- Reducing rebate amounts in $250 increments as rebate funds are depleted: Staff is proposing a rebate reduction of $250, applied to all rebate types. This change would likely have a moderate impact on the budget, and a small impact on rebate demand and EV sales estimates. This change allows for a moderate ramp down of the standard rebate while retaining a $2,500 bonus for low- and moderate-income applicants.

- Phasing out PHEVs: Staff is proposing to exclude PHEVs from the program which would immediately exclude the Honda Clarity PHEV, Ford Escape PHEV, and Toyota RAV4 Prime. Possible future impacted vehicles might include the Hyundai Santa Fe PHEV, the Kia Sorrento PHEV, and the Hyundai Tucson PHEV. Based on recent program data, there has been a shift toward an increase in rebate applications for battery electric vehicles. This change would focus remaining funding on the cleanest vehicles available and provide continued support toward a sustainable ZEV market.

- Reducing the income threshold for Low-to-moderate-income Increased Rebates to 300 percent of the federal poverty level: Reverting the household income threshold

[12] Vijayenthiran, V. (2021). BMW i3 on its way out, no direct successor planned. Motor Authority. *https://www.motorauthority.com/news/1125088_bmw-i3-on-its-way-out-no-direct-successor-planned*

for eligibility for the Low-/Moderate-income Increased Rebate from 400 percent of the federal poverty level (FPL) to 300 percent FPL would have a moderate budgetary impact. Data required to estimate the impact on rebate application demand and vehicle sales is not currently available, but price-elasticity of demand-based estimates suggest as much as 25 percent of the 300 percent to 400 percent FPL group could be lost from the program due to the reduction in rebate amount. Overall, this change would likely have a moderate budgetary impact. Although this change would have a moderate budget impact, it would take CVRP out of alignment with Financing Assistance and CC4A and complicate stacking opportunities for participants unless all three programs made this change at the same time.

- Increasing all-electric range minimum requirements for PHEVs: Staff considered an increase to the minimum all-electric range requirement established in the previous funding plan, from 30 EPA-based all-electric miles to 35 miles. This change would affect the Chrysler Pacifica PHEV (32 miles all-electric-range). The immediate budgetary and rebate application demand changes would be very small, likely less than 1 percent overall. The release of future vehicles with all-electric ranges between 30 and 35 miles would increase the impact of this change.
- Implementing a "limited-time offer" rebate mechanism for standard rebates: Staff considered a "limited-time offer" standard rebate program which would involve limiting availability of the rebate to a set time during the year. Staff considered two durations for a limited-time offer program: six months and four months. Once the $100 million in amendment funding added to FY 2020–21 to cover the waitlist and to bridge to next fiscal year has expired (estimated to be November 2021), the standard rebate would be closed until April 2022, when it would be reopened for four or six months, before being closed again for the subsequent six or eight months. Though there are insufficient data to confidently assess the impact of this design, it is estimated this would have a large effect on the budget, rebates, and sales. Further, it should be noted that while proponents of this approach argue that manufacturer offered limited time rebates work well for overall vehicle sales, staff believes this is likely because of the nature in which manufacturer discounts are offered and traditionally accepted by the public. A government offered incentive will not likely be accepted by the public in the same way, and as staff has seen over the last decade, incentives that stop and start cause confusion and frustration, which does not aid in achieving our ZEV goals.
- Implementing an annual per-OEM standard rebate cap: Staff considered implementing an annual per-OEM cap design which is intended to control funding overrun as a result of rapid increases in high-volume vehicle sales. This design would limit standard rebates to 20,000 per year, while leaving low-/moderate-income increased rebates unconstrained for all vehicles rebated. The cap would start and reset at the beginning of each calendar year. It's estimated that this would have a moderate

effect on rebates, budget, and sales. It is important to note that most stakeholders were against an approach like this because they argued that it would penalize manufacturers that are pushing ahead in the ZEV market, instead of supporting them for paving the way.

Additionally, during a working group in late-August 2021, stakeholders also asked CARB staff to consider changing the CVRP vehicle eligibility and rebate structure to incentivize longer range EVs similar to New Jersey's Charge Up EV incentive program[13]. An approach similar to this would tie rebate amounts to range, giving longer range EVs a larger rebate amount. As additional time is needed to analyze the feasibility of implementation of this approach and overall impact to CVRP and California's EV market, staff did not include this as an option for the FY 2021-22 allocation. However, staff will work closely with stakeholders and the CVRP administrator over the next few years to see if a program design like this can be implemented in the future.

Given this information, five initial phase-down scenarios were taken into consideration when developing a three-year plan for the FY 2021-22 allocation, all of which are summarized in Table 2.

[13] Charge Up New Jersey, *https://chargeup.njcleanenergy.com/*

Table 2. Initial phase-down design scenarios

Design Lever	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
MSRP Cap	Feb 2022: Cars = $40k	Feb 2022: Cars = $40k	Feb 2022: Cars = $40k	Feb 2022: Cars = $40k	Feb 2022: Cars = $45k
Income Cap*	Feb 2022: $135k/$175k/ $200k Feb 2023: $120k/$160k/ $185k	Feb 2022: $120k/$160k/ $185k	Feb 2022: $120k/$160k /$185k	Feb 2022: $120k/$160k/ $185k	Feb 2022: $135k/$175k/ $200k Feb 2023: $120k/$160k/ $185k
AER-Min	Feb 2022: 35 miles EPA	N/A	N/A	N/A	N/A
LMI-IR Threshold	Feb 2022: Reduce to 300% FPL	N/A	N/A	N/A	N/A
Rebate $ reduction**	Feb 2022: -$250 Feb 2023: -$250	N/A	N/A	N/A	Feb 2023: -$250
PHEVs ineligible	Feb 2023	Feb 2023	Feb 2023	Feb 2023	Feb 2023
Limited-time Offer	N/A	N/A	Apr-Sep 2022 & 2023	N/A	N/A
Annual per-OEM cap	N/A	N/A	N/A	Jan 2022: 20,000 standard rebates/yr	N/A

* single/head-of-household/joint filers
** All rebate types

Program and market impact estimates are summarized in Table 3. Impact estimates are relative to the middle baseline scenario from the program projections summarized above. These estimates apply each program design change element in series. As a result, the estimates do not take interactions between the designs into effect. For example, reducing the income cap may make some potential participants who may have purchased a $50,000 car ineligible, thereby reducing the impact of the MSRP cap, or vice versa. Therefore, these estimates may overestimate impact.

With the exception of the rebate amount reduction and Increased Rebate eligibility thresholds, sales differences were calculated assuming 54 percent average rebate

essentiality. The impact of rebate amount reductions and decreasing the threshold for Increased Rebate eligibility were calculated using a -2.5 price elasticity of demand.

Table 3. Initial phase-down design scenarios impact estimates.

Scenario	Budget Sav. Vs. baseline	Rebate diff.	Sales diff	3-year fund. demand	Over/under budget
Baseline	-	-	-	$650 M	Over: $135 M
S1	-$263 M	-75,000	-41,000	$387 M	Under: $128 M
S2	-$123 M	-56,000	-30,000	$528M	Over: $13 M
S3	-$169 M	-78,000	-42,000	$482 M	Under: $33 M
S4	-$157 M	-73,000	-40,000	$494 M	Under: $21 M
S5	-$146 M	-58,000	-31,000	$505 M	Under $10 M

Four of the five scenarios keep the overall three-year demand below the $515 million allocation for the next three fiscal years, including funding the FY 2021–22 waitlist. Scenario 2 produces a funding need approximately $13 million over budget. Scenario 3, which includes a six-month limited time offer makes the deepest cuts to the program in terms of rebates and sales.

After thorough analysis and input from stakeholders, staff determined that Scenario 5 would be the best approach for the next three years of CVRP. The budget savings projected from scenario 5 brings CVRP funding need closest to the FY 2021-22 allocation without going over. Additionally, the changes considered in Scenario 5 consist of adjustments to program levers already in place making it the easiest to implement in a timely manner. This combination of program changes also has the least impact on eligibility for increased rebates as it leaves the current income threshold of 400 percent FPL in place while narrowing the eligibility for standard rebates to focus on middle-income EV buyers. Lastly, this scenario includes adjustments to the MSRP cap and PHEV eligibility that allow the program to focus limited funding on the cleanest and most affordable EVs.

Trajectory Analysis to 2030

The sales trajectories established in the three-year funding simulations are calculated to 2030 to help estimate progress toward State goals, as required by the Supplemental Report to the 2018–19 Budget Act. The State's ZEV deployment goals are:

