Appendix C

Updated Three-Year Plan for CVRP, the ZEV Market, Clean Transportation Equity Investments, and Outreach

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

This page intentionally left blank

Contents

Introduction

Overview

Since the introduction of the first Light-Duty Long-Term Plan in FY 2016-17, the ZEV market has grown tremendously. Events over the few last years and the introduction of new vehicles (there are now over 40 eligible vehicles) and clean transportation equity programs (equity) have changed the ZEV market landscape. New data have become available and staff analyzed the impacts of these events and updated the assumptions, evaluations, and recommendations. Initial findings indicate a promising prospect for the ZEV market and equity in the coming years. Major changes in the light-duty ZEV market and clean transportation equity programs will be required to allow for project sustainability within a limited budget and to better foster market growth from harder to reach market segments.

Complementary to the Light-Duty Long-Term Plan, the FY 2014-15 Funding Plan also established several clean transportation equity projects. During these initial years staff and project grantees have gained a number of lessons learned and overcame a variety of implementation challenges. This year's long-term plan signals the second phase for equity and focuses on existing projects that have identified successful strategies on maximizing participation and benefits for low-income residents and low-income and disadvantaged communities (also known as priority populations). CARB's priorities for this new phase of investments includes: continued facilitation of coordination across projects, ensuring best practices and lessons learned are shared, and help projects expand on larger scales. CARB is also assessing clean mobility projects to identify strategies to project sustainability and independent operations without the dependence on future Low Carbon Transportation funding.

Statutory Goals and Requirements

SB 1275 (De León, Chapter 530, Statute of 2014), signed into law in 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 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 for 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 nonelectric 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. However, this year's plan includes a more in-depth and comprehensive update on the ZEV Market, including vehicle purchase incentives, and clean transportation equity investment programs.

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 Clean Transportation Equity Project Funding Needs
- Clean Transportation Equity Long-Term Funding Need Conclusions

Tables 1 and 2 provide summaries of CARB staff's estimated funding needs for the next three fiscal years of CVRP and transportation equity funding needs, respectively. Staff describes how it developed these estimates later in the document.

Table 1: Projected CVRP Funding Need over Next Three Years

Changes	FY 18-19 Waitlist	FY 19-20 cost	Savings	Total FY 19-20 need	FY 20-21 need	FY 21-22 need	Three-cycle average need
Funding Need with No Changes	$29 M	$264 M	$0 M	$293 M	$301 M	$337 M	$301 M
Funding Need with Changes	$29 M	$208 M	-$56 M	$237 M	$217 M	$243 M	$223 M

Table 2: Summary of Clean Transportation Equity Investments

Projects	FY 2019-20	FY 2020-21	FY 2021-22
Clean Cars 4 All	$30-35*	$35-$41*	$38-45
Financing Assistance for Lower-Income Consumers	$10-12	$15-$20	$15-30
Clean Mobility Options	$10–20	$25–50	$25–50
Clean Mobility in Schools	$5-10	$5-10	$5-10
Agricultural Worker Vanpools	$5-6	$6-16	$8-23
Rural School Bus Pilot Project	$5-60	$5-60	$5-60
Sustainable Transportation Equity Project (STEP)	$20-25	$25-45	$65-110
Outreach	$6.5-12	$10-17	$12-21
Totals	$90-180	$125-260	$175-350

**For Clean Cars 4 All, all of FY 2019-20 funding need and some of FY 2020-21 needs can be met with funding allocated from previous budget cycles.*

Evaluation of CVRP Funding Needs

California's ZEV market has grown steadily in the last year. 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, California EV market growth is expected to sustain this recent growth trend.

The next three to five years are critical years for the EV market as industry 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, 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.

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

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

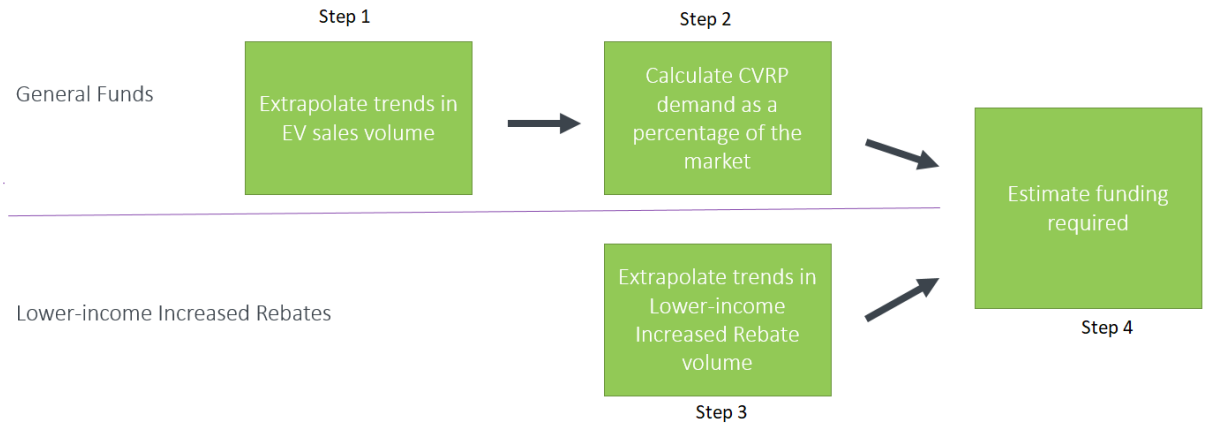
The forecast out to 2030 is a requirement of the Supplemental Report to the 2018-19 Budget Act.

Staff first describes its methodology for projecting CVRP funding needs. Staff then presents the projections over the next [3] years as well as an evaluation of effects of the CVRP changes proposed in this Funding Plan. Finally, staff presents the projections out to 2030.

CVRP Projection Methodology

Figure 1 shows the steps in projecting CVRP funding need. Each step of this analysis and the underlying assumptions are described in more detail below.

Figure 1: CVRP Projections Schematic



Step 1: Extrapolate trends in EV sales volume: First, new EV sales are extrapolated using historical monthly new vehicle sales data[2] aggregated into vehicle technology categories: plug-in hybrid electric vehicles (PHEVs), range-extended BEVx vehicles[3] battery electric vehicles (BEVs), and fuel-cell electric vehicles (FCEVs). Monthly sales data by vehicle category from March 2010 through December 2018 are supplemented by sales estimates based on CVRP rebate data from January 2019 through June 2019.

[2] Contains content supplied by R.L. Polk & Co; Copyright R.L. Polk & Co, 2018. All rights reserved.
[3] A regulatory category of vehicle that receives a BEV rebate but has a range-extending combustion engine. See cleanvehiclerebate.org for more detail. To date, the only eligible model in this category is the BMW i3 REx.

Sales data for zero-emission motorcycles (ZEMs) are not available, so rebate data are used to estimate ZEM sales from March 2010 through June 2019.

These data sources are used to develop Low, Middle, and High scenarios, which vary to account for considerable uncertainty about the future of the market. These scenarios are differentiated by the projection method used; how vehicle categories are grouped; and the timeframe used to produce the projections, as summarized in Tables 3 and 4 below and described next.

Table 3: Summary of Standard Rebate Scenarios

General Funds	Low	Middle	High
Data	Registration data and sales estimates based on rebates		
Date ranges	Jul '18 – Jun '19	Tesla: Apr '18 – Jun '19 Others: All data	All data
Unit of analysis	Vehicle category	Vehicle category, Tesla separate	Vehicle category, Models 3, S, X, Bolt
Method	Average	Linear	Linear
% Rebated Date Range	Nov '16 – Dec '18	Tesla: Apr '18 – Dec '18 Others: Nov '16 – Dec '18	Nov '16 – Dec '18

Table 4: Summary of Lower-income Increased Rebate Scenarios

Increased Rebates	Low	Middle	High
Data	Rebate data		
Date ranges	Jul '18 – Jun '19	All data: Mar '16 – Jun '19	Jul '18 – Jun '19
Unit of analysis	Vehicle category	Vehicle category	All
Method	Average	Linear	Linear

The Low scenario uses a 12-month average to illustrate the funding requirements for a program that continues to do as well as—but no better than—it has over the past year. This approach assumes no growth for the program. It is important to note that a static market during the next three years is very *unlikely* and does not put the state on a path toward meeting state goals. Thus, the Low scenario is not meant to be predictive of the future, but rather is included as a useful reference point: the "floor" or funding needed were the program to continue at its current demand with no growth.

In the Middle and High scenarios, each vehicle category is assumed to continue to grow as it has in the past. Both scenarios are based primarily on linear extrapolation of all available data by vehicle category, though the scenarios differ in treatment of Tesla vehicles and other BEVs.

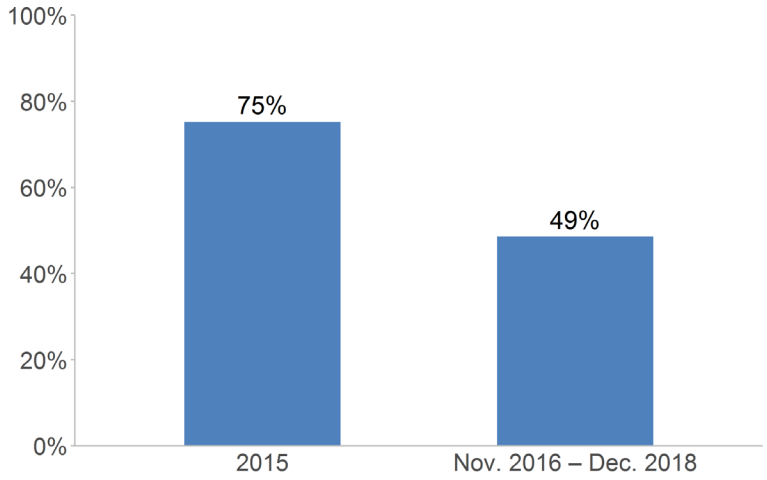
The introduction and roll out of the Tesla Model 3 dramatically disrupted the market with a long-anticipated, unprecedentedly-popular long-range BEV. Despite being sold at an increased volume only since mid-2018, the Model 3 will soon pass the Chevrolet Volt to become the most-rebated model over the course of the entire, nine-year CVRP program. It has made up nearly half of all rebate applications received since July 2018. Though monthly Model 3 sales numbers in California increased rapidly during the latter half of 2018, a slowdown in growth during the first half of 2019, combined with concerns about the impact of the ongoing phase-out of the federal tax credit for Tesla vehicles, contributes significant uncertainty to the projections.

The Middle scenario treats Tesla vehicles as an outlier relative to other manufacturers' vehicles with significant importance, by extrapolating its sales separately. However, it groups all Tesla vehicles as a single category, to temper high expectations for long-term growth that might be set by extrapolating Model 3 sales trends individually. This approach can be thought of as using a trend line reflective of the more modest trend in overall Tesla deliveries to California, rather than assuming CVRP funding demand will depend on the Model 3 continuing its stellar initial trajectory into the medium- and long-term. Input data for the Tesla category are further limited to the months since April 2018 to exclude those months with few early Model 3 deliveries, and therefore much of the rapid ramp-up of the Model 3, which further tempers extrapolated growth.

In the High scenario, four long-range BEV models—the Chevrolet Bolt, Tesla Model 3, Model S, and Model X—are modeled independently, and sales of other BEVs are extrapolated as a category. In this scenario, the impact of the Tesla Model 3's sales has a greater impact than in the middle scenario.

Step 2: Calculate CVRP demand as a Percentage of the Market: The market projections are then each multiplied by a category-specific percentage of sales/leases rebated to produce rebate estimates. This accounts for the fact that only a fraction of the CVRP eligible vehicles sold in California receives a CVRP rebate. These percentages of market rebated are calculated to reflect the "current program era," that is the period since November 2016 when the last major CVRP program change—(lowering of the income cap) went into effect through the end of available market data (December 2018). As illustrated by Figure 2 the percentage of market rebated changed dramatically with the introduction and adjustment of income-based eligibility criteria, in particular establishment of an income cap in March 2016 and lowering to its current level in November 2016, so data before November 2016 do not reflect current conditions.

Figure 2: Percent of Market Rebated



Historically, the percentage of sales/leases rebated has differed significantly by vehicle category. The percent of market rebated figures for each vehicle category are shown in Table 5. The table also illustrates the differences in how BEVs are modeled in each of the three scenarios described above. In the low scenario (the no growth scenario), all BEVs are modeled. In the middle scenarios, Teslas are modeled collectively and all other manufacturer's models are modeled collectively. In the high scenario, each of the four largest selling BEVs is modeled separately, and the other BEVs are modeled collectively.