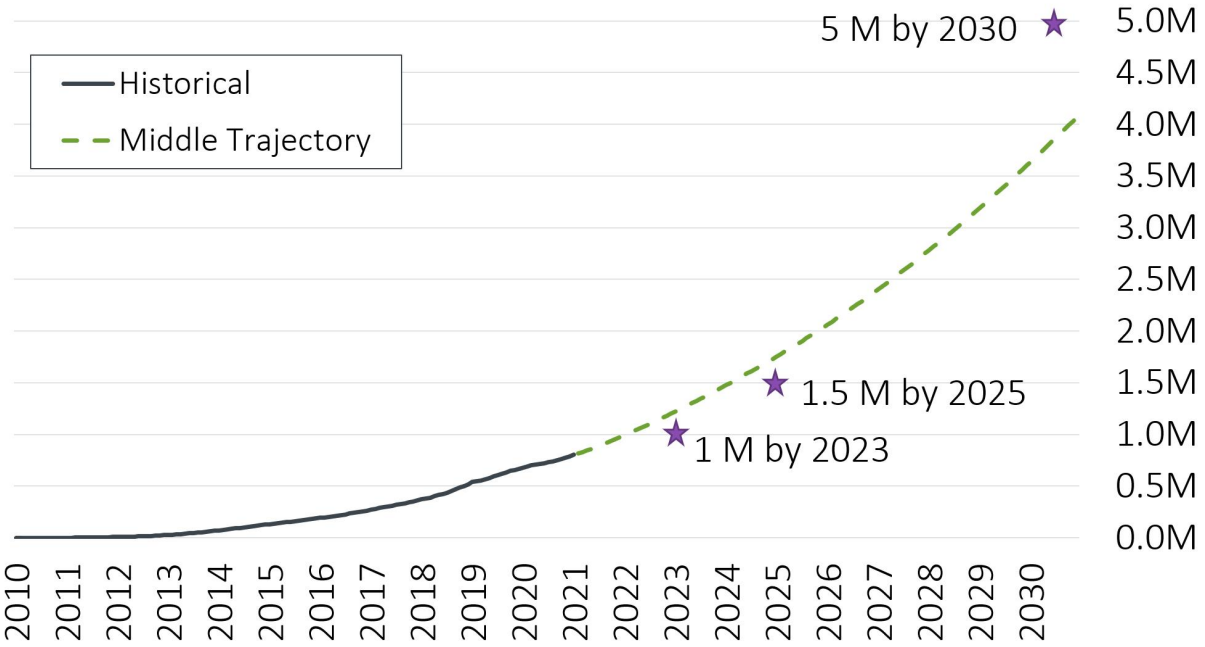
- 1 million vehicles by 2023
- 1.5 million vehicles by 2025
- 5 million vehicles by 2030

The considerable uncertainty introduced by the global pandemic and apparent US recession is amplified when projecting farther into the future. Additional unforeseen circumstances that could have significant impact on future EV sales become more likely over time, and trajectory

analyses smooth out those circumstances, as well as seasonal peaks and valleys. Despite these limitations, a trajectory analysis can be informative in indicating whether the market is "on-course" to achieving State goals, assuming the middle projected scenario.

The drop in EV sales significantly impacts progress toward State goals. Figure 2 shows the trajectory toward State goals based on the three-year projections continuing to 2030. The solid black line indicates actual EV sales[14] and the dashed green line represents the middle forecast trajectory. Sales goals are represented by purple stars. It should be noted that these projections are intended to only align with the State's currently approved regulations and incentive landscape, and as updates are made to Advanced Clean Cars regulations, CVRP, and other relevant incentives, these projections will also need to be updated.

Figure 2. Trajectory Toward ZEV Deployment Goals (Cumulative Sales)



Based on this analysis, the State's 2023 and 2025 EV deployment goals are expected to be reached on time or possibly ahead of schedule. The trajectory analysis shows that without additional measures, cumulative EV sales would not be on course to achieve the 2030 goal of 5 million EVs. However, the Advanced Clean Cars 2 rulemaking proposes to start with the requirement that approximately 25 percent of new car sales be ZEV and PHEVs in 2026 and 72 percent of sales in 2031, which would dramatically improve the trajectory outlined above, ensuring that the 5 million vehicle cumulative sales goal is achieved on time.[15]

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[14] Includes content from IHS Markit © 2020.

[15] Advanced Clean Cars 2 Regulatory Development Workshop Materials, https://ww2.arb.ca.gov/our-work/programs/advanced-clean-cars-program/advanced-clean-cars-ii-meetings-workshops

Estimated Funding Need to Reach Five Million ZEVs

Though the trajectory analysis shown in Figure 2 does not show cumulative EV sales meeting the 2030 goal, the trajectory analysis allows us to calculate the cost to reach State goals regardless of time. Table 4 shows the estimated number of rebates and funding needed to reach those goals, assuming the market and program continue along their trajectories until the goals are reached.

Table 4. Estimated CVRP Funding Need to Reach ZEV Deployment Goals

ZEV Deployment Goal	Additional Vehicles Rebated	Funding Need
1 million vehicles	40,000–45,000	$119 M–$122 M
1.5 million vehicles	166,000–236,000	$491 M–$716 M
5 million vehicles	510,000–1.9 M	$1.9 B–$5.9 B

The funds needed to reach State goals shown in Table 4 reflect only CVRP rebates, and do not include other incentives, changes to regulations that are already underway, private investment in vehicles, infrastructure or other supportive resources. Also, as noted above, these numbers also do not assume that the above goals are achieved in time, but simply consider the total cost necessary to achieve the goals. Total private investment for 510,000 to 1.9 million additional vehicles may be between $20 billion and $75 billion. A $1.9 billion to $5.9 billion public investment would amount to between approximately 7.9 and 9.5 percent of the total private investment.

Estimated Funding Need to Reach 16 Percent EV Market Share in California

Caret Platform (patent pending) was used to produce preliminary projections of time and cost to reach an EV sales market share of 16 percent in California. The modeling approach implements a logistic growth function of adoption over time parameterized by a modified Bass diffusion model to project changes in the market. The model uses EV market data to determine EV sales over time following a diffusion of innovations curve as observed in a variety of other technologies.[16]

To capture other complexities of the market transformation, the model also includes components that address the spectrum of sociotechnical stakeholders in the EV niche (such as consumers, manufacturers, dealers, different income groups, etc.) as well as learning curves that capture the evolution of parameters such as EV production costs.[17] This modeling approach gives a more complete picture of the relationship between incentive levels, time, and EV adoption than could be provided using price elasticity or choice models over the same long-time frame. Several scenarios are modeled based on National and California

[16] Rogers, E. M., 1962, Diffusion of Innovations (Free Press of Glencoe); Casetti, E., 1969, Geographical Analysis 1(1), 101-5, Why Do Diffusion Processes Conform to Logistic Trends?

[17] Young, H. P., 2009, American Economic Reviews, 99(5), 1899-1924, Innovation Diffusion in Heterogeneous Populations: Contagion, Social Influence, and Social Learning.

specific EV incentive policy components. These scenarios are described in Table 5. The projected outcomes of each of the scenarios are summarized in Table 6.

Table 5. Policy components modeled using Caret for the three scenarios presented in this analysis.

Scenario	Modeled EV Incentive Policy Components	
	National	CVRP
SCENARIO 1	No national EV incentive policy is used.	$2000 new EV incentive with an additional $2500 new EV incentive for 400% federal poverty level (FPL) and below; $60k MSRP cap and $150k income cap.
SCENARIO 2	$7500 new EV incentive tax credit with $70k MSRP cap. Assumes 50% of vehicles are eligible under federal manufacturer caps.	
SCENARIO 3	$7500 new EV incentive tax credit with $70k MSRP cap. Assumes 100% of vehicles are eligible under federal manufacturer caps.	

Table 6. Time and cost estimates to reach an EV sales market share of 16 Percent in California, via a combination of national and state incentives.

Scenario	Date When Market Share of 16% Is Reached		Total Cumulative Cost to CA (CVRP incentives only) [$B]
	Policy Year	Month in Year	
SCENARIO 1	6	4 (Apr)	3.1
SCENARIO 2	4	3 (Mar)	2.1
SCENARIO 3	3	2 (Feb)	1.6

Based on Scenario 1, with only the California state incentive (CVRP) it would take six years from the implementation and a total cumulative cost of $3.1 billion (in incentives) for EVs to reach 16 percent market share in California. With increasing national incentives in Scenarios 2 and 3 it would take $2.1 billion and $1.6 billion, respectively, and reduce the time taken from six years from policy implementation in Scenario 1 to three years in Scenario 3 to reach 16 percent market share. By default, Caret assumes that eligible EV buyers will participate in CVRP at a rate that is calibrated using national data.[18] If the actual overall CVRP-eligible participation rate is lower, then this will tend to somewhat reduce the cost and slightly extend the time required to reach the 16 percent EV sales market share goal. For example,

[18] This calibration was achieved by applying a Bayesian joint probability distribution derived by CSE from data in the U.S. Department of Labor Bureau of Labor Statistics Consumer Expenditure Surveys (CES) from 2015-2019, linking household income and new vehicle (of all types) purchase price.

rerunning the model projection using an assumed CVRP-eligible participation rate of 40 percent (consistent with recent CVRP outcomes) yields a cost of $1.1 billion to reach 16 percent EV market share in 3 years and 4 months after policy start.

ZEV Market and Technology Assessment

In this section of the Long-Term Plan, staff updates the ZEV Market and Technology Assessment originally included in the FY 2016-17 Funding Plan as required by SB 1275. As part of this assessment, staff presents:

- An overview of recent ZEV market growth in California, the United States, and worldwide.
- An update on the state of ZEV technology, particularly battery costs and a comparison of the total cost of ownership of ZEVs compared to internal combustion engine vehicles.

Several of the topics covered here such as growth in ZEV sales, market share, and vehicle diversity are also indicators that staff uses to evaluate progress toward a sustainable ZEV market in California. As such, California-specific trends for each of these indicators are discussed in greater detail in the "Sustainable ZEV Market" section later in this Long-Term Plan.