Table 5: Percent of Market Rebated by Vehicle Category

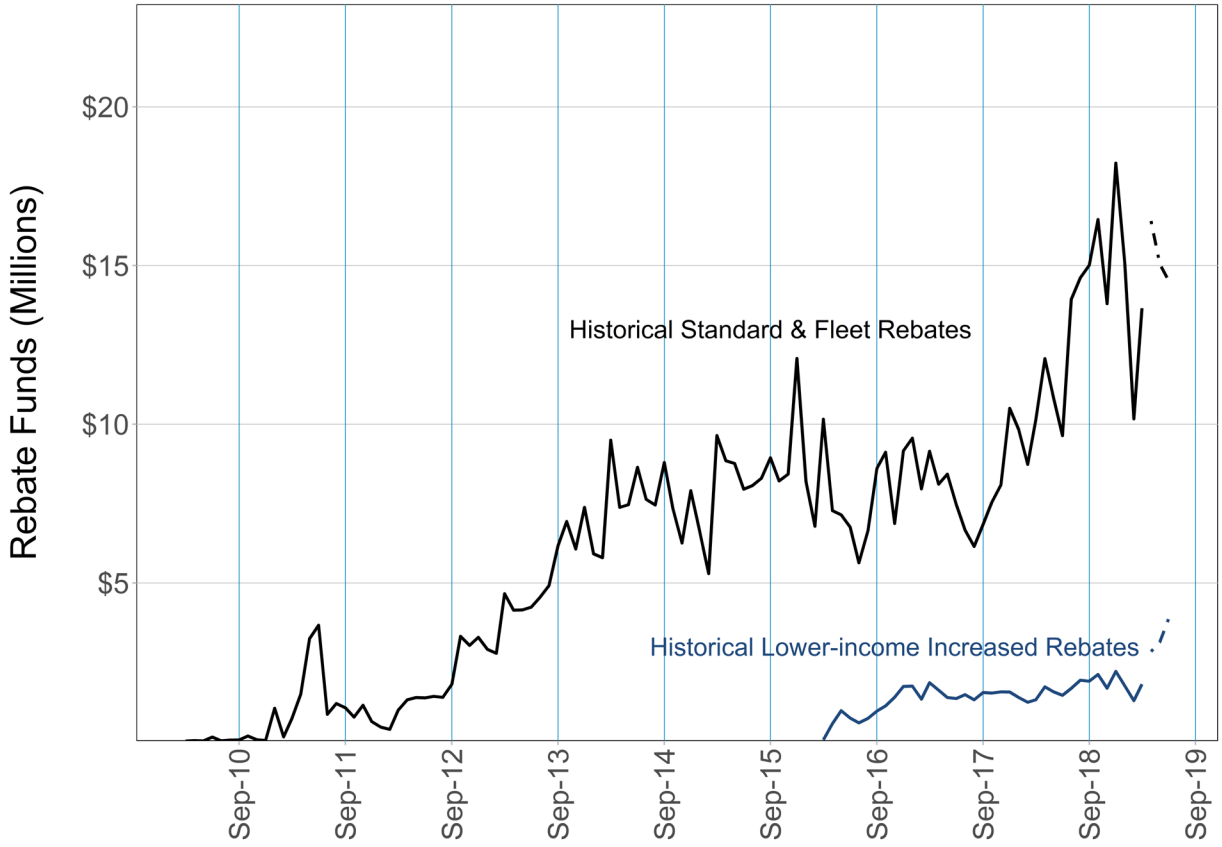
Vehicle Category			Low Scenario	Middle Scenario	High Scenario
PHEV			44%	44%	44%
BEVx			43%	43%	43%
BEV	Tesla*	Tesla Model 3	51%	45%*	51%
		Tesla Model S			31%
		Tesla Model X			31%
	Other BEV	Chevrolet Bolt		64%	54%
		Other BEV			71%
FCEV			89%	89%	89%
ZEM[4]			n.a.	n.a.	n.a.

* Limited to April 2018 – December 2018 to exclude months the Tesla Model 3 was not available.

[4] ZEM registration data is not available, so BEV percent of market rebated totals are used in lieu of ZEM-specific percentages.

Step 3: Extrapolate Trends in Lower-income Increased Rebates: In recent months, the number of lower-income Increased Rebate applications has increased, but have decreased as a percentage of total rebates. Figure 3 shows rebate funding by category. As such, it is no longer appropriate to model lower-income Increased Rebates simply as a percentage of Standard Rebate - the approach used in previous Funding Plans. To account for this, Lower-income Increased Rebates are now projected independently.

Figure 3: Historical Monthly CVRP Rebate Demand



Step 4: Estimate Total CVRP Funding Required:
After the demand is estimated, the projected number of rebates are multiplied by rebate amounts for each rebate type (shown in Table 6) to estimate program funding need during the next three funding cycles.

Table 6: Current CVRP Rebate Amounts

Vehicle Category	Standard	Increased for Lower-income and Public Fleets in DACs
PHEV	$1,500	$3,500
BEVx	$2,500	$4,500
BEV	$2,500	$4,500
FCEV	$5,000	$7,000
ZEM	$900	$900

CVRP Funding Need for Next 3 Years

Table 7 shows the projected CVRP funding need over the next three budget cycles if there are no changes made to the program. The total need for the FY 2019-20 funding cycle range from $240 and $370 under the three scenarios described above. Staff projects a funding need over the next budget cycle (through August 2020) of about $240-$370 million (see table 7). This includes:

- $26–$33 million to fund the waitlist that has been accruing since the end of the FY 2018–19 cycle.
- $191–$300 million for Standard and Fleet Rebates for FY 2019–20 (spanning September 2019 through August 2020).
- $26–$36 million for Increased Rebates for Lower- Income Consumers for FY 2019-20. (It should be noted that a surplus of about $10 million for low-income rebates is being carried over from FY 2018-19 and will offset a portion of this need.)

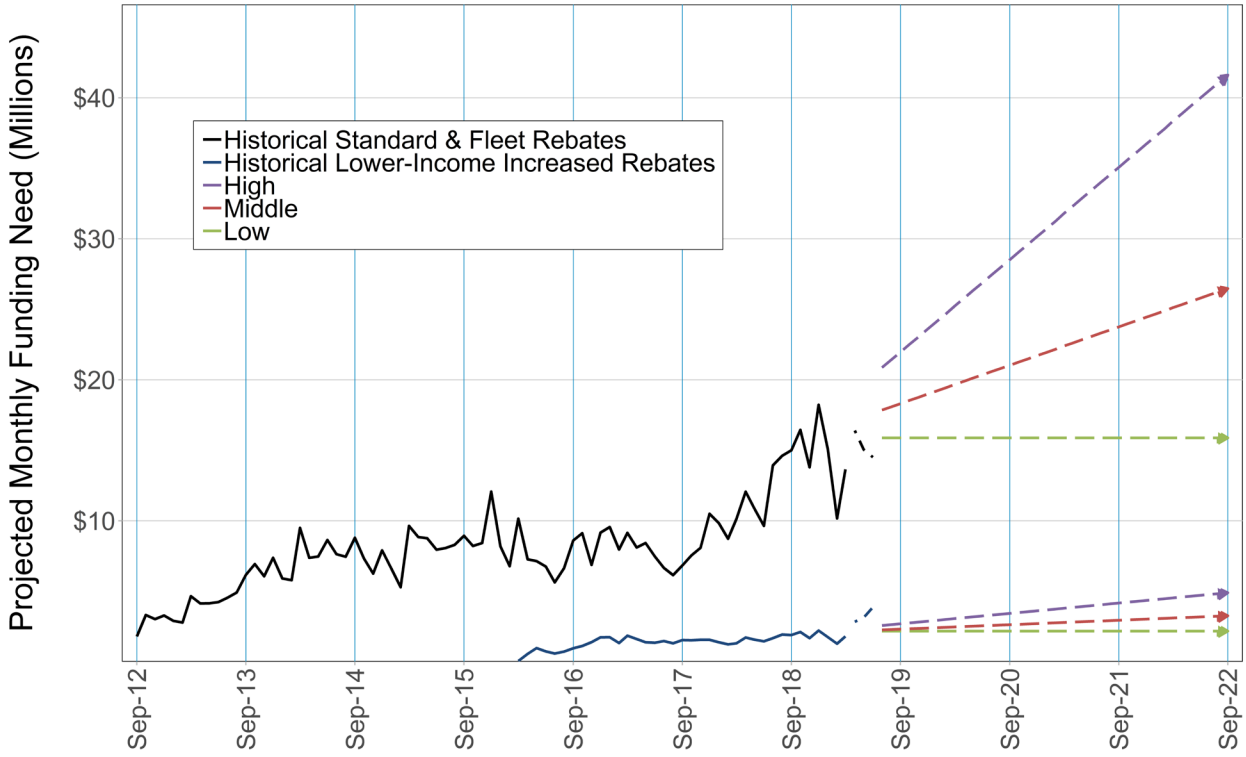
Staff used the middle scenario as its best estimate of funding need and to evaluate impacts of potential project changes. Under this scenario, the total funding need for the FY 2019-20 funding cycle (including the waiting list) is $293 million.

Table 7: Projected CVRP Funding Demand over Next Three Years

Funding Cycle (Sep thru Aug)	**Rebate Type** (All = Standard + Increased)	Projected Funding Demand (millions)			Projected Rebates (thousands)		
		Low	Middle	High	Low	Middle	High
FY 2018–19 Waitlist		$26	$29	$33	-	-	-
FY 2019–20	Standard and DAC-Fleet Increased	$191	$235	$300	78	94	118
	Lower-Income Increased Rebates	$26	$30	$36	6	7	8
	Total Need	$217	$264	$336	84	101	127
FY 2020–21	Standard and DAC-Fleet Increased	$191	$267	$378	78	107	148
	Lower-Income Increased Rebates	$26	$33	$45	6	8	10
	Total Need	$217	$301	$423	84	115	158
FY 2021–22	Standard and DAC-Fleet Increased	$191	$300	$457	78	120	178
	Lower-Income Increased Rebates	$26	$37	$54	6	8	12
	Total Need	$217	$337	$511	84	128	190
3-Year Average (Middle Scenario, Waitlist Excluded)			$301			115	

Figure 4 shows the projections over the next three years graphically along with historical CVRP demand.

Figure 4: Projected CVRP Demand Over Next Three Budget Cycles



Staff notes that it has refined its funding need methodology since the start of the public process for FY 2019–20 Funding Plan. Initially, staff projected forward each technology based on the 12 most recent months of data as it had in past Funding Plans. However, this gave undue influence to the spike in Tesla model 3 sales during the second half of 2018. Stakeholders were skeptical the Tesla Model 3 could maintain the rapid growth it demonstrated during its initial roll out, especially given the ongoing phase-out of the federal tax credit for Tesla vehicles. Additionally, rebate application totals received during the first half of 2019 were lower than indicated by trends based on data ending in 2018. As a result, the focus returned to modeling more aggregated vehicle categories, as described above. To further temper growth expectations in the Middle scenario, a time period after the ramp-up of Tesla Model 3 is used for Tesla vehicles. Finally, staff also updated the approach to estimating funding need for Lower-income as described earlier in this document.

Factors not addressed in Projections: It is also worthwhile to point out that several factors may influence future CVRP demand, but are not modeled due to lack of data. In particular, staff do not explicitly model the impact of the introduction of revolutionary, new vehicles that significantly impact the market much like the Tesla Model 3 did at the end of 2018. These could include a low-cost, long-range, all-electric SUV, electric pickup truck, or others. These aren't explicitly modeled because of a lack of concrete information on when such a vehicle would be introduced and the

market's reaction to it. However, the High scenario can represent a future in which Model-3-like models are introduced with successful launches or other new unique market incidences occur.

The projections do not attempt to account for the phase out of the federal tax credit for Tesla and General Motors. CVRP Consumer Survey data indicate that about half of those surveyed consider the federal tax credit to be extremely important in making it possible to acquire an EV. That fraction of consumers who value the federal tax credit is increasing over time. It is possible that, like for the CVRP rebate itself, the importance of the federal tax credit will continue to grow as more mainstream, less EV-enthusiastic consumers enter the EV market. By design, the tax credit will phase out for the best-selling makes and models first, which could have an impact on the market and California's progress toward state goals. Though the impact of the federal tax credit on consumer purchase decisions appears to be sizeable, it is presently difficult to estimate the potential impact of the phase down, and work to this end is ongoing. A more qualitative discussion of the impact of the federal tax credit is presented later in this document.

The projections also do not attempt to account for the introduction of, or changes in status to, other incentives, such as Rebate Now, Clean Cars 4 All, Financing Assistance for Lower-Income Consumers, or the launch of the new point-of-sale Clean Fuel Rewards program funded with the value of Low Carbon Fuel Standard credits. Nor do they address the impact of the ZEV Regulations; as such, these projections are a trend-based, not a compliance-based analysis.

Impact of Proposed CVRP Program Change on Funding Need

The 2019-20 Budget Act* appropriated $238M for CVRP, including $25 million for Lower-income Increased Rebates. To fund both the projected waitlist and FY 2019-20 program, CVRP will need to implement program changes to fit within the budget, given the projected demand under the middle scenario is about $300 million with existing program rules.

As noted above, staff used the middle CVRP projection scenario as its best estimate of funding need and to evaluate impacts of potential project changes. Staff modeled the following proposed CVRP program changes using the assumption that they would become effective December 1, 2019:

- Eligible PHEVs must have greater than 25-mile Urban Dynamometer Driving Schedule (UDDS) all-electric range
- Eligible vehicles must have a base MSRP less than $60,000 (excluding FCEVs)
- Consumers are limited to one rebate per person (not retroactive), compared to the current limit of 2

*Text was updated on January 13, 2020 to correct the reference to the 2019-20 Budget Act. The document previously referenced the 2018-19 Budget Act.