Trends in the ZEV Market

By the end of 2020, the number of electric passenger vehicles reached 10 million units worldwide, an increase of 2.8 million units from 2019. China still maintained the largest EV fleet in the world with a total of 4.5 million EVs but for the first time, Europe had the largest annual increase in electric vehicles to reach a total of 3.2 million by the end of 2020. The United States came in third with about 1.8 million EVs total by the end of 2020. Overall, the world EV market took a significant hit in 2020 due to the ongoing health and economic crisis with a large drop in EV registrations at the beginning of the year followed by much stronger sales toward the end of 2020. This resulted in a 16 percent drop in EV registrations worldwide compared to 2019 numbers.[19]

The ongoing health and economic crisis has continued to have an impact on the EV market. While most of the world has reopened, effects are still being felt across the vehicle production and delivery line. Worldwide closures followed by a slow return to operation have led to shortages of semiconductor chips causing delays in the production and delivery of vehicles. [20] This has in turn led to increases in prices for new and used vehicles as demand

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[19] *Global EV Outlook 2021.* https://www.iea.org/reports/global-ev-outlook-2021

[20] *Jim Henry, "Auto Dealers Can Drive A Hard Bargain, As New-Car Shortage Continues", Forbes. April 22, 2021* https://www.forbes.com/sites/jimhenry/2021/04/22/auto-dealers-can-drive-a-hard-bargain-as-new-car-shortage-continues/?sh=5bb65c863308

outpaces supply.[21] The auto chip supply is not expected to be fully recovered until the end of 2021 or possibly early 2022 which will make it challenging for the EV market to recover the losses of last year and get back on track to pre-2020 levels.[22]

As the world began to reopen towards the end of 2020, U.S. EV sales saw a resurgence to levels seen prior to the start of the ongoing health and economic crisis. According to the CEC's Zero Emission Vehicle and Infrastructure Statistics dashboard, there was a total of over 145,000 new EVs sold in California in 2020 which allowed EVs to maintain a nearly 8 percent market share.[23] Through the first half of 2021, an additional 121,000 new EVs were sold in California increasing EV market share to 10.7 percent.[24] New EV sales in California are expected to remain strong throughout 2021, however, reduced inventory due to the microchip shortage will put a damper on the number of new EVs actually sold this year. Based off current trends, new car sales in California are expected to increase in 2021 by 10 percent over 2020 numbers but these projections are subject to change if there are additional waves of shutdowns.[25]

The additional new EV sales from the first half 2021 now brings the total of EVs sold in California to about 925,000. If strong sales are sustained, California will most likely hit its first EV deployment goal of 1 million EVs by the end of 2021 - well before the 2023 deadline. This also puts California on track to reach the second goal of 1.5 million EVs on the road much sooner than the 2025 deadline. Despite this achievement, we still have quite a bit of ground to make up under the current regulatory landscape to reach the goal of 5 million EVs on California's roads by 2030 and to build a sustainable EV market. The Advanced Clean Cars 2 regulation aims to support the goal of all-electric new vehicle sales by 2035, with increased stringency on EV deployment beginning in 2026.

The entire world continues to feel the impact of the ongoing health and economic crisis. Many industries, including new cars sales, took a direct hit in 2020 that is still being felt in 2021. As new car sales rebound and vehicle prices increase as a result of limited inventory, it is critical to continue support of the EV market. It is encouraging to see that the new EV market in California managed to maintain a nearly 8 percent market share during such trying times and surged ahead in 2021 to nearly 11 percent. This is a positive sign regarding the growth and sustainability of the ZEV market. However, significant additional market growth is

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[21] Ibid.

[22] Jim Henry, *"New-Car Supply Is Scarce, And Prices Are Up, Because The (Computer) Chips Are Down", Forbes.* May 17, 2021. *https://www.forbes.com/sites/jimhenry/2021/05/17/new-car-supply-is-scarce-and-prices-are-up-because-the-computer-chips-are-down/?sh=59d9c6dc5f1e*

[23] California Energy Commission (2021). California Energy Commission Zero Emission Vehicle and Infrastructure Statistics. Data last updated July 30, 2021. Retrieved August 7, 2021 from https://www.energy.ca.gov/zevstats

[24] *Ibid.*

[25] California New Car Dealers Association. *California Auto Outlook: 2021 Q1.* May 2021 *https://www.cncda.org/wp-content/uploads/Cal-Covering-1Q-21.pdf*

needed to meet California's ZEV deployment goals, which supports the need for stronger regulatory action.

ZEV Technology Assessment Update

Battery price is the major cost component in electric vehicle manufacturing. Monitoring the battery cost production and close analysis of cost reduction is critical for market projection. This section discusses current and future battery costs and its impact on ZEV market acceleration, based on public information that is currently available. As with all other components of this plan, staff expects to have updated information in next year's plan that takes into account updates to the current regulatory and incentive landscape.

Battery/Battery pack system cost and projections

Recent findings show that the trend of declining battery costs is continuing and the average cost of battery production is falling. A recent survey indicates that prices of automotive battery packs were around $137/kWh by the end of 2020 which represents a 13 percent decline from 2019 and a nearly 90 percent decline from 2010. [26] This downward trend is expected to continue. BloombergNEF's 2020 Battery Price Survey and other technical studies credit falling prices to improved and simplified battery cell and pack designs, introduction of new battery chemistries, and new manufacturing techniques. Based on their analysis, Bloomberg NEF expects the price of an average battery pack to be around $101/kWh by 2023 and $58/kWh by 2030.[27] Other sources, such as from the National Academies of Sciences, Engineering, and Medicine, expect battery pack costs to decrease to $90-$115/kWh by 2025 and $65-$80/kWh by 2030.[28]

For a 200km (125 miles) range EV to be cost competitive with Internal Combustion Engines (ICEs), battery prices of $100/kWh are necessary, at a fuel price of 80¢ per liter ($3.20 per gallon) and 18,000 km/year (11,184 miles/year) mileage. The cost parity threshold falls to $50/kWh for BEVs at a 400km (248 mile) range, in the same mileage and fuel price conditions.[29] If the battery cost reduction trend continues, cost parity would happen by 2030 for EVs with the 400km (248 mile) range.[30]

Update on Incremental costs of PEVs

The higher purchase price of EVs is considered one of the main barriers for consumers purchasing these vehicles. The average incremental costs of an EV in 2018 ranged from

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[26] BloombergNEF. *2020 Battery Price Survey*. December 2020. *https://about.bnef.com/blog/battery-pack-prices-cited-below-100-kwh-for-the-first-time-in-2020-while-market-average-sits-at-137-kwh/*

[27] Ibid.

[28] National Academies of Sciences, Engineering, and Medicine. 2021. Assessment of Technologies for Improving Light-Duty Vehicle Fuel Economy—2025-2035. Washington, DC: The National Academies Press. *https://doi.org/10.17226/26092*

[29] Ibid.

[30] Ibid.

approximately $8,000 for a short range car to about $21,000 for a long range SUV when compared to their internal combustion engine vehicle (ICEV) counterparts.[31] Although this higher purchase price is a critical element in consumer decision-making process, for a more accurate comparison, total cost of ownership is a more accurate measure to compare the cost of ICEVs and PEVs. When comparing the first-owner five-year ownership costs of EVs in various classes with ICEVs, N. Lutsey and M. Nicolas found that consumer ownership parity was realized a few years sooner than initial cost parity.[32] This was due in large part to an average fuel savings of $3,500-$4,200, dependent on vehicle class, as electricity costs are generally much lower than conventional gasoline.[33]

As we've seen, EV purchase prices are not yet competitive with ICEVs. On a per mile basis, operating a BEV is cheaper than operating an ICEV – the cost of electricity per mile is lower than the cost of gasoline per mile. However, assuming 3.5 years of ownership, even with higher than average fuel prices, the total cost of ownership for a BEV is higher than an ICE vehicle when additional upfront costs such as increased manufacturing costs, vehicle purchase price markups, and home charging infrastructure installation are included. Battery manufacturing costs are expected to decline, therefore shrinking the price gap between total cost of ownership of EVs and ICE vehicles and making EVs a more favorable choice to consumers.

While batteries are the most expensive component in the total cost of ownership calculation, there are opportunities for cost reductions in other areas. Redesigning EV manufacturing platforms and investing in fewer moving parts can help reduce the total manufacturing cost. There are indications that manufacturers are investing to develop more EV specific manufacturing platforms for larger scale production. Over the next 10 years, 18 of the world's top 20 OEMs have made plans to invest more in EV production by increasing their portfolio of EV models and scaling up production of EVs[34].

Overall, in 2018, the average purchase price of an EV varied by vehicle class and ranged from $8,000-$21,000 more than a comparable ICEV.[35] With battery cost reduction, vehicle redesigned manufacturing, and employing newer digital technologies to match battery capacity and size to consumer needs, the cost parity of EVs ranging about 150 miles

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[31] Lutsey, Nic and Nicolas, Michael. (2019). "Working Paper: Update on Electric Vehicle Costs in the United States through 2030". The International Council on Clean Transportation. Available at: *https://theicct.org/publications/update-US-2030-electric-vehicle-cost*

[32] Ibid.

[33] Ibid.

[34] IEA. *Global EV Outlook 2021.* April 2021. *https://www.iea.org/reports/global-ev-outlook-2021*

[35] Lutsey, Nic and Nicolas, Michael. (2019). "Working Paper: Update on Electric Vehicle Costs in the United States through 2030". The International Council on Clean Transportation. Available at: *https://theicct.org/publications/update-US-2030-electric-vehicle-cost*

compared to ICEVs can potentially be achieved by 2025 with cost parity expected for EVs with approximately 250 miles closer to the 2030 timeframe.[36]

In summary, findings of the technology assessment indicate that the overall trend of advancements towards lower cost and battery capacity improvements is continuing as expected. Therefore, manufacturers will benefit from these improvements and will be able to offer more ZEV choices with longer ranges and lower prices in the next 5 to 10 years. This will also lead to EVs reaching consumer ownership parity with ICEVs within the next 10 years.

A Sustainable ZEV Market

To address the SB 1275 requirement of assessing when a self-sustaining market is expected, CARB staff in consultation with academia and stakeholders, decided to use the *Diffusion of Innovation Theory* as the framework for this analysis when it did the first Long-Term Plan for CVRP and the ZEV market as part of the FY 2016-17 Funding Plan. Based on this approach, staff defined the self-sustainable ZEV market as a state of the market where broad incentives are not required to increase ZEV adoption. A self- sustaining market is expected once the California new ZEV market share reaches 16-20 percent, the market has reached the early majority segment, and there is enough demand to help market mechanisms take over and drive the market. The detailed description of the theory and staff's original work to establish this metric to define a sustainable ZEV market can be found in Part II of FY 2016-17 Funding Plan[37].

In developing FY 2019-20's update to the Long-Term Plan, staff asked stakeholders if it should consider alternative approaches to defining a sustainable ZEV market. There was no alternative offered, hence staff will continue using the metric of 16-20 percent ZEV market share based on the Diffusion of Innovation Theory as the indicator of a sustainable ZEV market. Staff recognizes, however, that this theory is predicated on a free-market, whereby the technologies originally included in the theory's development were not regulated in the same way that vehicles are regulated in California. Regardless, this theory serves as a reasonable guide given the nature of the vehicle market.

In the 2016-17 Long-Term Plan, staff identified metrics that can be used to track progress toward market sustainability. The most outstanding one was ZEV market share and staff chose this metric to define the sustainable market. Other indicators evaluated include annual ZEV sales numbers, diversity in available models, and consumer awareness. Progress on these metrics is described below. Staff also identified several technology-based metrics such as battery and vehicle cost as indicators of progress, which were described earlier in this Long-Term Plan in the ZEV Market and Technology Assessment section. Finally, staff also

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[36] Ibid.

[37] California Air Resources Board. *Proposed Fiscal Year 2016-17 Funding Plan For Low Carbon Transportation And Fuels Investments And The Air Quality Improvement Program.* May 2016. https://ww2.arb.ca.gov/sites/default/files/classic/msprog/aqip/fundplan/proposed_fy16-17_fundingplan_full.pdf

evaluated the importance and impact of the federal policies, including the federal tax credit, in the next section. This was done since federal policies may ultimately have a significant impact on the growth of the ZEV market toward sustainability and it is one of the elements CARB is required to evaluate per the Supplemental Report of the 2018-19 Budget Act.

Annual New ZEV Sales and ZEV Market Share

Staff consider annual new ZEV sales in California as an indicator of market growth, and over the last few years monitored and analyzed the trend closely. California annual ZEV sales have grown continuously over the last three years even though general light duty vehicle sales have been declining since 2016. The new vehicle market in 2020 has been, and continues to be, impacted by the current health and economic crisis; new light vehicle registrations were expected to decline more than 26 percent from 2019. However, new ZEV sales remained strong through the latter half of 2020 and into the first half of 2021. Table 7 shows details of new EVs sold over the last five years and California ZEV market share has held steady at about 8 percent of the new light-duty vehicle sales in 2020 and surged ahead to a nearly 11 percent market share in the first half of 2021. The California ZEV market share is expected to increase as the new light-duty market continues to rebound in 2021 and beyond.

Table 7. Hybrid and Electric New Vehicle Registrations and Market Share[38]

Metric	2017	2018	2019	2020	YTD 2021*
Plug in hybrid registration	45,492	59,699	50,660	38,153	35,414
Plug in hybrid share	2.1%	2.7%	2.40%	2.1%	3.1%
Electric registration**	48,095	97,444	96,687	106,946	85,592
Electric share	2.2%	4.3%	4.4%	5.7%	7.6%
Total # of Vehicles	93,587	157,143	147,347	145,099	121,006
Total PEV Market Share	4.3%	7.0%	6.8%	7.8%	10.7%
Year-to-Year Growth Rate	-	63%	-3%	15%	TBD

Data Source: California Energy Commission Zero Emission Vehicle and Infrastructure Statistics
*Data through June 2021
**Includes BEV and FCEV registration data

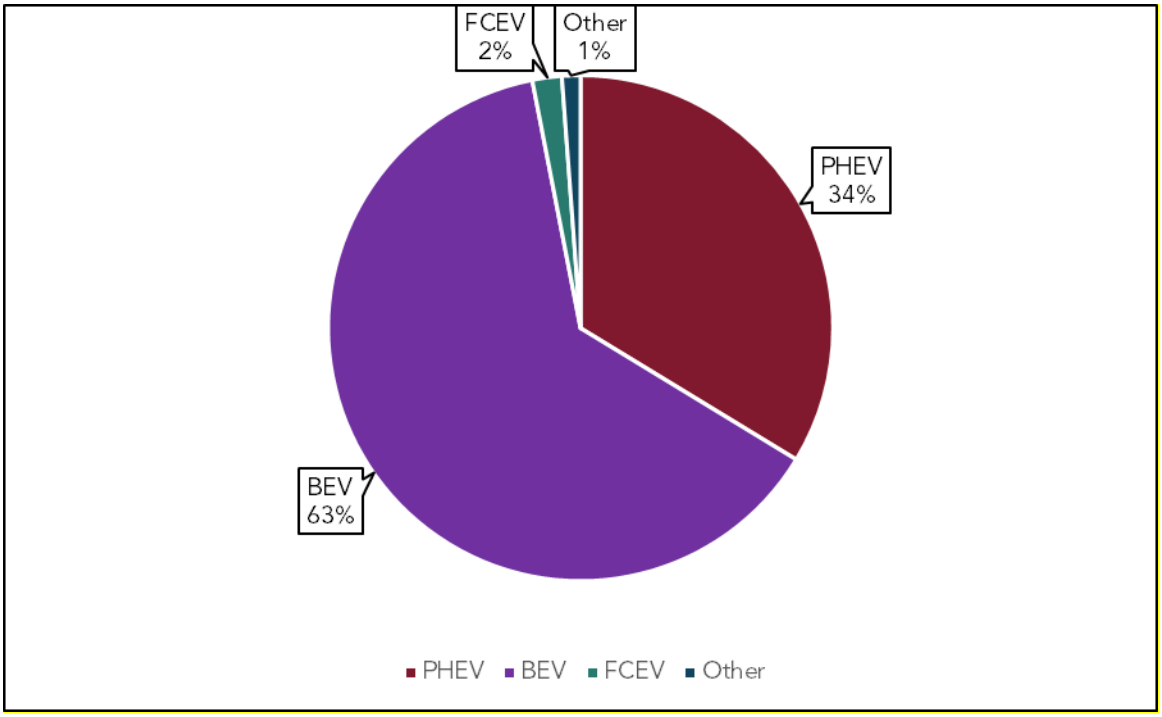
New PEV registrations in 2020 reached 145,099, which is a slight decline from 2019 numbers. Given the impact of the global health and economic crisis, we might have expected the decline to be steeper. However, the growing number of EV models, continued expansion of California's charging network, and the State's commitment to strong EV incentives may be some reasons why the EV market didn't take as big of a hit in 2020 and continues to surge into 2021.

[38] California Energy Commission (2021). California Energy Commission Zero Emission Vehicle and Infrastructure Statistics. Data last updated July 30, 2021. Retrieved August 7, 2021 from https://www.energy.ca.gov/zevstats

Despite the overall decline of total new light-duty vehicle sales in California, ZEV sales are increasing or holding steady each year, and the ZEV market share has grown about 25 percent over the past few years on average. As more ZEV models are introduced in varying vehicle classes, it is likely that their market share will continue to increase.

In recent years, the same technology split trend under CVRP has been observed and as Figure 3 shows, CVRP recipients chose BEVs 1.5 times more than PHEVs. This indicates that with more diverse and higher-range BEVs with higher incentive amounts available, consumers are more interested in choosing cleaner technologies.

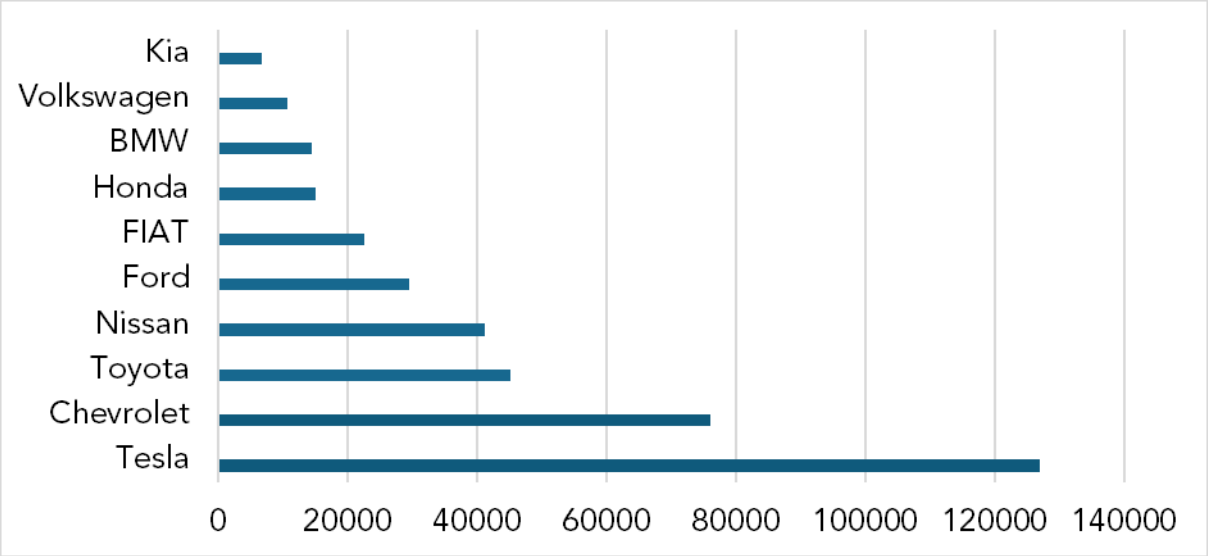
Figure 3. CVRP Cumulative Rebates by Technology Type



Tesla, Chevrolet, Nissan, Toyota, and Ford are the top five manufacturers whose vehicles have received rebates under CVRP, which is similar to the makeup of the top-selling EV manufacturers in California.[39] Figure 4 illustrates the amount of rebates received under CVRP by the top ten vehicle makes since the inception of the program.