- Applicants must apply within three months of purchase or lease[5]
- The Standard rebate for PHEV, BEVx, BEV, and FCEV is reduced by $500, and rebates for ZEM reduced by $150
- There will be no waitlist implemented at the end of the FY 2019-20 funding cycle if the program runs out of funding

As shown in Table 8 staff estimates that these changes would collectively reduce the funding need for the FY 2019-20 funding cycle from just under $300 million to $237 million, roughly equal to the CVRP budget for FY 2019-20. Thus, these estimates show that it may be possible to operate CVRP without interruption through the FY 2019-20 funding cycle if staff's proposed changes are adopted by the Board and demand matches the Middle projection scenario.

Table 8: CVRP Funding Need after Proposed Program Changes

Changes	FY 18-19 Waitlist	FY 19-20 cost	Savings	Total FY 19-20 need	FY 20-21 need	FY 21-22 need	Three-cycle average need
Funding Need with No Changes	$29 M	$264 M	$0 M	$293 M	$301 M	$337 M	$301 M
Funding Need with Changes	$29 M	$208 M	-$56 M	$237 M	$217 M	$243 M	$223 M

Trajectory Analysis to 2030

In this section, staff 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.

It should be noted that the market and rebate projections described above are regularly used to identify funding needs over a given fiscal year with reasonable accuracy. They are also reasonably appropriate to help set expectations for funding requirements over a three-year timeframe, assuming no market disruptions. However, the farther into the future past trends are extrapolated, the more *illustrative* they

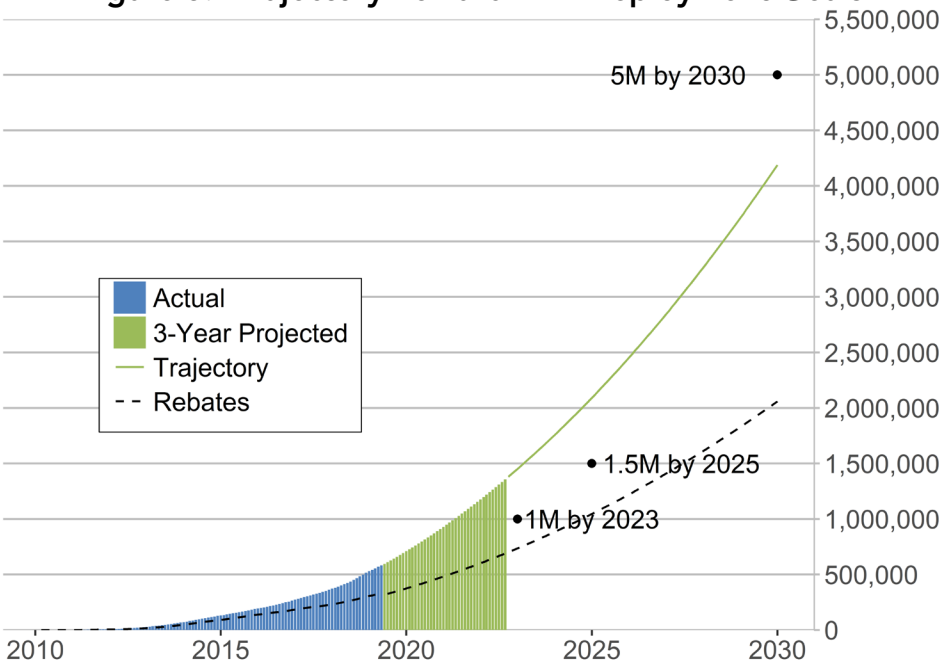
[5] Given that a 3-month or less application window has been implemented successfully in other state EV rebate programs, estimates assume all applicants will adapt to 3-month application window—i.e., implying no change to funding demand. To the extent consumers are unaware of the rule change during the transition, a modest reduction in rebate demand may result (but likely not more than $20M, reflective of the roughly 10 percent of historical applicants who took longer than 3 months to apply when the application window was 18 months).

become. Unforeseen, market-altering events become increasingly likely over time. Even within a three-year planning horizon, they represent a trend that averages out peaks and valleys in demand. In addition, any adjustments represent a careful balancing act between accounting for the accelerated expansion that would represent market and policy success without underestimating the barriers to widespread commercialization.

As such, use of such projections to assess the state's progress toward its long-term goals must be cognizant of these limitations. Nevertheless, when taken as illustrative rather than predictive, extrapolating past and current trends can be informative. For example, if the current trajectory points toward a goal, it does not predict its attainment, but it gives a no-guarantee indication of being "on course" under current conditions. If the trajectory falls short of a goal, it does not necessarily predict failure. However, it gives an indication that measures greater than or in addition to those already in place might be needed (unless an expected future factor, such as ZEV regulations, will sufficiently accelerate progress beyond the growth trend to attain the goal).

With that context in mind, the Middle growth scenario appears to be on track to exceed the 1 million vehicle and 1.5 million goals, and the trajectory appears to point toward roughly 4.2 million EVs by 2030, falling short of the 5 million vehicle goal as shown in Figure 5. These projections assume provides CVRP rebates to half of the vehicles sold in California, based on historical CVRP data. The trajectory analyses show that additional policies - regulatory, incentive-based, or a combination – would be needed to accelerate growth to meet the 5 million goals by 2030. Staff will update the analyses annually as more sales data become available.

Figure 5: Trajectory Toward ZEV Deployment Goals



Estimated Rebate Funding Needed to Reach 5-Million-ZEV Goal

The trajectory analysis shown in Figure 5 can be used to estimate the amount of additional CVRP funding that would be needed to meet the state's ZEV deployment goals. About $5.6 billion may be needed to rebate the 2.1 million additional vehicles to reach the goal of 5 million ZEVs in California assuming the percentages of the market rebated stay the same into the future as shown in Table 9. The state would reach that target after 2030, given the current trajectory of the ZEV market.

Table 9: Estimated CVRP Funding Need for Three-Year Planning Timeline and ZEV Deployment Goals

	Middle Scenario	
	Additional Vehicles Rebated	**Funding Need**
Projected 3-year total	354,000	$921 M
1 million vehicles	195,000	$505 M
1.5 million vehicles	435,000	$1.1 B
5 million vehicles	2.1 M	$5.6 B

It should be noted that the estimated funding need in Table 9 is for rebates only and does not include private investment in vehicles, or public and private investment in charging infrastructure or other market features. For context, using an illustrative calculation in April 2019 that multiplied base MSRP by forecasted EV sales[6], a $5.6 billion-dollar public investment in rebates amounts to less than 3 percent of the more than $188 billion dollars in private investment in purchase/lease EV that would be required to meet the state's 5-million-ZEV goal.

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.

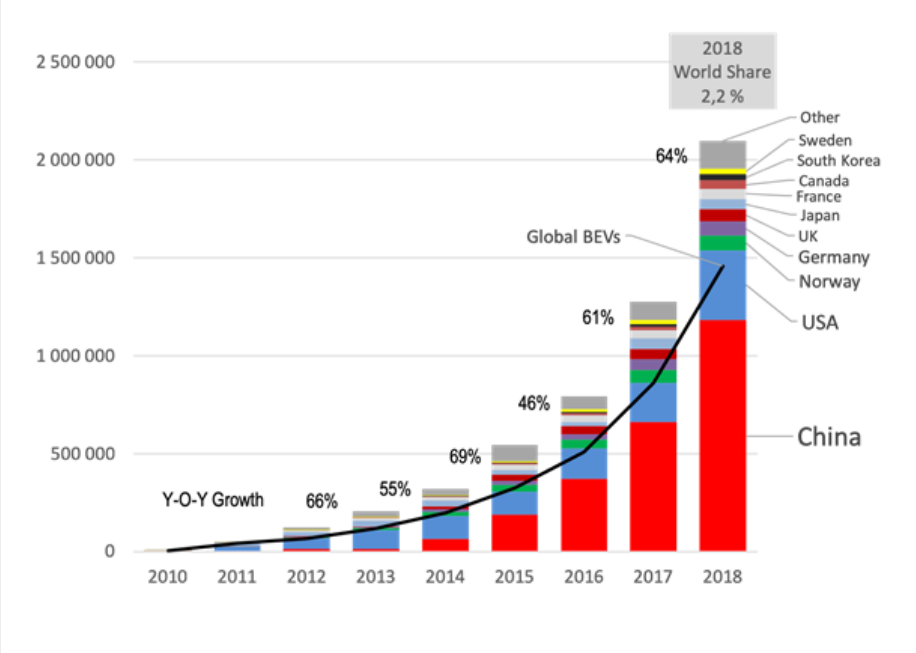
Several of the topics covered here such as growth in ZEV sales, market share, and vehicle diversity are also indicators that staff uses to evaluate progress toward a sustainable ZEV market in California. As such, California-specific trends for each of these indicators are discussed in greater detail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

[6] Updated Funding Need, Program-Change Scenarios, and other Planning Considerations

Trends in the ZEV Market

In 2018, the number of electric passenger vehicles reached 5.1 million units worldwide, an increase of 2 million from 2017, which corresponds to an increase of 63 percent. The upturn is similar to a growth rate of 57 percent in 2017 and 60 percent in 2016. Battery electric vehicles account for 64 percent of the world's electric car fleet whereas PHEVs and FCEVs were 39 percent of total sales[7]. With about 1.1 million sales in 2018, China was the world's largest electric car market, an increase from 600,000 sales in 2017; accounting for 55 percent of the global electric car market. Europe was the second largest EV market in 2018 with the sales of 385,000 vehicles or 31 percent growth rate, which was 10 percent less than 2017. With 361,307 EV sold, United States experienced 82 percent sales growth compared to 24 percent in 2017[8]. Figure 6 illustrates this growth for different markets across the world over the last 8 years.

Figure 6: Global Light-Duty Plug-In Electric Vehicle Deliveries – ev-volumes.com



Tesla, by far, was the largest contributor to increased EV sales, specifically in the United States EV market. In 2018 with 134,000 vehicles, the Tesla Model 3 was the bestselling EV in the US and had the most impact on the EV market.

These are all positive signs regarding the growth of the ZEV market. However, significant additional market growth is needed to meet California's ZEV deployment goals. As discussed in the previous section, California remains behind the growth trajectory needed to meet the 2030 goal of 5 million ZEVs even with the impressive growth in recent years.

[7] Global EV Outlook 2019 and EV-volumes.com

[8] insideevs.com

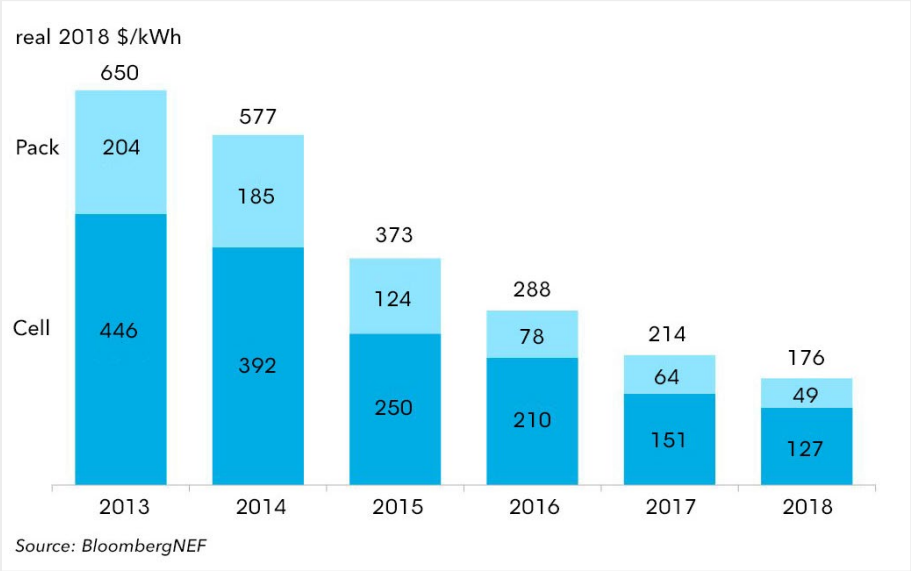
ZEV Technology Assessment Update

Battery price is the major cost component in electric vehicle manufacturing. Therefore, monitoring the battery cost production and close analysis of cost reduction is critical for market projection. In this section, current and future battery cost and its impact on ZEV market acceleration is being discussed.

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 $176/kWh by the end of 2018[9]. The significant price drop in comparison with the $215/kWh used for the central estimate of the Total Cost of Ownership analysis[10] in 2018 reflects changes in the key determinants of battery pack costs.

This trend is expected to continue for the near future because as the production volume increases, the price will continue to decrease. Illustrated in Figure 7, BloombergNEF suggests that for every doubling of cumulative volume, there would be an 18 percent reduction in price, and they expect the price of an average battery pack to be around $94/kWh by 2024 and $62/kWh by 2030.

Figure 7: Lithium-Ion Battery Price Survey

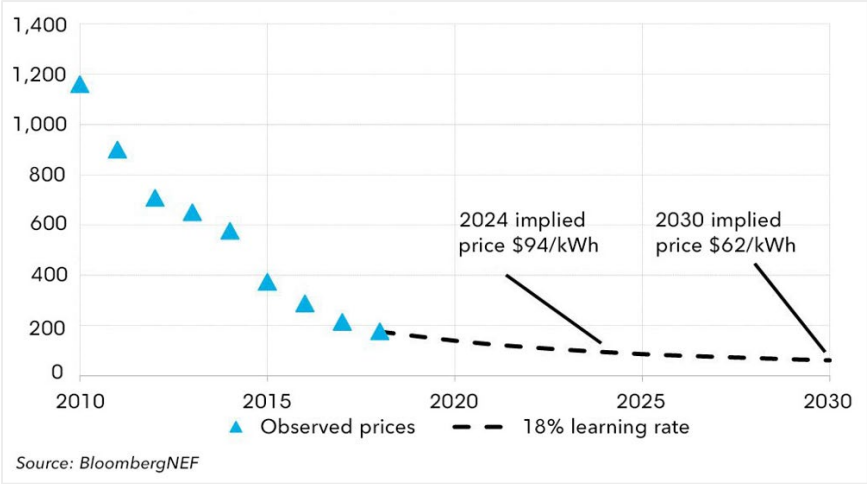


For a 200km (125 miles) range EV to be cost competitive with Internal Combustion Engines (ICEs), battery prices of $100/kWh are necessary, at a fuel price of 80¢ per liter (20¢ per gallon) and 18,000 km/year (11,184 miles/year) mileage. The cost parity threshold falls to $50/kWh for BEVs at a 400km (248 mile) range, in the same mileage and fuel price conditions.

[9] **BloombergNEF**

[10] Global EV Outlook 2019

Figure 8: Lithium-Ion Battery Price Outlook



As Figure 8 suggests, if the current battery cost reduction continues, cost parity is expected to happen in 2024 for lower range EVs and in 2030 for longer range EVs.

Update on Incremental costs of PEVs: The higher purchase price of EVs is considered one of the main barriers for consumers purchasing new vehicles. According to the International Renewable Energy Agency (IRENA), purchase price of a standard medium size EV is approximately 40 percent more than a conventional internal combustion engine (ICE) vehicle of similar size[11]. 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 ICEs and PEVs. With battery prices to auto manufacturers of $260 per kilowatt-hour (kWh) (comparable with battery production costs close to $215/kWh, i.e. accounting for a 20 percent profit margin for battery suppliers), scaling up the consumer adoption of BEVs in cars continues to require policy support[12].

EV purchase prices are not yet competitive with ICE vehicles and for a first-owner, assuming to keep the car on average for 3.5 years, even with higher prices for fuel than for electricity on a per kilometer basis, the total cost of ownership for a BEV is still higher than for an ICE vehicle. Battery manufacturing cost should be further reduced to fill the price gap between total cost of ownership of EV and ICE and make the EVs a more favorable choice to consumers. As battery prices decline, EVs become cheaper to operate than ICE vehicles, and where fuel prices are high, PHEVs owners experience lower total cost of ownership than ICE vehicles.

While battery cost is the most expensive component in the total cost of ownership calculation, there are opportunities for cost reduction in other areas. Redesigning the EV manufacturing platforms and investing on less moving parts can help reduce the

[11] The International Renewable Energy Agency

[12] https://webstore.iea.org/global-ev-outlook-2019

total manufacturing cost. There are indications that manufacturers are investing to develop more EV specific manufacturing platforms to be used at larger scale production.

Overall, in 2018 the purchase price of a mid-size EV cost about 40 percent more than a comparable ICE[13]. The economic advantage of EVs are limited to specific cases. 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 and ICEs can potentially be achieved by 2025.

In summary, findings of the technology assessment indicates that 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 range in the next 5 to 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. Self- sustaining market is expected to happen 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[14].

In developing this update to the Long-Term Plan, staff asked stakeholders if it should consider alternative approaches to defining a ZEV market. There was no consensus or an alternative, hence staff will continue using the 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.

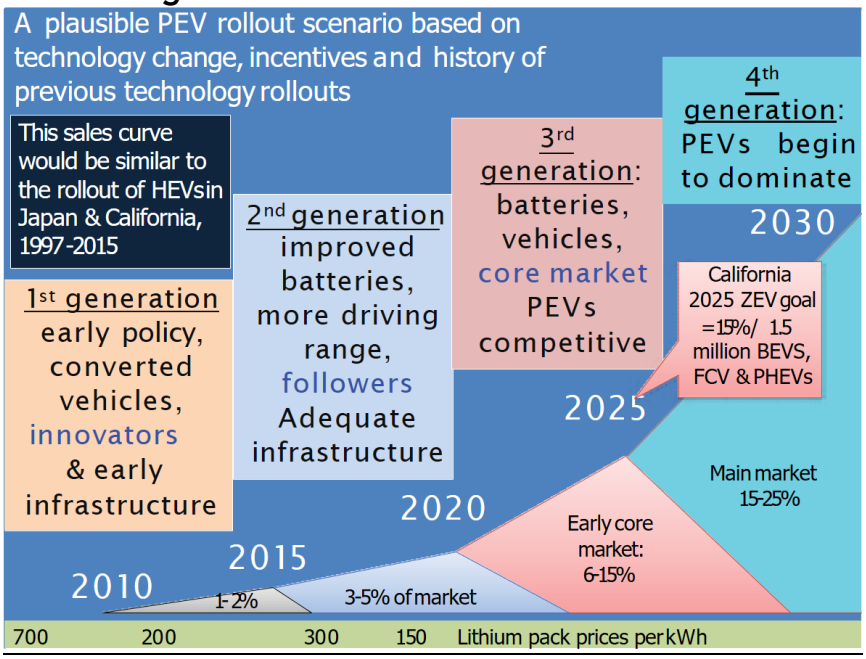
Figure 9 shows how the market could grow toward self-sustainability based on the principals of the diffusion of innovation theory.

---

[13] ibid

[14] Proposed Fiscal Year 2016-17 Funding Plan For Low Carbon Transportation And Fuels Investments And The Air Quality Improvement Program

Figure 9: EV Rollout Scenario to 2030[15]



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 the 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 evaluated the importance of the federal tax credit below because that may ultimate 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 as per the Supplemental Report of the 2018-19 Budget Act.

Annual New ZEV Sales and ZEV Market Share

Staff considered the 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 2018. Table 10 shows details of the new EVs sold over the last three years and California ZEV market share is now about 8 percent of the new light-duty vehicle sales and expected to grow in the coming years.

[15] Developed by Tom Turrentine, UC Davis

Table 10: Hybrid and Electric New Vehicle Registrations and Market Share

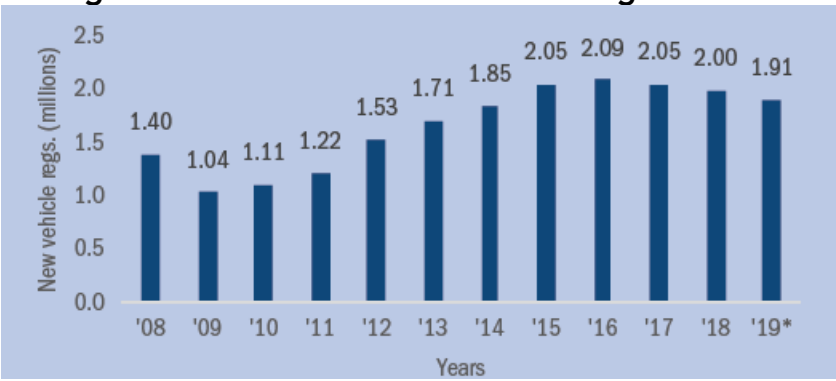
	2015	2016	2017	2018	2019 YTD (Thru June)
Plug in hybrid registration	27740	34727	45040	62847	21193
Plug in hybrid share	1.4%	1.7%	2.2%	3.1%	2.2%
Electric registration	34477	40347	53500	94801	52807
Electric share	1.7%	1.9%	2.6%	4.7%	5.6%
Total # of Vehicles	62217	69204	98540	157648	74000
Total PEV Market Share	3.1%	3.6%	4.8%	7.8%	7.8%
Year-to-Year Growth Rate	16%	33%	63%		

*Data Source: IHS - California New Car Dealer Association

By the end of the second quarter of 2019, total PEV registrations reached more than 52,000 vehicles and is on pace to exceed 100,000 vehicles through the end of the year. Comparing the end of the second quarters of 2018 and 2019 suggests 18 percent growth.

Figure 10 shows California new vehicle registrations during the last 11 years. New vehicle registrations in California are expected to slip below 2 million units in 2019, a 4.6 percent decline from 2018, nonetheless it is still above historical average.

Figure 10: California New Vehicle Registration[16]

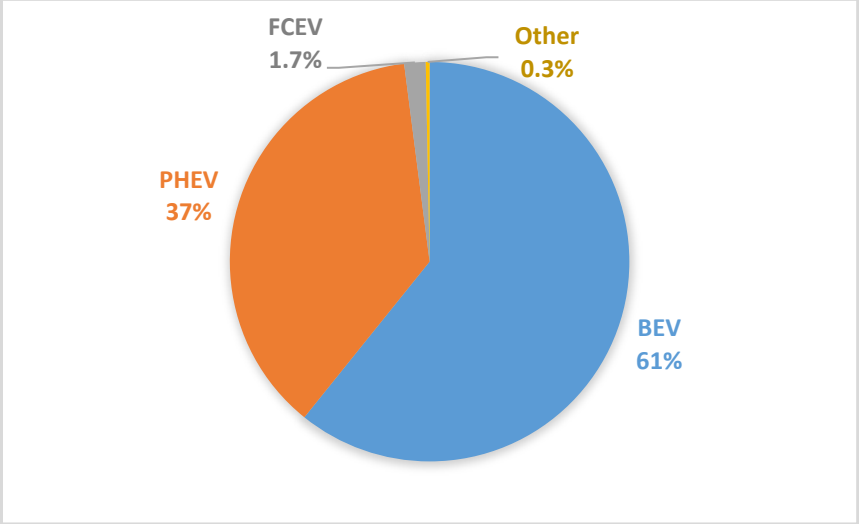


Despite the overall decline of total new light-duty vehicle sales in California, ZEV sales are increasing each year, and the ZEV market share has grown 37 percent over the past three years on average. The big spike seen in 2018 was due to the Tesla Model 3 debut.

[16] California Auto Outlook Covering Second Quarter 2019

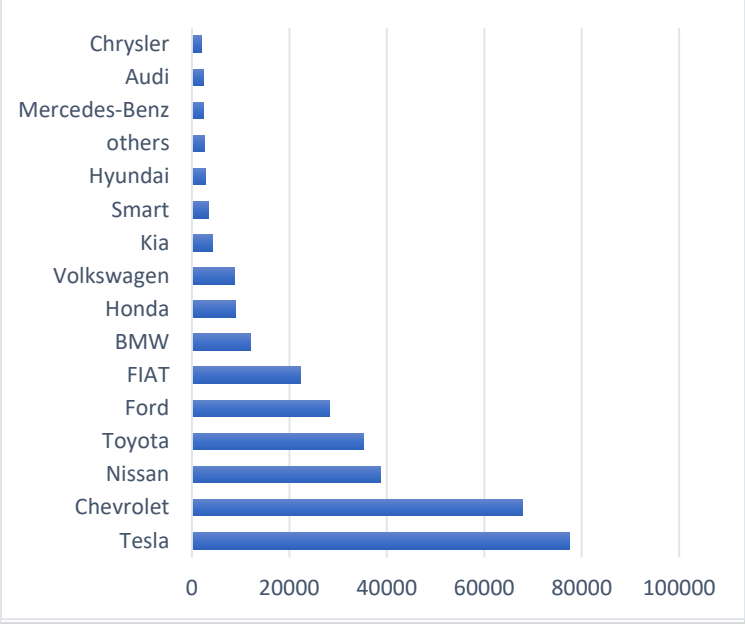
In recent years, the same technology split trend under CVRP has been observed and as Figure 11 shows, CVRP recipients chose BEVs 1.5 times more than PHEVs. This indicates that with more diverse and higher-range BEVs with higher incentive amounts available, consumers are more willing to choose cleaner technologies.

Figure 11: CVRP Cumulative Rebates by Technology Type



Tesla, Chevrolet, Nissan, Toyota, and Ford were the top five manufacturers that had rebates issued under CVRP. Figure 12 illustrates the amount of rebates received under CVRP by Vehicle Make since the inception of the program.

Figure 12: Cumulative CVRP rebates by Vehicle Make



In summary, ZEV car sales have grown to about 8 percent of new car sales in California by mid-2019. This is about half way to staff's defined indicator of a sustainable ZEV market of 16-20 percent market share. Staff also estimates over 600,000 ZEVs will be sold in California through mid-2020 – over 60 percent of the way to the 1 million 2023 ZEV deployment goal.

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. For Model Year 2018, 56 different models of electric-drive vehicles were available in the US market[17], 47 of them were CVRP eligible in California.

As staff has noted, vehicle diversity is an indicator of the health of the ZEV market. This is supported by research. For example, a recent publication by the International Council on Clean Transportation (ICCT) shows that cities with more models available to consumers tended to have higher registration in 2018 as can be seen in Figure 13[18]. More choices in larger vehicle categories like SUV, minivan, and 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.