[39] California New Car Dealers Association, "*California Green Vehicle Report*". August 2019. https://www.cncda.org/wp-content/uploads/Cal-Alt-Powertrain-Report-3Q-19-Release.pdf

Figure 4. Cumulative CVRP Rebates by Vehicle Make – Top Ten



In summary, ZEV sales managed to maintain a market share of about 8 percent of new car sales in California through the end of 2020 and increased this percentage to nearly 11 percent through the first half of 2021. This is about half way to staff's defined indicator of a sustainable ZEV market of 16-20 percent market share. In total, 924,822 EVs have been sold in California through Q2 of 2021[40] – over 90 percent of the way to the 2023 goal of 1 million ZEVs deployed.

Vehicle Choice Diversity

Consumers have different needs and expectations, especially when it comes to vehicles. Vehicle choice and model availability across market segments is a critical decision making factor for new car shoppers and a diverse selection of makes and models is an indicator for market growth. Through Q2 of 2021, SUVs, Trucks, and Vans accounted for two-thirds of new vehicles sales in California while small, mid-size, and large cars accounted for the remaining third.[41] For Model Year 2021, 98 different models of electric-drive vehicles across 11 EPA vehicle classes are available in the US market[42], and 35 of them are CVRP-eligible in California.

As staff has noted, vehicle diversity is an indicator of the health of the ZEV market, which is supported by research. For example, a recent publication by the International Council on

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[40] California Energy Commission (2021). California Energy Commission Zero Emission Vehicle and Infrastructure Statistics. Data last updated July 30, 2021. Retrieved August 7, 2021 from https://www.energy.ca.gov/zevstats

[41] California New Car Dealers Association, *California Auto Outlook: Q2 2021*, Volume 17, Number 3, Released August 2021. Retrieved September 9, 2021 from https://www.cncda.org/wp-content/uploads/2021-Q2-Auto-Outlook.pdf

[42] U.S. Department of Energy. *Transportation Energy Data Book Edition 38.* https://tedb.ornl.gov/data/

Clean Transportation (ICCT) shows that cities with more models available to consumers had higher EV registrations.[43] More choices in larger vehicle categories like SUV, minivan, pick-up truck, and light-duty trucks in the PEV market are needed for the emerging EV market to be more attractive to consumers and become competitive with the ICE market.

As a number of electric trucks and SUVs are expected to hit the U.S. market in the next few years, it is important that eligibility requirements for CVRP are crafted in a way that supports these emerging larger vehicle categories. Bifurcating eligibility requirements for smaller vs. larger plug-in hybrid and battery electric vehicles is one way to do so. As larger plug-in hybrid and battery electric vehicles come to the market, staff recognize that these vehicles may have a higher MSRP with ranges that may be shorter than smaller vehicle classes that have been part of the ZEV market for some time. This change could help CVRP continue to be supportive of electric vehicle deployment across the various vehicle classes in the light-duty market while prioritizing funding for the cleanest vehicles.

Table 8 lists each of the 98 models available by type across 11 different vehicle classes in the US market. Models with an asterisk (*) are eligible for CVRP.

Table 8. Electric-Drive Vehicles Available by Manufacturer, Model Year 2020[44]

Model	Drive Type	EPA Size Class
Audi e-tron	BEV	Standard Sport Utility Vehicle 4WD
Audi e-tron Sportback	BEV	Standard Sport Utility Vehicle 4WD
BMW i3*	BEV	Subcompact Cars
BMW i3s*	BEV	Subcompact Cars
Chevrolet Bolt EV*	BEV	Small Station Wagons
Ford Mustang Mach-E AWD*	BEV	Small Station Wagons
Ford Mustang Mach-E AWD Extended*	BEV	Small Station Wagons
Ford Mustang Mach-E RWD*	BEV	Small Station Wagons
Ford Mustang Mach-E RWD California Route 1*	BEV	Small Station Wagons
Ford Mustang Mach-E RWD Extended*	BEV	Small Station Wagons
Hyundai Ioniq Electric*	BEV	Midsize Cars
Hyundai Kona Electric*	BEV	Small Sport Utility Vehicle 2WD
Jaguar I-Pace EV400	BEV	Small Sport Utility Vehicle 4WD
Kandi K27	BEV	Compact Cars

[43] https://theicct.org/sites/default/files/publications/ICCT_EV_surge_US_cities_20190610.pdf

[44] Fueleconomy.gov

Model	Drive Type	EPA Size Class
Kia Niro Electric*	BEV	Small Station Wagons
MINI Cooper SE Hardtop 2 door*	BEV	Subcompact Cars
Nissan Leaf (40 kW-hr battery pack)*	BEV	Midsize Cars
Nissan Leaf (62 kW-hr battery pack)*	BEV	Midsize Cars
Nissan Leaf SV/SL (62 kW-hr battery pack)*	BEV	Midsize Cars
Polestar 2*	BEV	Midsize Cars
Porsche Taycan 4S Perf Battery	BEV	Large Cars
Porsche Taycan 4S Perf Battery Plus	BEV	Large Cars
Porsche Taycan Perf Battery	BEV	Compact Cars
Porsche Taycan Perf Battery Plus	BEV	Compact Cars
Porsche Taycan Turbo	BEV	Large Cars
Porsche Taycan Turbo S	BEV	Large Cars
Tesla Model 3 Long Range AWD*	BEV	Midsize Cars
Tesla Model 3 Performance AWD*	BEV	Midsize Cars
Tesla Model 3 Standard Range Plus RWD*	BEV	Midsize Cars
Tesla Model S Long Range	BEV	Large Cars
Tesla Model S Performance (19in Wheels)	BEV	Large Cars
Tesla Model S Performance (21in Wheels)	BEV	Large Cars
Tesla Model S Plaid (21in Wheels)	BEV	Large Cars
Tesla Model X Long Range Plus	BEV	Standard Sport Utility Vehicle 4WD
Tesla Model X Performance (20in Wheels)	BEV	Standard Sport Utility Vehicle 4WD
Tesla Model X Performance (22in Wheels)	BEV	Standard Sport Utility Vehicle 4WD
Tesla Model Y Long Range AWD*	BEV	Small Sport Utility Vehicle 4WD
Tesla Model Y Performance AWD*	BEV	Small Sport Utility Vehicle 4WD
Tesla Model Y Standard Range RWD*	BEV	Small Sport Utility Vehicle 2WD
Volkswagen ID.4 1st*	BEV	Small Sport Utility Vehicle 2WD
Volkswagen ID.4 Pro*	BEV	Small Sport Utility Vehicle 2WD
Volkswagen ID.4 Pro S*	BEV	Small Sport Utility Vehicle 2WD
Volvo XC40 AWD BEV*	BEV	Small Sport Utility Vehicle 4WD
BMW i3 with Range Extender*	BEVx	Subcompact Cars
BMW i3s with Range Extender*	BEVx	Subcompact Cars

Model	Drive Type	EPA Size Class
Honda Clarity*	FCEV	Midsize Cars
Toyota Mirai Limited*	FCEV	Compact Cars
Toyota Mirai XLE*	FCEV	Compact Cars
Audi A7 quattro	PHEV	Midsize Cars
Audi A8 L	PHEV	Large Cars
Audi Q5	PHEV	Small Sport Utility Vehicle 4WD
BMW 330e	PHEV	Compact Cars
BMW 330e xDrive	PHEV	Compact Cars
BMW 530e	PHEV	Compact Cars
BMW 530e xDrive	PHEV	Compact Cars
BMW 745e xDrive	PHEV	Large Cars
BMW X3 xDrive30e	PHEV	Small Sport Utility Vehicle 4WD
BMW X5 xDrive45e	PHEV	Standard Sport Utility Vehicle 4WD
Bentley Bentayga	PHEV	Standard Sport Utility Vehicle 4WD
Chrysler Pacifica Hybrid*	PHEV	Minivan - 2WD
Ferrari SF90 Stradale Coupe	PHEV	Two Seaters
Ford Escape FWD PHEV*	PHEV	Small Sport Utility Vehicle 2WD
Honda Clarity Plug-in Hybrid*	PHEV	Midsize Cars
Hyundai Ioniq Plug-in Hybrid	PHEV	Midsize Cars
Jeep Wrangler 4dr 4xe	PHEV	Small Sport Utility Vehicle 4WD
Karma GS-6 (21-inch wheels)	PHEV	Subcompact Cars
Karma GS-6 (22-inch wheels)	PHEV	Subcompact Cars
Karma Revero GT (21-inch wheels)	PHEV	Subcompact Cars
Karma Revero GT (22-inch wheels)	PHEV	Subcompact Cars
Kia Niro Plug-in Hybrid	PHEV	Small Station Wagons
Land Rover Range Rover PHEV	PHEV	Standard Sport Utility Vehicle 4WD
Land Rover Range Rover Sport PHEV	PHEV	Standard Sport Utility Vehicle 4WD
Lincoln Aviator PHEV AWD	PHEV	Standard Sport Utility Vehicle 4WD
Lincoln Corsair AWD PHEV	PHEV	Small Sport Utility Vehicle 4WD
MINI Cooper SE Countryman All4	PHEV	Midsize Cars
Mitsubishi Outlander PHEV	PHEV	Small Sport Utility Vehicle 4WD