Figure 13: Electric vehicle share of new vehicles and model availability in the 50 most populous metropolitan areas[19]

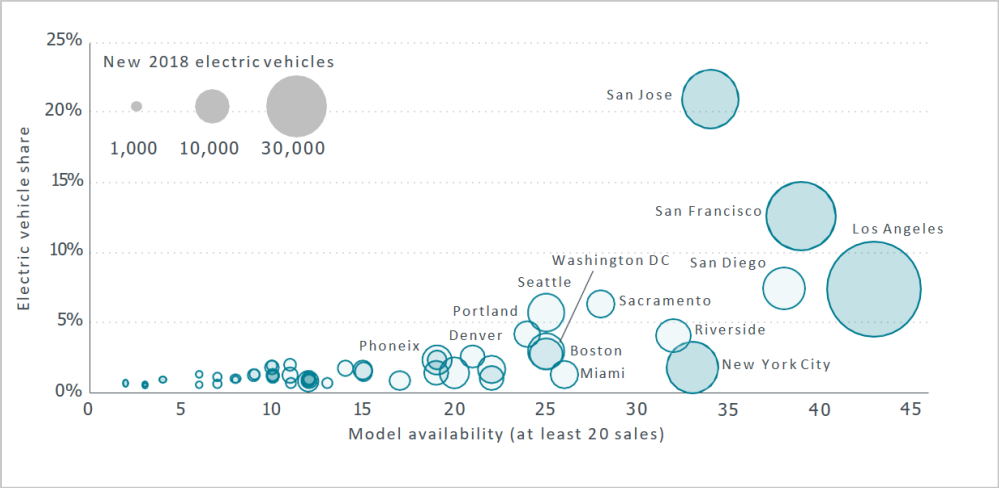


Table 11 lists each of the 56 models available by type across different vehicle classes in the US market.

[17] https://www.energy.gov/eere/vehicles/articles/fotw-1093-august-5-2019-model-year-2018-electric-drive-vehicle-models-were

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

[19] New vehicle registration data are from IHS Markit

Table 11: Electric-Drive Vehicles Available by Manufacturer, Model Year 2018

Model	Drive Type	EPA Size Class
BMW i3 (94Ah)	EV	Subcompact Car
BMW i3s (94Ah)	EV	Subcompact Car
BYD e6	EV	Small SUV 2WD
Chevrolet Bolt EV	EV	Small Station Wagon
Fiat 500e	EV	Minicompact Car
Ford Focus Electric	EV	Compact Car
Honda Clarity EV	EV	Midsize Car
Hyundai Ioniq Electric	EV	Midsize Car
Kia Soul Electric	EV	Small Station Wagon
Nissan Leaf	EV	Midsize Car
smart fortwo electric drive convertible	EV	Two Seater
smart fortwo electric drive coupe	EV	Two Seater
Tesla Model 3 Long Range	EV	Midsize Car
Tesla Model S 100D	EV	Large Car
Tesla Model S 75D	EV	Large Car
Tesla Model S 75kWh	EV	Large Car
Tesla Model S P100D	EV	Large Car
Tesla Model X 100D	EV	Standard SUV 4WD
Tesla Model X 75D	EV	Standard SUV 4WD
Tesla Model X P100D	EV	Standard SUV 4WD
Volkswagen e-Golf	EV	Compact Car
Audi A3 e-tron	PHEV	Compact Car
BMW 330e	PHEV	Compact Car
BMW 530e	PHEV	Compact Car
BMW 530e xDrive	PHEV	Compact Car
BMW 740e xDrive	PHEV	Large Car
BMW i3 (94Ah) with Range Extender	PHEV	Subcompact Car
BMW i3s (94Ah) with Range Extender	PHEV	Subcompact Car
BMW X5 xDrive40e	PHEV	Standard SUV 4WD
Cadillac CT6 Plug-In	PHEV	Midsize Car
Chevrolet Volt	PHEV	Compact Car
Chrysler Pacifica Hybrid	PHEV	Minivan 2WD
Ford Fusion Energi Plug-in Hybrid	PHEV	Midsize Car
Honda Clarity Plug-in Hybrid	PHEV	Midsize Car
Hyundai Ioniq Plug-in Hybrid	PHEV	Midsize Car
Hyundai Sonata Plug-in Hybrid	PHEV	Midsize Car
Karma Revero	PHEV	Subcompact Car
Kia Niro Plug-in Hybrid	PHEV	Small Station Wagon
Kia Optima Plug-in Hybrid	PHEV	Midsize Car
Mercedes-Benz C350e	PHEV	Compact Car
Mercedes-Benz GLC350e 4matic	PHEV	Small SUV 4WD
Mercedes-Benz GLE550e 4matic	PHEV	Standard SUV 4WD
MINI Cooper SE Countryman All4	PHEV	Midsize Car
Mitsubishi Outlander PHEV	PHEV	Small SUV 4WD
Porsche Cayenne S e-Hybrid	PHEV	Standard SUV 4WD
Porsche Panamera 4 e-Hybrid ST	PHEV	Large Car
Porsche Panamera Turbo S e-Hybrid	PHEV	Large Car
Porsche Panamera Turbo S e-Hybrid Executive	PHEV	Large Car
Porsche Panamera Turbo S e-Hybrid ST	PHEV	Large Car
Toyota Prius Prime	PHEV	Midsize Car
Volvo S90 AWD PHEV	PHEV	Midsize Car
Volvo XC60 AWD PHEV	PHEV	Small SUV 4WD
Volvo XC90 AWD PHEV	PHEV	Standard SUV 4WD
Honda Clarity Fuel Cell	FCEV	Midsize Car
Hyundai Tucson	FCEV	Small SUV
Toyota Mirai	FCEV	Subcompact Car

In summary, there are currently 47 EV models eligible for CVRP and available to Californians, and there has been a significant increase in the number of eligible vehicles over recent years. In 2011, there were about 5 eligible vehicles available for sales and has expanded to more than 40 in 2018. Looking forward, manufacturers have announced many additional vehicle introductions anticipated over the next several years. However, vehicle diversity remains far more limited than the fully diversified ICE market, so it still does not meet the needs of a wide range of consumers for various vehicle choices in different categories.

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 of Automobile Manufacturers (The Auto Alliance), 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; 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 aims to engage electric car stakeholders with three annual forums that include interesting panels and speakers on current electric car topics, as well as webinars designed to share and discuss the latest updates in the electric car industry. In coordination with its contractor, Charge Across Town, Veloz also coordinated a statewide ride-and-drive campaign (Best.Drive.EVer) to increase electric car awareness and adoption across the State. Best.Drive.EVer also reached low income and disadvantaged communities that are typically underserved with electric car events. Veloz also launched a multi-million dollar electric car public awareness campaign called Electric For All, focused on reaching Californians. CSE and CARB are founding members of Veloz.

The Auto Alliance 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 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.

It should be noted that Center for Sustainable Energy (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. Table 12 shows the increases of outreach in recent years under CVRP grant.

Table 12: CVRP Dealer Outreach Team Activities

Dealership Outreach by Year	2015	2016	2017	2018	2019*	Total
In Person Visits	-	-	222	990	1,561	2,773
Information Sessions	-	-	2	48	67	117
Materials Distributed	48	1,081	1,640	6,694	5,417	14,880

* As of 8/1/2019

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.

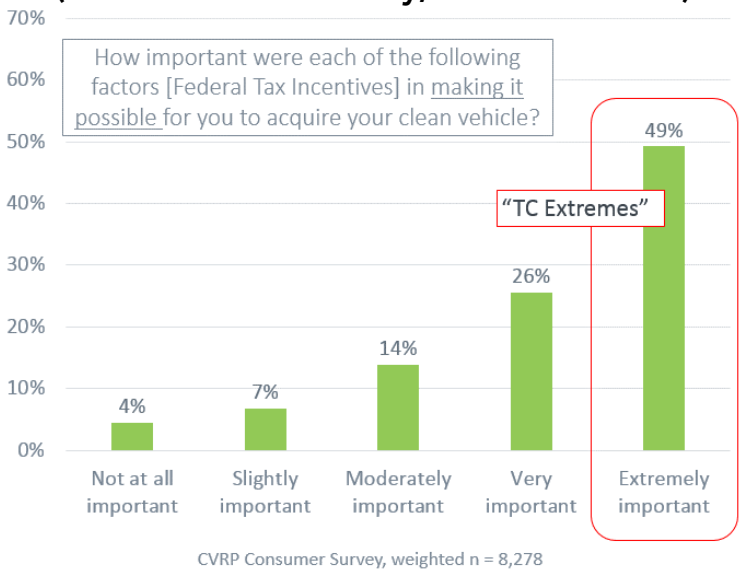
Other consumer surveys are being conducted under various research grants and contracts and CARB will coordinate to streamline the survey methodologies and questions to collect similar information across surveys to help inform long-term analyses.

Importance of the Federal Tax Credit

The Supplemental Report of the 2018-19 Budget requires CARB to evaluate the impacts of federal policy, such as the federal tax credit, on the adoption of ZEVs. 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 down 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. During 2018, both Tesla Motors and General Motors exceeded 200,000 electric vehicles sold, triggering phase-down. The credit will be eliminated for Tesla at the beginning of 2020 and for GM at the beginning of April 2020.

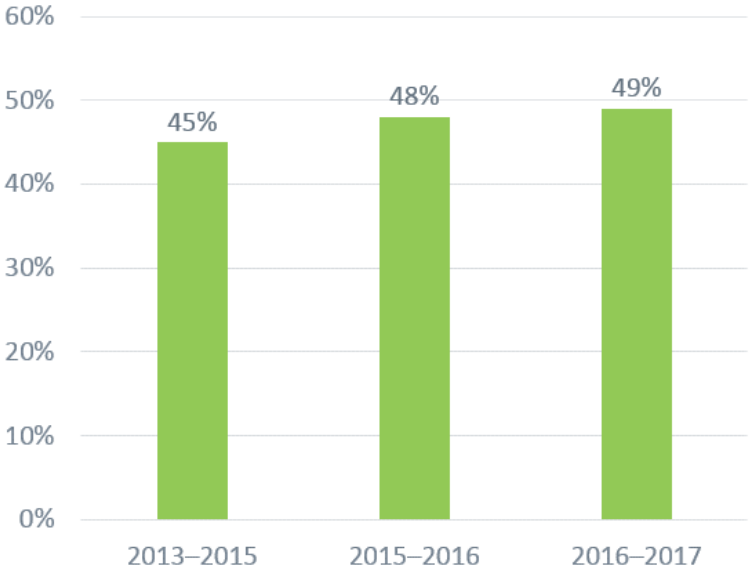
The CVRP Consumer Survey asks respondents to rate the importance of the federal tax credit in making it possible to acquire an electric vehicle. Those who answered "extremely important" are most influenced by the incentive and can be used as a rough proxy for those who might not have purchased/leased their vehicle without the tax credit. In the 2016–17 edition of the survey, 49 percent of respondents said the tax credit was extremely important as shown in Figure 14.

Figure 14: Importance of Federal Tax Credit (CVRP Consumer Survey, 2016–17 edition)



The electric vehicle market has matured considerably in the 10 years since the tax credit was introduced. Vehicle and battery technology have improved, there are an increasing number of consumer vehicle choices, and electric vehicles make up a growing share of the new vehicle market. Despite these advances, program data indicate that the importance of vehicle purchase/lease incentives – both rebates and the federal tax credit – appears to be increasing, not decreasing, over time. Figure 15 shows the percentage of respondents who said the incentive was extremely important by survey edition.

Figure 15: Weighted Portion of Program Participants Rating the Federal Tax Credit Extremely Important, by Survey Edition



Preliminary analysis of more recent data puts the extreme-importance portion of the program at over 50 percent. As the market moves beyond early adopters, the influence of the tax credit may remain substantial, or potentially continue to grow over time. By design, the tax credit will phase out for manufacturers with the best- selling makes and models first, which could have a significant impact on the market and on California's progress toward state goals. Work to estimate the potentially sizeable impact of the tax credit phase out is ongoing.

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 have grown to about 8 percent of new car sales in California by mid- 2019, about half way to this target. Increases in ZEV sales and vehicle diversity and reductions in battery costs are all strong indicators of market growth. However, 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, market, economy, and fuel price the market is moving towards the path to achieve the State's ZEV deployment goals. If ZEV sales growth continues on the current trajectory, State would meet the 1 million 2023 and 1.5 million 2025 goals early, but would not meet the 5 million goal by 2030.

ZEVs have not become the mainstream option for vehicle purchasers and there are still barriers that consumers must overcome before choosing this new technology over ICEs. Availability of less expensive EVs and a more diverse selection in different classes with higher range is needed to make ZEVs more favorable than ICEs.

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, All Electric Range (AER) requirement for PHEVs should be increased and eventually phased out for the broad consumer market in few years. This policy change would direct the limited funding towards cleaner technologies, mainly BEVs and FCEVs. Staff recommends that incentives for PHEVs should continue to be available for low-income consumers for a few more years.

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.

Evaluation of Clean Transportation Equity Project Funding Needs

Similar to the Fiscal Year 2016-17 Funding Plan on equity project funding, CARB staff developed funding need projections for clean transportation equity pilot projects to benefit lower-income consumers and those living in low-income and disadvantaged communities. Data sets are an essential element of projecting funding needs over time, but are not available for all projects given varied level of implementation. This year's projections have been developed based on staff and project grantee experience, lessons learned from project implementation, developing the SB 350 Low- Income Barriers Study, Part B: Overcoming Barriers to Clean Transportation Access for Low-Income Residents (Guidance Document), and feedback received through the public work group process, including from State and local partners and clean mobility stakeholders. This includes critical drivers such as technology advancements, increased popularity and potential expansion into additional communities. In addition, the evaluation for determining funding estimates takes into account a diversified portfolio of options that should be designed to meet community specific needs identified across the clean transportation and mobility programs.

Funding projections also take into account anticipated future pilot project growth and increased resident demand over the next three years. These estimates are intended to allow flexibility based on further identification of community transportation needs, as well as policy adjustments over time based on lessons learned through project implementation. This includes flexibility to build out pilot projects that are achieving tangible positive results in communities, or scale back if funding would better serve different transportation needs. Staff also analyzed factors including, but not limited to: available user data, increased project demand, potential expansion and replication, community eligibility expansion, stakeholder and community visibility and interest, community characteristics (e.g. size, demographics, and density), new outreach and education strategies, and funding needed for replicating similar projects across the State.

Projections are anticipated to be refined over time as the analysis of the effectiveness of pilot projects is further assessed, data is gathered as to what is needed to maximize participation, and the impacts from the investments already made in low-income and disadvantaged communities, including increasing outreach and education, to increasing access to clean transportation and mobility options. Through the analysis on estimating funding needs for the near future, CARB staff want to signal the importance of the role pilot projects play in meeting the State's climate change, air quality, and clean transportation equity goals.

.

Staff's evaluation of funding needs is split into three sections as follows:

- Vehicle Purchase Incentives Pilot Projects
- Clean Mobility Options Pilot Projects
- Outreach Strategies

These sections cover the three-year estimates of funding needs for each program or project, as well as descriptions of the methodologies used, and potential policy changes or adjustments identified to help meet each projects various goals. Staff will update these estimates annually through a public process, allowing the opportunity to incorporate new information and to refine our estimates.

Vehicle Purchase Incentives Pilot Projects

This section describes CARB staff's funding need projections and potential future policy changes for CARB's equity focused vehicle purchase incentive pilot projects: Clean Cars 4 All and Financing Assistance for Lower-Income Consumers (Financing Assistance). Clean Cars 4 All and Financing Assistance are designed to increase awareness and access to lower-income consumers to cleaner vehicles as prescribed by SB 1275 and supported by SB 350, as well as provide support to the secondary ZEV market.

Clean Cars 4 All

Table 13 shows staff's projected participation levels in the Clean Cars 4 All programs over the next three fiscal years and the corresponding funding needs for each year. Overall, staff estimates a steady increase in participation over the coming three years as the existing programs continue to grow and additional programs are launched in new air districts.

Table 13: Projected Participation and Funding Ranges

Air Districts	FY 19-20	FY 20-21	FY 21-22
South Coast AQMD	2,000 - 2,200	2,100 – 2,300	2,200 – 2,400
San Joaquin Valley APCD	700 - 900	800 – 1,000	900 – 1,100
Bay Area AQMD	400 - 600	500 - 700	600 - 800
Sac Metro AQMD	200 - 250	400 - 600	500 - 700
Total Participants	**3,300 - 3,950**	**3,800 - 4,600**	**4,200 - 5,000**
Total Funding (in millions)	**$30- $35**	**$35M- 41**	**$38M – 45**

Funding Estimate Methodology

Staff's estimated funding levels for Clean Cars 4 All are based primarily on data collected over four years of implementation, as well as regular consultations with each implementing air district. Staff also made the following assumptions:

- The capacity of each district to process applications is the primary determinant of participation rates given the program's inherently resource-intensive application process;
- Each air district's capacity improves modestly over time due to streamlined processes, improved outreach and education, and greater availability of vehicles in the secondary market;
- Each air district receives an increasing number of monthly applications over time;
- The incentive amount (averaged across participants) stays fairly consistent throughout this three-year period; and
- The average total cost of each incentive is $9,000.

As shown in Table 13 above, participation and funding projections are made district by district before being aggregated to a total funding estimate for each of the three fiscal years. To account for uncertainty, staff estimated a range of values for each year. Table 14 summarizes historic consumer participation for each air district.

Table 14: Historic Consumer Participation by Air District

Air District	FY 15-16	FY 16-17	FY 17-18	FY 18-19
South Coast AQMD	586	947	1,008	1,725
San Joaquin Valley APCD	548	364	274	704
Bay Area AQMD	0	0	0	15
Sac Metro AQMD	0	0	0	0
Total Participants	**1,134**	**1,311**	**1,282**	**2,444**

The South Coast AQMD launched their program in July 2015. To date, the district's program has demonstrated a steady increase in participation each year. During the first two years of implementation demand consistently surpassed the district's capacity to process applications, and participation was ultimately determined by how quickly the district could process applications. After making a number of adjustments to improve operational efficiency, the district was able to significantly increase participation from 1,008 in FY 2017-18 to 1,725 in FY 2018-19. Staff estimates the district will be able to increase participation to between 2,000 to 2,200 in FY 2019-20, and continue to increase by at least 100 participants in each of the following two years.

The San Joaquin Valley APCD launched their program in July 2015. Since then, participation has varied. After starting with over 500 participants in FY 2014-15, participation declined over the subsequent two years before improving to just over 700 participants in FY 2018-19. Recently, the district was able to increase participation at their traditional bi-weekly Tune-in/Tune-up events by increased outreach and developing a new website which now provides residents the option to apply online.

Staff expects participation to grow modestly in the coming years as more district residents are able to access the program online alongside the continued success of their Tune-in/Tune-up events. Staff estimates there will be between 700 to 900 participants in FY 2019-20 with growth of at least 100 participants in each of the following two years.

The Bay Area AQMD launched their program in May 2019. Based on the similar design of each program, staff expects participation in Bay Area's first full year of implementation to be similar to South Coast AQMD's. As such, staff estimates participation in FY 2019-20 will be between 400 to 600 vehicles with growth of at least 100 cars in each of the following two years. Staff's projected growth is lower than the growth experienced by South Coast at the same stage of their implementation due to the Bay Area having a significantly smaller population living in eligible zip codes.

The Sac Metropolitan AQMD is currently developing their program and expects to launch by late 2019 or early 2020. Once operating, staff expects similar participation to the Bay Area AQMD given that both districts have a similar program design and similar population living in eligible zip codes. Assuming their program will not be operational until six months into the fiscal year, staff estimates between 200 to 250 participants in FY 2019-20. Staff estimates participation will increase between 400 to 600 participants in FY 2020-21, and grow by at least 100 participants in FY 2021-22.

Potential Policy Changes/Adjustments

Over the next three years, staff will continue to monitor program data, market conditions, and communicate with stakeholders to identify any necessary policy changes. In coordination with the Financing Assistance program, staff will be considering how and when to phase out conventional hybrid replacement vehicles to maximize emission benefits and help CARB meet its ZEV deployment goals. Staff will be closely monitoring participation in the new programs in the Bay Area and Sac Metro air district to assess whether it is necessary to adjust the DAC zip code eligibility requirement.

Financing Assistance for Lower-Income Consumers

Table 15 shows staff's projected participation levels in the Financing Assistance program over the next three fiscal years, and the corresponding total funding need for each year. Overall, staff estimates a steady increase in program interest and participation over the coming three years as the program grows statewide. Staff will update these estimates annually through a public process, allowing the opportunity to incorporate new information and to refine our estimates. Rationale for estimates is described in further detail below.

Table 15: Financing Assistance Three-Year Funding Estimates

Financing Assistance for Lower-Income Consumers	FY 19-20	FY 20-21	FY 21-22
Total Estimated Participants	1,200-1,800	2,100-2,800	2,100-4,200
Total Funding (in millions)	$10-$12	$15-$20	$15-$30

Funding Estimate Methodology

To date, $35.9 million has been allocated for both Financing Assistance projects, of which $2.9 million has gone to the local pilot project in the Bay Area ($0.9 million spent) and $23 million to the statewide project ($5 million spent). $10 million from FY 2018-19 remains to be split between the local and statewide project.

Estimates for long-term funding needs were developed based on staff expertise, program administrator input, and data from the local and statewide Financing Assistance pilots. Updates will be made as more data becomes available.

The local Financing Assistance pilot project, demand and processing times are expected to remain approximately consistent with the first three-and-a-half years of program implementation. However, increases in demand may occur because of expansion to additional service counties and increased outreach activities, including the One-Stop-Shop. Funding needs for the statewide project constitute the majority of the 3-year funding projections for Financing Assistance, but the information available for estimating statewide funding needs is still limited. The statewide program launched in June 2018 and was closed after five months due to a high demand of funds.

It is difficult to project beyond the initial five months with accuracy for several reasons. First, the demand spike seen in the initial months of the program could be due to many factors (e.g. outreach). Second, the technology preferences and demographics of participants in the first five months are not necessarily widely representative of future participants. Third, delays in processing as a result of the high demand may have affected the conversion rate (the number of interested applicants that ultimately redeem an incentive).

Staff estimated low and high bounds of funding ranges using a set of assumptions derived from project data and observations from the project administrators. These assumptions include:

- Processing/implementation fees increase proportionally to incentive funds.
- Implementation costs go down somewhat with time as programs scale, but the programs remain resource-intensive.
- The projects receive an increased number of monthly applications over time.

- Conversion rates go up marginally over time due to streamlined processes, improved outreach and education, and greater availability of vehicles in the secondary market.
- The incentive amount (averaged across participants) stays fairly consistent throughout this three-year period, despite changes to incentive amounts.

Factors considered in the bounding scenario are the number of applications received per month, the conversion rate (the ratio of applications to redeemed incentives), the vehicle buy-down incentive amount, the implementation cost factor (percentage based on expected costs for program administrators to process applications), the EVSE incentive amount and conversion rate, and the loan-loss reserve rate (the percentage of each paid incentive that goes to guarantee loan risk for lenders). The high bound scenario is likely, based on observations to date and stakeholder input that low-cost financing addresses a key barrier to clean vehicle adoption and therefore participation in this program could rapidly grow given the existing communication networks in communities.

CARB is implementing changes to the Financing Assistance vehicle buy-down incentive amounts in FY 2019-20, which would affect funding allocations from FY 2017-18 and FY 2018-19 as well as FY 2019-20, FY 2020-21, and FY 2021-22 (see Tables 16, 17, and 18). In conducting the analysis to determine appropriate incentive amounts, staff considered vehicle prices in the used market, affordability for lower-income consumers, and the potential for program alignment. Stakeholder and administrator feedback on program alignment and incentive amounts was solicited through public work groups. Key considerations behind the incentive amount adjustments are the need to increase access to high quality clean vehicles for the lowest-income consumers, a gradual phase out of conventional hybrid technologies to focus on near-zero and zero emission vehicles, and to ensure that incentive funding is spread as far as reasonably possible. Ongoing analysis of the program will be conducted to determine if further adjustments to vehicle incentive amounts are justified so that incentive amounts continually reflect community-identified needs, lessons learned from the local and statewide projects, and stakeholder feedback from public work groups.

Table 16: Incentive Amounts to Date[20]

Income Bracket	Hybrid Electric Vehicle (HEV)	Plug-in Hybrid Electric Vehicle (PHEV)	Battery Electric Vehicle (BEV)*
Less than 400 percent of Federal Poverty Level	$2,500	$5,000	$5,000

*Fuel Cell Electric Vehicles (FCEV) are an eligible vehicle type. To date, the project has not funded enough FCEVs to provide data to include in staff's analysis.

[20] These amounts applied to the implementation years funded by FY 2014-15 and FY 2016-17 funds.

Table 17: Phase 1 – New Vehicle Incentive Amounts for Fiscal Year 2019-20[21]

Income Bracket	HEV	PHEV	BEV
Less than 225 percent of Federal Poverty Level	$2,500	$5,000	$5,000
225 to 400 percent of Federal Poverty Level	$1,500	$4,500	$5,000

Table 18: Phase 2 – New Vehicle Incentive Amounts for Fiscal Year 2020-21[22]

Income Bracket	HEV	PHEV	BEV
Less than 225 percent of Federal Poverty Level	$0	$5,000	$5,000
225 to 400 percent of Federal Poverty Level	$0	$4,000	$4,500

The results of reducing incentive amounts for vehicles (particularly conventional hybrids) and increasing the upper funding limit of the EVSE incentive could have a small effect on overall funding needs, but it is unlikely to be substantial because (1) BEV and PHEVs have been more popular to date and are associated with the higher vehicle buy-down incentive amount, and (2) despite an increased cap on the EVSE incentive, not all EVSE incentives will cost the maximum amount, especially with additional flexibility incorporated into this offering.

These three-year projections are subject to change as more data becomes available, so staff will reevaluate funding needs annually. Staff has determined that projections based on program data are likely to adequately capture the dynamics of this program over the next three fiscal years.