Model	Drive Type	EPA Size Class
Polestar 1	PHEV	Minicompact Cars
Porsche Cayenne Turbo S e-Hybrid	PHEV	Standard Sport Utility Vehicle 4WD
Porsche Cayenne Turbo S e-Hybrid Coupe	PHEV	Standard Sport Utility Vehicle 4WD
Porsche Cayenne e-Hybrid	PHEV	Standard Sport Utility Vehicle 4WD
Porsche Cayenne e-Hybrid Coupe	PHEV	Standard Sport Utility Vehicle 4WD
Porsche Panamera 4 e-Hybrid	PHEV	Large Cars
Porsche Panamera 4 e-Hybrid Executive	PHEV	Large Cars
Porsche Panamera 4 e-Hybrid ST	PHEV	Large Cars
Porsche Panamera 4S e-Hybrid	PHEV	Large Cars
Porsche Panamera 4S e-Hybrid Executive	PHEV	Large Cars
Porsche Panamera 4S e-Hybrid ST	PHEV	Large Cars
Porsche Panamera Turbo S e-Hybrid	PHEV	Large Cars
Porsche Panamera Turbo S e-Hybrid Executive	PHEV	Large Cars
Porsche Panamera Turbo S e-Hybrid ST	PHEV	Large Cars
Subaru Crosstrek Hybrid AWD	PHEV	Small Sport Utility Vehicle 4WD
Toyota Prius Prime	PHEV	Midsize Cars
Toyota RAV4 Prime 4WD*	PHEV	Small Sport Utility Vehicle 4WD
Volvo S60 AWD PHEV	PHEV	Compact Cars
Volvo S90 AWD PHEV	PHEV	Midsize Cars
Volvo V60 AWD PHEV	PHEV	Small Station Wagons
Volvo XC60 AWD PHEV	PHEV	Small Sport Utility Vehicle 4WD
Volvo XC90 AWD PHEV	PHEV	Standard Sport Utility Vehicle 4WD

In summary, there are currently 35 EV models eligible for CVRP and over 90 models available in the US market, and there has been a significant increase in the number of EV models over recent years. In 2011, there were about 5 EVs available for sale which has expanded to more than 80 in 2020, and more than 90 in 2021. Looking forward, manufacturers have announced many additional vehicle introductions anticipated over the next several years specifically in larger vehicle classes. However, vehicle diversity remains far more limited than the fully diversified ICE market. Because of this, the ZEV market still does not meet the needs of a wide range of consumers for various vehicle choices in different categories, but it should in the next few years as more trucks and larger vehicles are added to the mix.

Consumer Awareness and Assessment of ZEV Marketing Efforts by Automobile Manufacturers

The Supplemental Report to the 2018-19 Budget Act directs CARB to assess the marketing efforts of EV manufacturers. CARB is coordinating with stakeholders including OEMs, Alliance for Automotive Innovation (Auto Innovators), California New Car Dealers Association (CNCDA), and VELOZ to evaluate current marketing efforts and determine how to enhance these efforts.

CNCDA's Green Vehicle Report is released twice a year and provides comprehensive information on the State's green vehicle market. The report includes a segment watch, including the top 20 best-selling alternative powertrain vehicles; best sellers in market segments including hybrid, plug-in hybrid, electric, and fuel cell vehicles; and market trends by powertrain type and brand shares in alternative powertrain market. In coordination with CNCDA, CVRP will host a special webinar to highlight the efforts that dealers are taking to be green leaders.

Veloz is a nonprofit organization with members from key sector companies, agencies and nonprofits that aim to inspire Californians to drive electric. Veloz engages electric car stakeholders with its Summit Series, as well as webinars throughout the year designed to share and discuss the latest updates in the electric car industry. In January 2021, Veloz launched its latest Electric For All public awareness campaign, "40 Million Reasons to Go Electric," that highlights the reasons why every Californian needs to go electric.[45] Campaign content was viewed or listened to more than 10.8 million times, generating more than 370,000 web visits and more than 70,000 automaker leads.[46] As equity was key to the campaign, at least 35% of paid media was focused on reaching priority populations.[47] Survey results indicated that many respondents had an improved perception of ZEVs after seeing the campaign.[48] Veloz's ElectricForAll.org website is a useful shopping tool for electric car makes and models, available incentives, dealers and the new Home Charging Advisor that helps ZEV drivers shop for Level 2 home chargers and apply for applicable incentives. Veloz is currently working on the next phase of its Electric for All outreach campaign that will help address remaining barriers to ZEV ownership such as charging, affordability, ZEV knowledge, and consumer preference. CARB and CSE are founding members of Veloz.

Auto Innovators continues to promote dialogue with industry, federal, and state governments around public policy and incentives, as well as providing analysis around market data. OEMs are also helping to provide the public with more information about EVs by

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[45] Veloz Press Release, January 20, 2021, *Electric For All launches "40 Million Reasons To Go Electric"*. https://www.electricforall.org/wp-content/uploads/2021/01/Veloz_40MillionReasons_EV_Campaign_PressRelease_FINAL.pdf

[46] Veloz, July 30, 2021, *40 Million Reasons to Go Electric Campaign Wrap Up*. https://www.veloz.org/40-million-reasons-to-go-electric-campaign-wrap-up/

[47] Ibid.

[48] Ibid.

educating dealer staff through trainings. CVRP continues to educate and foster relationships with eligible OEMs and dealers about the CVRP rebate and the clean vehicle market.

Plug In America has introduced PlugStar which provides nationwide dealer training on EVs as well as online support and tools for consumers, dealers, and electric utilities.[49] The PlugStar website offers an EV buying guide that allows shoppers to compare models, find information on charging, research available incentives, and get connected with PlugStar-trained EV dealers. PlugStar also offers in-person and online EV training for dealers nationwide that includes topics such as information about vehicle technology, incentives, and utility rates. More in-depth training is available to dealers to become PlugStar certified which provides dealers with a much better understanding of EVs and improves EV sales.[50]

It should be noted that CSE, as the CVRP administrator, undertakes extensive outreach and education activities to increase new car purchasers' awareness of EVs. In addition, a dedicated outreach and education team focuses on lower-income consumers in disadvantaged communities to make sure these priority populations receive proper education and information regarding EVs and incentives. Since 2014, CSE's outreach and education teams have participated in more than 800 events across the state and conducted more than 68,000 EV and incentive related conversations with consumers.

Furthermore, CSE's Dealer Outreach team focuses on providing training, tools, and tips to dealers for EVs and incentives. During the COVID-19 global pandemic, the Dealer Outreach team has transitioned outreach to virtual platforms, including phone calls, emails, virtual information sessions and webinars. While in-person visits were not possible due to the pandemic, staff made 3,524 phone calls and sent 81,592 emails to dealership staff from April 2020 to April 2021 regarding. Table 9 shows the dealership outreach in recent years under the CVRP grant.

Table 9. CVRP Dealer Outreach Team Activities

Dealership Outreach by Year	2015	2016	2017	2018	2019	2020	2021*	Total
In Person Visits	-	-	222	990	1,777	339	0	**3,328**
Information Sessions	-	-	2	48	67	50	23	**190**
Materials Distributed	48	1,081	1,640	6,694	12,080	4,738	686	**26,967**

*As of 5/27/2021

Under the CVRP grant, CSE administers surveys to individual CVRP participants and covers topics such demographics, housing characteristics, interest in and research on PHEVs, sources of information used, decision- making process, dealership experience, vehicle details, and charging.

[49] Plug In America, PlugStar EV Dealer Training, https://pluginamerica.org/about-us/evtraining/

[50] Ibid.

Other consumer surveys are being conducted under various research grants and contracts and CARB will coordinate to streamline the survey methodologies and questions to collect similar information across surveys to help inform long-term analyses.

Larger research efforts are also occurring that analyze consumer trends of new vehicle purchasers across the country. J.D. Power created the U.S. Electric Vehicle Consideration (EVC) Study that aims to understand why consumers aren't purchasing EVs.[51] The inaugural U.S. Electric Vehicle Consideration (EVC) Study was fielded in December 2020 and January 2021 with respondents being car shoppers with an intent to purchase or lease a new vehicle in the next 12 months. The first edition of this survey found that consumers who had first-hand experience with EVs were more likely to buy an EV.[52] Additionally, respondents site lack of EV knowledge as their main reason for not purchasing an EV.[53] This implies that in order to build stronger consumer demand for EVs, industry, auto manufacturers, and policy makers need to continue to focus heavily on consumer education and outreach and look for opportunities to increase hands-on experience with EVs among consumers. This will be critical over the next 10-15 years as California, and the U.S. as a whole, looks to transition to fully-electric vehicle sales.

Historical Consumer Awareness

While acceptance of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs) has historically been challenged by lack of awareness, a 2020 Consumer Reports survey indicates that most consumers are aware of BEVs but need more information.[54]

Most nationwide consumers, 68 percent, have learned about BEVs but do not know much about them.[55] Only 2 percent had never heard of BEVs, and the remaining 29 percent range from knowledgeable to very knowledgeable about BEVs.[56] Exposure to BEVs appears widespread; many have seen public charging stations (63 percent) or ads for BEVs (44 percent).[57] Fewer have seen a BEV in their neighborhood (36 percent) or know someone

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[51] J.D. Power, *February 25, 2021 Press Release: Battleground for Electric Vehicle Purchase Consideration is Wide Open, J.D. Power Finds.* https://www.jdpower.com/business/press-releases/2021-us-electric-vehicle-consideration-evc-study

[52] *Stropp, Stewart. "JD Power Suggests Outreach & Education To Build EV Demand".* Published on the Inside EVs website on April 28, 2021. https://insideevs.com/news/504167/jd-power-ev-demand-education/

[53] Ibid.

[54] The 2020 Consumer Reports Survey was administered by the NORC at the University of Chicago; participants are representative of consumers nationwide. CR Survey Research Department. (2020). "Electric Vehicles and Fuel Economy: A Nationally Representative Multi-Mode Survey." Available at: https://article.images.consumerreports.org/prod/content/dam/surveys/Consumer_Reports_Electric_Vehicles_Fuel_Economy_National_August_2020

[55] Ibid.

[56] Ibid.

[57] Ibid.

who owns one (31 percent).[58] Despite this awareness, few, 4 percent, plan on getting a BEV for their next vehicle, and 27 percent would consider a BEV as a next vehicle.[59] Reasons for avoiding BEVs include lack of knowledge about BEVs, lack of charging stations, the purchase price of BEVs, range, among others.[60] Nationally, while consumers appear to know about BEVs, they do not appear confident in the depth of their knowledge and are interested in learning more before committing to purchase or lease.