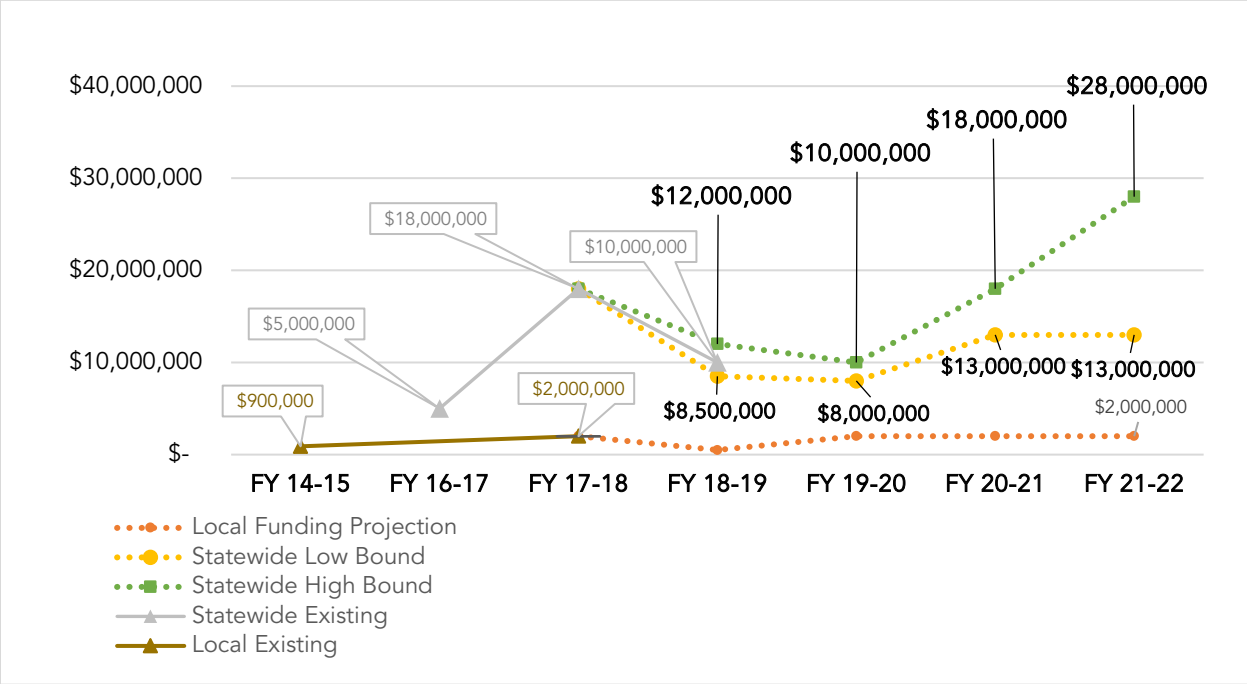
Staff recognizes the need for a secondary market analysis to determine the highest bound for funding based on market demand. At this time, there is not enough in-depth information about the secondary ZEV market to derive accurate predictions from this exercise. Many difficult-to-measure factors, including growing consumer awareness about EVs and the rapidly growing secondary market, could increase demand for this program. When more data become available, a market analysis of new vehicle registrations will consider factors that affect the secondary ZEV market such as vehicle technology type, MSRP, and purchased vs. leased vehicles to determine the number of used ZEVs feasibly available to the lower-income consumers eligible for Financing Assistance. This should provide an upper bound for the highest possible funding amounts the Financing Assistance project could expend in coming

[21] Affects implementation years funded by FY 2017-18 and FY 2018-19 funds.
[22] Subject to change.

years. This information can be used to inform policy and funding decisions moving forward.

In addition, stakeholders and project administrators have maintained that low-cost financing options for vehicle purchases address a key barrier for lower-income consumers to adopt clean, reliable vehicles. Staff believes there will be substantial demand for this type of project in coming years, as seen in Figure 16. Given the rapidly changing transportation landscape, continued funding for Financing Assistance can signal a commitment to clean transportation equity investments for priority populations.

Figure 16: Financing Assistance Projected Funding Needs



Note that the funding needs appears higher in FY 2017-18 because the $20 million allocation was intended to cover two years of implementation. $10 million was allocated for FY 2018-19 to cover one year of implementation.

Proposed Policy Changes/Adjustments

The ability to quickly adapt and make program changes through a public work group process will be critical to the success of this program. As new program data, market information, and new technologies become available, nimble policy adjustments will enable the program to be most effective.

This year, staff evaluated the vehicle incentive amounts for Financing Assistance. For the FY 2019-20 funding cycle, staff proposed adjustments through a public work group process to the Financing Assistance incentive buy-down amounts to ensure accessibility to cleaner vehicles, spread funds further where feasible, and evaluate the

impact of the changes on program participation. The proposed amounts that will be implemented have been vetted through the public work group process.

For FY 2020-21 funding, staff proposes phasing out funding for conventional hybrid vehicles as an eligible vehicle technology to align with California's goal of five million ZEVs on the road by 2030. Stakeholders have emphasized that providing incentives for conventional hybrids makes cleaner and more fuel-efficient technology available to the lowest-income consumers, so a gradual phase-out is imperative. In later years, Financing Assistance may incorporate increased stringency on PHEV range requirements, and may adopt the same PHEV requirements as CVRP to prioritize longer-range PHEVs and contribute to the program alignment effort.

Another issue identified are barriers to accessing charging infrastructure for lower-income consumers. These factors include high contractor costs associated with site evaluation and installation of EVSE, which could justify increasing the upper incentive limit for the EVSE incentive and providing additional flexibility for implementing this incentive as more information becomes available. CARB staff will continue to evaluate the barriers for EVSE for potential adjustments to better meet the needs of lower-income consumers.

Finally, a pilot of the Zero-Emission Assurance Project (ZAP)[23] may be incorporated into the Financing Assistance Program in coming years to help address potential issues with battery degradation and consumer hesitation in battery electric vehicle technologies. This pilot project still needs to be created and developed. Future funding needs will be evaluated and updated in future funding plans.

Clean Mobility Projects

This section describes CARB staffs three-year projection estimates for clean mobility projects. These various projects complement the various vehicle purchase incentives by investing in clean mobility options such as car sharing, bike sharing, van pooling, micro mobility, clean school buses, or a combination of these options that most directly address community identified needs. The following is a list of clean mobility pilot projects:

- Clean Mobility Options
- Clean Mobility in Schools
- Agricultural Worker Vanpools Pilot Project
- Rural School Bus Pilot Project
- Sustainable Transportation Equity Project (New)

[23] The Zero-Emission Assurance Project is mandated by AB 193 (Cervantes, Chapter 363, Statute of 2018).

Clean Mobility Options

Table 19 estimates the projected needs of funding for the three elements of CARB's Clean Mobility Options pilots: the Statewide Administrator, existing local pilot projects, and potential new projects. These estimates take into consideration the variability of projects, existing and future, and allow for flexibility in order to overcome the many barriers in this newer, innovative category of equity investments. Estimates were developed from a combination of data collected, both qualitative and quantitative, and other factors including scalability, sustainability, capacity and resources, and other factors described below. Rationale for estimates is described in further detail below.

Table 19: Clean Mobility Options Three-Year Funding Estimates (in millions)

	FY 19-20	FY 20-21	FY 21-22
Statewide Administrator Potential New Projects	Up to 9	Up to 35	Up to 35
Funding Estimates	$5-$10	$20-$40	$25-$45
Expansion Pilot Project Funding Estimates	$5-$10	$5-$10	$0-$5
Total	**$10-20**	**$25-50**	**$25-50**

Funding Estimate Methodology

The funding estimate methodology process involved the assessment of a variety of project needs and potential policy directions including, but not limited to:

- Predictable and continued funding to support ensuring local planning includes clean mobility for priority populations,
- Opportunities for additional funding for project models showing success,
- Funding to replicate success models in additional communities that have common characteristics as pilot communities,
- Diversified and flexible policies that allow investments to be made in for communities that do community transportation needs assessments,
- Increase access to funding to under-resourced communities, and
- Provide gap funding to existing projects that have experienced delays and could utilize some additional funds to bridge the gap to sustainability.

In addition to acknowledging project needs and policy design, CARB staff based these estimates on data and lessons learned from the various existing projects. Based on these pilot projects and acknowledging the high variability between project designs, staff concluded that a site with approximately three to four electric cars available for car-sharing may cost around $0.6 million to develop and launch for a short period of time (i.e., one to two years of operation and access for residents). This includes all aspects of start-up project costs including staffing, operations, outreach and awareness, vehicle purchasing and maintenance costs, infrastructure permitting and construction, reservation platforms, resources for community based organizations, and other costs unique to shared mobility projects.

As projects become operational, they build up the knowledge of how to develop and implement a project in a certain geographic areas while also identifying potential challenges new projects could face. The knowledge and lessons learned from implementing these projects, including feedback from a wide network of grantees, subgrantees, and users of these projects are as important to developing these funding estimates as quantitative data. These estimates are derived from a combination of the two.

Based on utilizing these various factors, CARB staff is estimating a need for gap funding and potential for project expansion in order to get existing projects to self-sustainability of $5-10 million for FY 2019-20, $5-10 million for FY 2020-21, and $0-5 million for FY 2021-20. Staff expect that the demand will decrease as project grantees implement various innovative strategies to become self-sustainable.

In estimating the funding needs to continue the streamlined funding mechanism currently being developed through the Statewide Administrator for Clean Mobility Options Voucher pilot project, CARB staff analyzed the project criteria that is being developed through the public work group process. This pilot project, being administered by CALSTART, Inc., has been awarded $17 million for this new program from FY 2017-18 funding. This program is in an initial phase of design and development and anticipates launching the streamlined application system in early 2020. The current proposed maximum voucher amount is up to $1 million per project, with the goal is to funding at least 10-15 small-scale clean mobility projects. This project level of $1 million per project takes into consideration the average $0.6 million per site as seen in existing projects. This higher level of funding allows for a wide range of combinations of clean mobility options that best fits the transportation needs of these communities.

Forecasting funding estimates based on the number of projects that this fiscal year could fund will depend on the scale individual projects that are applied for. If all applications ask for the maximum, the project can fund up to nine projects, with the high end of the estimate, $10 million. This estimate also takes in account implementation costs.

Staff will observe the demand during this initial application intake period and if the project becomes oversubscribed, staff may propose more funding for future years.

Potential Policy Changes/Adjustments

Staff proposes doing an initial review of current projects to assess the need and demand for additional funding to ensure projects can continue. As a result of various factors, these projects have taken more time than initially anticipated to develop and launch and may have run out of funds for some components, including implementation and outreach costs. Grantees will need to demonstrate funding needs and provide this information to CARB in order to receive additional funding. Project data, including feedback from vehicle use data, surveys, focus groups and other sources, provide CARB staff with information to make changes that may affect funding needs.

In addition, staff will analyze whether the statewide model being developed to streamline the process to get well needed funds to priority communities and whether this model can expand to fund projects that are larger in scope and size. This analysis would provide additional information to staff to make adjustments to funding estimates in future years.

Clean Mobility in Schools

Table 20 lists three-year estimates for funding the Clean Mobility in Schools pilot project. Estimates take into consideration the variability of projects, existing and future, and allow for flexibility in order to overcome the many barriers in this new and innovative project category of equity investments. Staff will update these estimates annually through a public process, utilizing information from the demand resulting from the first solicitation, while also allowing the opportunity to incorporate new information and to refine these estimates. Rationale for estimates is described in further detail below.

Table 20: Clean Mobility in Schools Three-Year Funding Estimates (in millions)

Project	Funding Estimates		
	FY 19-20	FY 20-21	FY 21-22
Clean Mobility in Schools	$5-10	$5-10	$5-10

Funding Estimate Methodology

The annual funding range represents historical project allocations because there are no data available for the demand, given other projects in the equity category and funding allocations from the Legislature, and staff projections of probable award amounts. These estimates will be refined to reflect actual funding requested once staff reviews applications from the first solicitation in fall 2019.

Potential Policy Changes/Adjustments

Eligible project components may be expanded to include broader range of projects that achieve GHG reductions, if appropriate policy-wise. Staff will also consider transitioning this project to be eligible for, and therefore funded by, AB 617 Community Air Protection Program funds. Assessments of lessons-learned by first grantee(s) will also shape future project adjustments.

Agricultural Worker Vanpools Pilot Project

Table 21 lists the three-year estimates for funding the Agricultural Worker Vanpool pilot project. Estimates take into consideration increase in demand over time and continued project growth, as well as capital and implementation costs. Rationale for estimates is described in further detail below.

Table 21: Agricultural Worker Vanpools Three-Year Funding Estimates (in millions)

Project	Funding Estimates		
	FY 19-20	FY 20-21	FY 21-22
Agricultural Worker Vanpools	$5-6M	$6-16M	$8-23M

Funding Estimate Methodology

The Agricultural Worker Vanpools Pilot Project, administered by the California Vanpool Authority (CalVans), has received $10.7 million in grant funding. The original $6 million project launched in March 2018, and the project expanded in the spring of 2018 through a $4.7 million expansion grant. Actual demand exceeded CARB's previous 3-year funding projection of $9 million, and continued project growth is expected in the next three years. The hybrid vans have proven a desirable mode of transportation for agricultural workers, resulting in a waiting list for vehicle placements, and a sharp increase in demand. Demand projections indicate a steady increase as the project gains visibility and popularity. The funding ranges presented in this three-year estimate cover project capital costs, (e.g., vans and equipment), and project implementation costs, (e.g., vehicle insurance, vehicle maintenance, and vehicle storage outside the growing seasons, etc.). These estimates are extrapolated based on fleet assignments and user data since project deployment, forecasted demand based on CalVans' implementation and outreach activities, stakeholder feedback during CARB's public work group process, and other environmental and social factors as described below:

- Good agricultural economy and favorable water conditions,
- Long distances to agricultural job sites,
- Shortage of domestic farmworkers leading agricultural employers to increasingly rely on the H-2A Guestworker Program to meet agricultural labor needs. Under H-2A, employers must provide workers with transportation services that are approved by the California Employment Development Department (EDD), and
- CalVans is currently the only transportation provider approved by the U.S. Department of Labor for H-2A agricultural workers

Under the current project, 154 hybrid conversion vans are in service, and 111 additional vans will deploy in Spring 2020 under the $4.7 million expansion, for a cumulative total of 265 project vans. CalVans also serves agricultural workers through its existing (non-project) vanpool fleet of approximately 440 gasoline vans. The funding estimates represent vanpool demand by workers living in low-income and disadvantaged communities beyond those workers already served by CalVans project and non-project agricultural vanpool fleet. These projections of funding needs focus on expansion of the cleaner vanpool fleet, not replacement of CalVans existing gasoline vans to hybrid technology.