Furthermore, a survey of Sacramento residents echoes such findings that consumers are aware of PHEVs and BEVs but need deeper familiarity to consider purchasing or leasing a vehicle.[61] About half are aware of BEV/PHEV advertising, and about a quarter are aware of education programs.[62] Several respondents reported that they are aware of state government incentives (54 percent), federal government incentives (46 percent), and parking incentives (46 percent).[63] Despite this knowledge, Hardman et al. found that the likelihood of a consumer getting a BEV is more closely correlated with a consumer having sought information themselves or having a conversation with a BEV owner than any other factor. It appears that awareness without the personal means of gaining familiarity with the vehicle is usually not enough to spur purchasing or leasing of a PHEV or BEV.

Hardman et al. conclude that incentives and charging programs are less effective when there are gaps in consumer knowledge and familiarity with BEVs. The authors suggest understanding the conversations between BEV/PHEV owners and non-owners to emulate when designing outreach and infrastructure programs.

These studies underscore the importance of CVRP outreach and education about PHEV/BEVs in general. Methods for reaching consumers may be more encouraging when focusing on familiarity with the vehicles. Incentives and infrastructure are useful policy measures when combined with in-depth knowledge and familiarity. CVRP outreach can be evaluated with this lens in efforts to increase participation and knowledge among consumers.

Impacts of Federal Policies – Federal Tax Credit

The Supplemental Report of the 2019-20 Budget requires CARB to evaluate the impacts of federal policy, such as the federal tax credit, on the adoption of ZEVs. Further, the State Auditor recommended that CARB collect survey information for consumer-focused incentive programs that includes the behavioral effects of the federal tax credit. The analysis below

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[58] Ibid.

[59] Ibid.

[60] Ibid.

[61] Hardman, S., Kurani, K. S., and Chakraborty, D. (2020). "The usual policy levers are not engaging consumers in the transition to electric vehicles: a case of Sacramento, California." *Environmental Research Communications*. Available at: https://iopscience.iop.org/article/10.1088/2515-7620/aba943

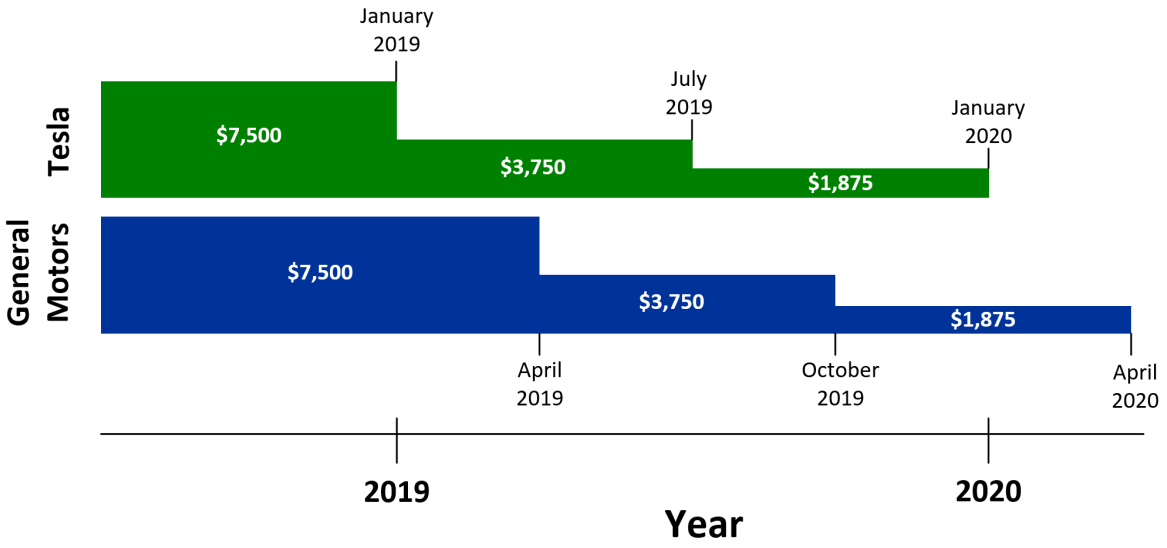
[62] Ibid.

[63] Ibid.

builds upon previous data provided annually in the Funding Plan, and will continue to be expanded through new survey efforts in the future.[64]

The Internal Revenue Code Section 30D allows a tax credit up to $7,500 for the purchase of a qualifying plug-in electric vehicle. The tax credit amount begins to phase out once a vehicle manufacturer has sold 200,000 qualified vehicles, halving two quarters after the milestone is reached, and again two quarters after that, before being eliminated entirely after six quarters. Tax credits began to phase out in January 2019 and April 2019 for Tesla Motors and General Motors, respectively. (Figure 5).

Figure 5. Tax incentive levels for Tesla Motors and General Motors[65] during the phase out period



The CVRP Consumer Survey asks respondents to rate the importance of the federal tax credit in making it possible to acquire an electric vehicle. Those who answered "extremely important" are most influenced by the incentive and can be used as a proxy for those who might not have purchased/leased their vehicle without the tax credit. For applicants between March 2017 through December 2019, 47 percent of respondents said the tax credit was extremely important, as shown in Figure 6. This level of importance indicated by respondents has remained relatively constant throughout this period.

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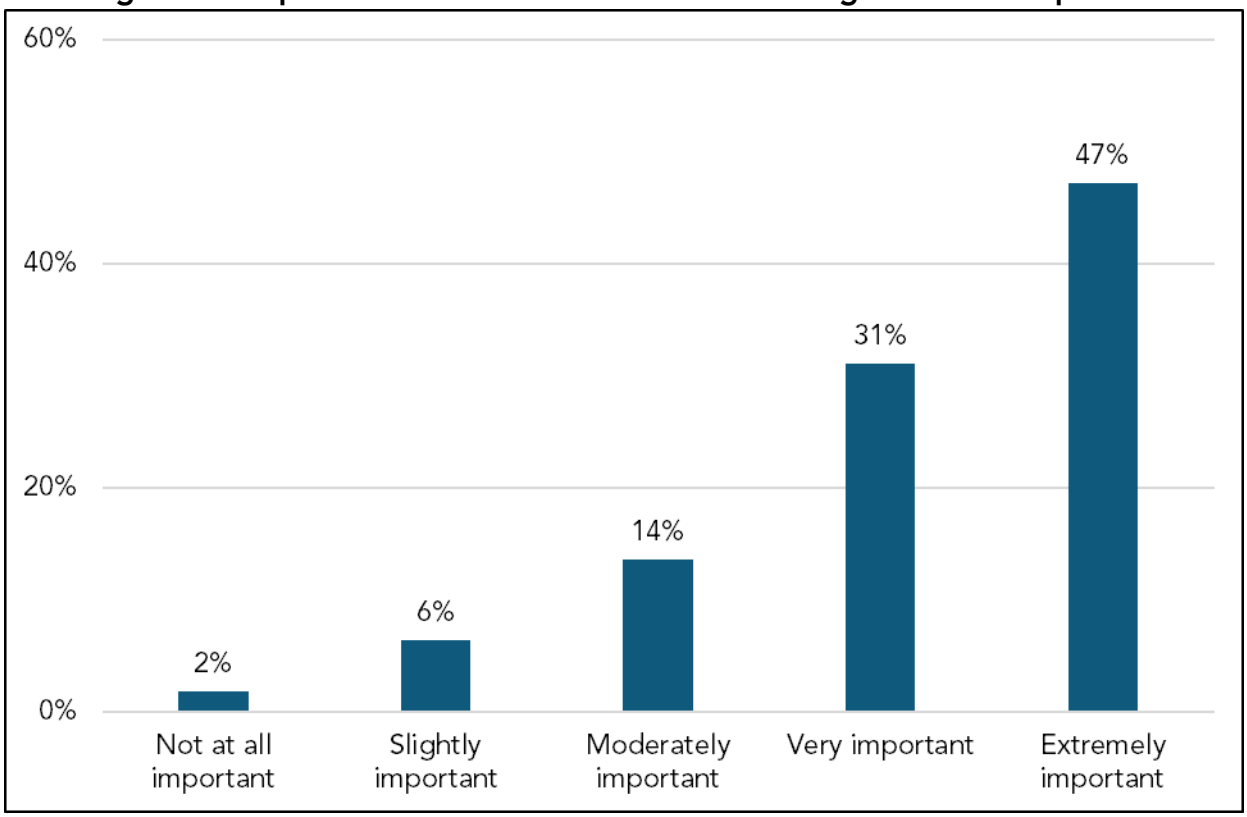
[64] California State Auditor. California Air Resources Board: Improved Program Measurement Would Help California Work More Strategically to Meet Its Climate Change Goals. February 2021. *http://auditor.ca.gov/pdfs/reports/2020-114.pdf*

[65] Fueleconomy.gov (2020 August 21). Federal Tax Credits for New All-Electric and Plug-in Hybrid Vehicles. Retrieved 26 June 2020 from *https://www.fueleconomy.gov/feg/taxevb.shtml*

Figure 6. Importance of Federal Tax Credit Among CVRP Participants[66]