Funding ranges for each fiscal year are based on a "constrained" estimate representing the lower funding boundary, and an unconstrained estimate representing the higher funding boundary. The constrained estimate incorporates an organizational capacity threshold on labor and administrative resources available to implement the project. The constrained estimate caps the Agricultural Worker Vanpools Pilot Project at 20 percent annual growth. The unconstrained estimate is based on CalVans 2018 fleet allocations and 2019 demand-based van deployments for the spring 2019 harvest season. CalVans agricultural vanpool fleet is currently oversubscribed, and CalVans initiated a waiting list in April 2019 for vans to serve workers living in low-income and disadvantaged communities.

Potential Policy Changes/Adjustments

Staff is not proposing any policy changes to this project and does not foresee any changes in the next three years. Continued use of hybrid conversion technology for agricultural vanpools is expected for the three-year planning horizon. While market advances in battery electric technology continue at a rapid pace, a fully commercialized, zero-emission model van that meets the long-distance range requirements, vehicle performance requirements and passenger/cargo capacity specifications for agricultural vanpools is unlikely. Should zero-emission vans become commercially available that meet project needs, funding estimates would increase by at least one-third given the higher incremental cost of zero-emission technologies.

Rural School Bus Pilot Project

Table 22 lists the three-year estimates for funding the Rural School Bus pilot project. Estimates take into consideration a steady demand for projects over time. Staff will update these estimates annually through a public process, allowing the opportunity to incorporate new information and to refine our estimates. Rationale for estimates is described in further detail below.

Table 22: Rural School Bus Three-Year Funding Estimates (in millions)

Project	Funding Estimates		
	FY 19-20	FY 20-21	FY 21-22
Rural School Bus Pilot Project	$5-60	$5-60	$5-60

Funding Estimate Methodology

The low end of the annual funding range represents historical school bus replacement project allocations under an earlier California Department of Education program, as well as balance with other projects in the equity category and funding allocations from the Legislature. The high end is based on North Coast Unified AQMD's (the current project administrator) outside estimate of capacity to implement the project. The most recent solicitation (conducted in 2018) received applications to replace ~600 school buses, totaling about $200 million, which justifies funding within the estimated

range. Existing school bus inventory indicates need for funds beyond this range. School bus funding would need to $200 million to $480 million (depending on bus size and propulsion type) allocation per year in order to turn over the existing inventory completely within 20 years. Appendix E provides more detail about California's school bus incentive programs.

Potential Policy Changes/Adjustments

CARB needs to analyze grant recipients and those who have not participated, as well as school bus inventory in rural areas, to determine if adjustments are necessary. What would encourage more school districts to participate? Is it ok if some school districts receive repeat funding over multiple years? Should the program transition to zero-emissions only? Monitor market and vehicle pricing to determine if reduced grant amount becomes more appropriate. Incorporate infrastructure analysis and partnerships with CPUC/CEC/utilities to ensure maximum leverage and effectiveness of public funds. Analyze how additional requirements, such as V2G capability, can further influence technology advancement and energy efficiencies. How can we support sharing of best practices, lessons learned, and workforce training amongst ZE school bus owners and operators? As confidence in zero-emission school bus technology grows, this program could transition to voucher-type program, similar to HVIP or VIP.

Sustainable Transportation Equity Project (STEP)

Table 23 lists the three-year estimates for funding the Sustainable Transportation Equity Project (STEP). This new project builds from SB 350 Guidance Document recommendations and related program implementation and will follow a community-based approach to collaboratively identify and address the unique mobility needs of a given community. It will provide a critical example of how clean transportation equity projects can work with local planning and transportation agencies in developing innovative strategies to achieve SB 375 GHG reductions. Estimates are based on the stakeholder feedback received to date, and gauging overall interest in the program in providing additional community solutions to meeting clean transportation and mobility needs across the State. Staff will update these estimates annually through a public process, allowing the opportunity to incorporate new information and to refine our estimates. Rationale for estimates is described in further detail below.

Table 23: STEP Three-Year Funding Estimates (in millions)

Project	Funding Estimates		
	FY 19-20	FY 20-21	FY 21-22
STEP	$20-25	$25-45	$65-110

Funding Estimate Methodology
In an effort to help meet SB 375 GHG emission reduction targets and address key challenges outlined in CARB's 2018 SB 150 Progress Report, CARB staff anticipates the need for this type of project in countless communities throughout the State. During workgroup for this pilot, CARB staff received substantial interest from stakeholders in this pilot project and heard continued support for efforts to take a community-based approach to CARB's transportation and mobility investments.

Staff plans to pilot this project with $20-25 million in FY 2019-20 to fund at minimum one implementation block grant in the first year and $25-45 million in FY 2020-21 to fund one or two additional implementation block grants and before rolling out a larger solicitation with $65-110 million in FY 2021-22 to fund three to five implementation block grants. Each year also includes funding for a series of planning grants.

Funding estimates reflect staff's understanding of the potential uptake for these types of projects; interest expressed by stakeholders, including disadvantaged and low-income communities; and the projected scale of these projects, which staff anticipates to be similar to projects funded by round two of the Transformative Climate Communities program.

Staff expects interest to grow as early funded projects are implemented, and plans to increase the number of implementation block grants available over time in anticipation of the increased readiness of communities to implement projects. Staff is also interested in increasing the availability of implementation block grants over time to pilot implementation projects in different community contexts, accounting for diversity in community size, demographics, density, and geography, among other community characteristics. CARB staff plans to evaluate the success of the pilot project annually and update funding estimates accordingly.

Potential Policy Changes/Adjustments
In future years of the pilot, CARB staff may expand community eligibility to communities that do not contain disadvantaged or low-income communities as identified by AB 1550, but that are in need of investments in transportation and land-use. Focus may include tribal communities and communities that have high vehicle miles traveled per capita.

Outreach Strategies

Historically, transportation investments and plans in California have not always met the needs of low-income communities of color, resulting in racial disparities in transportation-related burdens and benefits.[24] Ensuring equitable investment in disadvantaged communities and amongst priority populations is a high priority for equity projects. As part of CARB's equity funding, an allocation of $7 million is

[24] The Greenlining Institute. (2018) Mobility Equity Framework: How to Make Transportation Work for People. Retrieved from http://greenlining.org on August 1, 2019.

proposed to continue implementation of the recommendations from CARB's SB 350 Guidance Document. CARB's SB 350 priority recommendations focus on strategies, including prioritizing funding for community-based organizations to: 1) ensure meaningful community engagement to better understand transportation needs and gaps, 2) tailor outreach and train local ambassadors to increase awareness of funding programs, 3) provide technical assistance to strengthen partnerships and build capacity to develop sustainable clean mobility projects, and, 4) provide application technical assistance and increase funding accessibility through a streamlined application process.

A key barrier to increasing low-income residents' access to clean transportation is a lack of awareness of clean transportation and mobility options, including rebate and incentive programs. Effective outreach is an essential element to support the successful launch and implementation of equity pilot projects. Of the proposed outreach funding, $5 million is proposed to expand development of the One-Stop-Shop streamlined application for equity projects. The remaining $2 million is proposed to fund outreach to increase awareness of equity projects, support community transportation needs assessments, convene networking sessions to strengthen partnerships and develop community-identified projects, and provide application technical assistance to prospective applicants. All of these elements will ultimately help to increase ZEV adoption by low-income residents through CARB's incentive projects, such as CVRP, CC4A, and Financing Assistance, as well as support development of clean mobility projects, such as Clean Mobility Options and STEP. Outreach funding may be added to existing grant programs conducting technical assistance and outreach, may be administered statewide through a single entity as a new 'technical assistance' project, or a combination of both.

Table 24 lists the three-year estimates for funding outreach projects, including One-Stop-Shop, Community Transportation Needs Assessments, and Technical Assistance. Estimates take into consideration stakeholder feedback received to date, plans for expansion of existing projects, increased community engagement, and overall interest in the programs providing key solutions to meeting clean transportation and mobility needs across the State. Staff will update these estimates annually through a public process, allowing the opportunity to incorporate new information and to refine our estimates. Rationale for estimates is described in further detail below.

Table 24: Outreach Three-Year Funding Estimates (in millions)

	FY 19-20	FY 20-21	FY 21-22
• One-Stop-Shop	$4-6	$6-8	$8-12
• Outreach/Coordination	$1-3	$1-3	$1-3
• Community Transportation Needs Assessments	$1-2	$2-4	$2-4
• Technical Assistance	$.5-1	$1-2	$1-2
Total	**$6.5-12**	**$10-17**	**$12-21**

Funding Estimate Methodology

One-Stop-Shop: Funding scenarios for One-Stop-Shop assume full participation from CARB's Clean Transportation Equity Project program administrators and income verification requirements and processes across all the programs are aligned (within existing regulatory parameters). CARB staff estimates that $4-$6 million in funding would be needed for the first year to extend and build out the pilot project at current funding levels through October 2021. This includes completing the three-year pilot as envisioned in the FY 17-18 grant solicitation, which would include incorporation of CARB's Clean Transportation Equity projects, and positioning the program to serve as a natural runway for expansion. For FY 20-21, staff estimates a funding need of $6-$8 million, which includes additional capacity described in the FY 19-20 funding estimate and full operation of all key features, functionality, and outreach activities. In addition, staff estimate a funding need of $8-$12 million for FY 21-22 for full operation of all key features, functionality, and outreach activities and statewide campaign to the general public and expanded functionality in the high scenario.

Outreach/Coordination: The SB 350 Outreach Roadmap recommends strategies for increased coordination, streamlining and tailored delivery of outreach on LCTI programs. Based on other similar contracts for California Climate Investments outreach, CARB staff estimates that $1-$3 million in funding would be needed per year for the next three years.

Community Transportation Needs Assessments: Based on similar costs for transportation needs assessments conducted within specific California communities over the past year, CARB staff estimates that $1-2 million in funding would be needed in the first year to develop a community needs assessment toolkit and provide funding to local and community-based organizations to conduct the assessments. Staff estimates that this amount could fund transportation needs assessments for 10-20 communities. Based on the success of the initial year, and anticipated increases in needs assessments for future project funding, second and third year funding would increase to $2-4 million.

Technical Assistance: Based on similar costs for LCTI technical assistance contracted through the California Strategic Growth Council, CARB staff estimates that $.5-1 million in funding would be needed in the first year to fund additional resource

development in the form of a Technical Assistance Toolkit, as well as technical assistance by community-based organizations in 10-20 communities. For second and third years, it's anticipated this funding amount would double to $1-2 million annually, with most funding allocated to community-based organizations to conduct the technical assistance.

Potential Policy Changes/Adjustments
Because this is the first year CARB staff is proposing a separate line item for outreach, CARB staff will evaluate each of the program's success as a pilot outreach program and make policy adjustments, as needed, going forward.

Clean Transportation Equity Long-Term Funding Need Conclusions

CARB staff will continue to work with project administrators and stakeholders as part of the three-year funding projection process to collect critical data as it becomes available, to refine funding estimates for clean mobility equity investments, as well as the approach for projections as a whole. Funding needs will consider the ultimate goals of project sustainability and maximizing access to clean transportation and mobility options across the State. Future estimate methods are anticipated to include data derived from project implementation, consider technological advancement, the breadth of community impact and involvement, and complementary efforts in California and across the world. CARB staff want to work with communities and stakeholders to develop a methodology for assessing future project needs as they are refined and mature, as well as potential adjustments to provide intended benefits and maximize opportunities in transitioning to a zero-emission economy. Critical lessons learned will be applied to our analysis to better understand the needs of communities and how to address them in a strategic way. Table 25 summarizes the overall three-year funding estimates for the clean transportation equity investments.

Table 25: Summary of Clean Transportation Equity Investments Three-Year Funding Estimates (in millions)

Projects	FY 19-20	FY 20-21	FY 21-22
Clean Cars 4 All	$30-35*	$35-$41*	$38-45
Financing Assistance for Lower-Income Consumers	$10-12	$15-$20	$15-30
Clean Mobility Options	$10–20	$25–50	$25–50
Clean Mobility in Schools	$5-10	$5-10	$5-10
Agricultural Worker Vanpools	$5-6	$6-16	$8-23
Rural School Bus Pilot Project	$5-60	$5-60	$5-60
STEP	$20-25	$25-45	$65-110
Outreach	$6.5-12	$10-17	$12-21
Totals	$90-180	$125-260	$175-350

**For Clean Cars 4 All, all of FY 2019-20 funding need and some of FY 2020-21 needs can be met with funding allocated from previous budget cycles.*