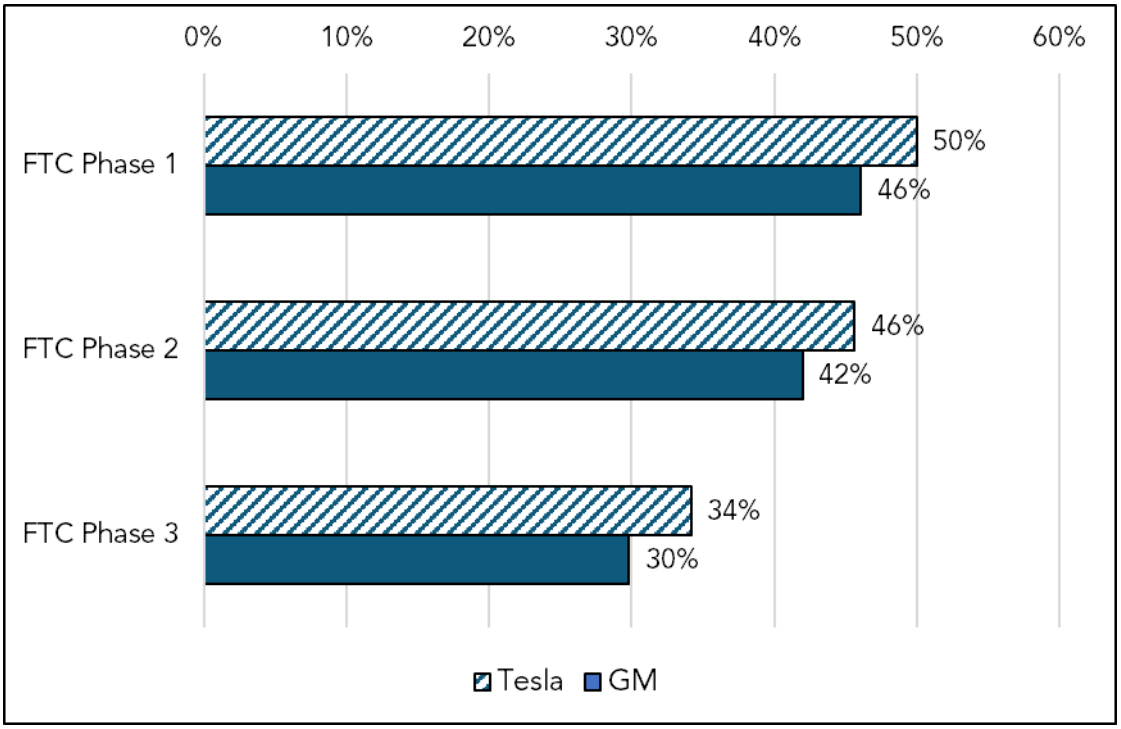


The phase out of tax credits for Tesla Motors and General Motors provides an opportunity to evaluate the importance of the tax credit and its impact on the importance of the CVRP rebate. Figure 7 shows that the percent of consumers indicating that the federal tax credit was extremely important decreased by approximately a third as the tax credit decreased from $7,500 to $1,875 for both Tesla Motors and General Motors. Interestingly, there was no increase in the importance of the CVRP rebate despite the decrease in the tax credit level for both manufacturers (Figure 8).

The CVRP survey responses indicate that tax credits remain important to consumers despite the phase out of tax credits for the best-selling manufacturers. The phase out of tax credits for Tesla and GM showed that decreasing incentive levels are associated with a decrease in the importance of the tax credit. As the tax credits have phased out for Tesla and GM, the survey data does not indicate that the CVRP rebate has increased in importance. It is not clear from this analysis how the phase out of tax credits impacts EV adoption, but it is feasible that it will reduce the rate of adoption or shift consumers to makes that have available tax credits. Research aimed at specifying the impact of the tax credit on the market is ongoing.

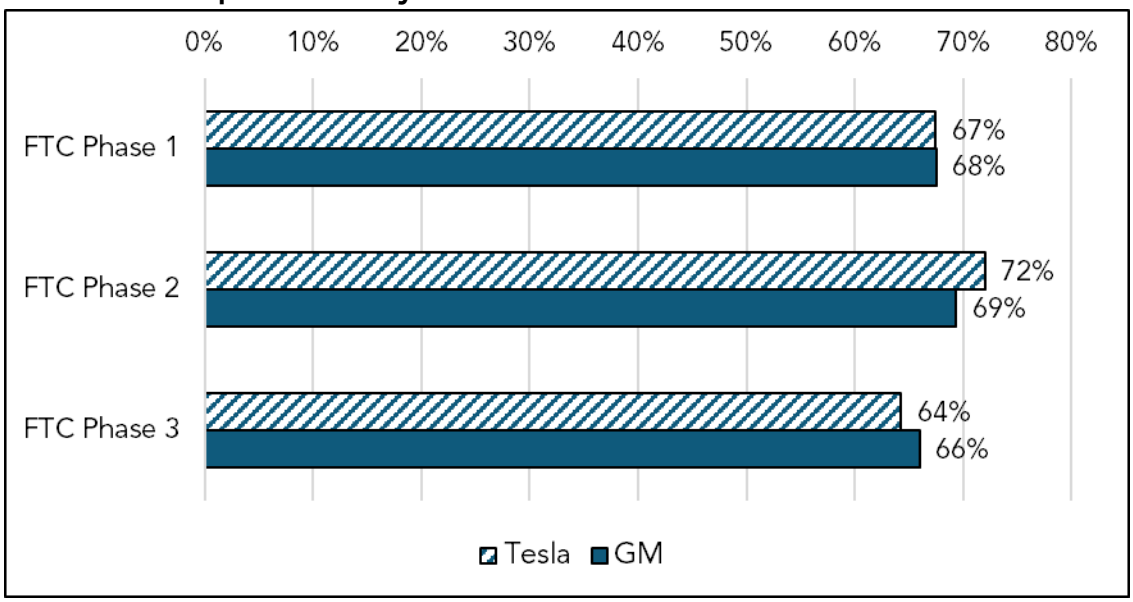
[66] CVRP Rebate Data. Applications received March 2017 – December 2019. N = 160,272.

Figure 7. Percent of consumers indicating that the federal tax credit was of "Extreme Importance" by the size of the tax credit available[67]



[67] CVRP Rebate Data. Applications received March 2017 – December 2019. N = 95,907.

Figure 8. Percent of consumers indicating that the CVRP rebate was of "Extreme Importance" by the size of the tax credit available[68]



The current Federal Administration is also looking at ways to strengthen emissions standards, increase EV incentives and charging infrastructure across the country, and modify the Federal Tax Credit for EVs in order to encourage a country-wide transition to electric.[69] Additionally, the current administration has outlined a target of 50 percent of new vehicle sales in the U.S. must be electric in 2030.[70] These supportive policies will be necessary as we look to encourage EV adoption. While their actual impact is unknown, these are similar to policies that have been successful in other countries. Staff will continue to analyze the changing landscape of federal EV policies and report on their impact on EV adoption in future iterations of this appendix.

Summary of a Sustainable ZEV Market Section

Staff has defined the ZEV market reaching 16-20 percent market share of the new light-duty car market as the point at which it would be considered sustainable, and no longer need financial incentives for the broader market. ZEV car sales sustained an 8 percent share of new car sales in California in 2020 and grew to nearly 11 percent by mid-2021 despite the ongoing health and economic crisis. Increases in ZEV sales and vehicle diversity and reductions in battery costs are all strong indicators of continued market growth. However,

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[68] CVRP Rebate Data. Applications received March 2017 – December 2019. N = 96,490.

[69] The White House Briefing Room Fact Sheet: President Biden Announces Steps to Drive American Leadership Forward on Clean Cars and Trucks. August 5, 2021. *https://www.whitehouse.gov/briefing-room/statements-releases/2021/08/05/fact-sheet-president-biden-announces-steps-to-drive-american-leadership-forward-on-clean-cars-and-trucks/*

[70] Ibid.

consumer awareness remains an issue where additional work is needed, and the elimination of the federal tax credit may negatively impact growth.

CVRP and ZEV Market Long-Term Plan Conclusions

Considering the current state of EV technology, the EV market, the economy, and fuel prices, the market is moving towards the path to achieve the State's ZEV deployment goals. If ZEV sales growth increases and continues on the current trajectory and there are no additional major disruptions in the economy, California would meet the 2023 ZEV deployment goal by the end of 2021 and the 2025 ZEV deployment goal early according to our simulations, but would still fall short of the goal of 5 million EVs deployed by 2030. However, CARB's pending proposal to greatly increase the stringency of its ZEV program, requiring 100 percent ZEV sales by 2035, will further efforts toward meeting these goals and help stabilize the market.

ZEVs have yet to become the mainstream option for vehicle purchasers and there are still barriers that consumers must overcome before choosing this new technology over ICEVs. Availability of less expensive EVs and a more diverse selection in different vehicle classes with higher range is needed to make ZEVs more favorable than ICEVs.

As the market is approaching the early majority segment, or mainstream consumers, who are sensitive to pricing and vehicle utility, incentives are more essential than ever before. Incentives will continue to encourage mainstream consumers to purchase cleaner vehicles and help maintain the current momentum of the ZEV market. Since technology has advanced and more models with higher ranges are available to consumers compared to three years ago, the All Electric Range (AER) requirement for PHEV eligibility in CVRP should be increased and PHEVs eventually phased out for the broad consumer market in the next few years. This policy change would direct the limited funding towards cleaner technologies, mainly BEVs and FCEVs.

Additionally, an MSRP cap could be adjusted over time. As more models become available, reducing the MSRP cap could help drive the supply side of the market to produce more economical choices, supporting the needs of the mass market and lower-income consumers. Although, staff recommends that in each vehicle class there should be at least two model choices available to consumers. Ramping down incentives and making adjustments as the market progresses may allow us to be more responsive to market changes and thus better direct limited incentives funding towards those who need it the most, in particular to priority populations.

Next year, staff will provide a more in-depth analysis that will lay out a plan for the next three fiscal years – 2022-23, 2023-24, and 2024-25. In addition to defining goal markers for a sustainable ZEV market, staff will develop a plan to phase-out the standard rebate for the mass market. As the ZEV market is expected to reach the early majority in this timeframe, staff believes it will be the right time to shift CVRP's main focus to harder to reach market segments through increased rebates. Staff will work with stakeholders through the public process to determine how to best shape CVRP into an EV purchase incentive program

focused solely on equity in future years and provide a plan in next year's update to the Long-Term Plan for CVRP and the ZEV Market.