CALIFORNIA ENERGY COMMISSION

California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

Monterey Bay EV Acceleration Project

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- The Monterey Bay Plug-In Electric Vehicle (PEV) Readiness Plan as part of CEC grant ARV-11-003, 2012-2014
- The Monterey Bay Alternative Fuel Readiness Plan, CEC grant ARV-13-016, 2014-2016
- The Monterey Bay Electric Vehicle (EV) Acceleration Project, CEC grant ARV-16-016, 2017-2019

These grants have been instrumental to the successful implementation of light-duty electric vehicle adoption, the electrification of school bus fleets and the large-scale implementation of level 2 and DC fast charge electric vehicle charging infrastructure in the Monterey Bay Region.

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PREFACE

Assembly Bill (AB) 118 (Nùñez, Chapter 750, Statutes of 2007), created the Clean Transportation Program (also known as the Alternative and Renewable Fuel and Vehicle Technology Program). The statute authorizes the California Energy Commission (Energy Commission) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. AB 8 (Perea, Chapter 401, Statutes of 2013) re-authorizes the Clean Transportation Program through January 1, 2024, and specifies that the Energy Commission allocate up to $20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of approximately $100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance, and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and non-road vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the Energy Commission's Clean Transportation Program Investment Plan, updated annually. The Energy Commission issued grant funding opportunity GFO-16-601 under the Clean Transportation Program to fund projects that will support new and existing planning efforts for zero-emission vehicles (battery-electric vehicles and hydrogen fuel cell electric vehicles, and including plug-in hybrid electric vehicles). In response to GFO-16-601, the Monterey Bay Air Resources District submitted application #4, which was proposed for funding in the Energy Commission's Notice of Proposed Awards dated January 12, 2016, and the agreement was executed as ARV-16-016 on July 19, 2017.

ABSTRACT

The challenge to be addressed by the Monterey Bay EV Acceleration Project is the slow uptake of plug-in electric vehicles (PEVs) in the Monterey Bay region, including medium- and heavy-duty e-buses and e-trucks. This challenge is due largely to a high initial purchase price of EVs, limited range, limited consumer awareness, inconvenient and limited public EV charging and limited availability of models in key vehicle segments including trucks and buses. The purpose of this project is to significantly accelerate EV uptake by incorporating several new market and technology factors with timely regional and state investments.

New market factors include:

- Introduction of mass-market-priced battery electric vehicles (BEVs) with over 200 miles of range e.g., Chevy Bolt, Tesla Model 3, Hyundai Kona and Kia Niro
- Imminent introduction of long-range battery electric trucks and buses within the medium to heavy-duty transportation sector.
- Gradual deployment of new fast charging technologies at the 150KW+ level, which will significantly improve charging convenience and effective driving range

The Monterey Bay E-Fleet Accelerator Project team will leverage these trends by:

- Increasing PEV awareness especially via ride and drive events
- Aligning regional investment in charging networks with emerging fleet needs
- The comprehensive electrification of passenger and goods movement in the medium and heavy-duty fleets
- Providing support to larger cities for adoption of building codes mandating electric vehicle supply equipment (EVSE) stub-outs to enable inexpensive future growth in charging infrastructure in commercial and residential buildings.

Keywords: California Energy Commission, Electric Vehicles, Fleets, Electrification, Infrastructure, Monterey Bay Air Resources District

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TABLE OF CONTENTS

Page

Acknowledgements i

Preface ii

Abstract iii

Table of Contents iv

List of Figures v

List of Tables vi

Executive Summary 1

CHAPTER 1: The EV Ride and Drive Experience 2

EV Incentive Programs 2

Monterey Bay Air Resources District EV Test Drive Campaign 4

CHAPTER 2: EV Infrastructure 11

MBARD Plug-In Monterey Bay EV Infrastructure Installation Program 11

Camp Roberts Safety Roadside Rest Area Solar Powered DCFC Stations 15

CHAPTER 3: The EV Reach Codes Model 19

California Green Building Standards and the Reach Codes 19

Reach Code Presentations to Key Municipalities 20

The EV Infrastructure Reach Code Model 22

CHAPTER 4: The E-Fleet Accelerator 25

E-Fleet Accelerator Approach and Results 25

Fleet Outreach 25

Presentations 26

School Bus Fleets 26

Transit and Paratransit 28

Goods Movement 29

Local Governments 29

E-Fleet Transition Plans 30

CHAPTER 5: Observations, Recommendations and Conclusions 34

Observations 34

Recommendations and Conclusions 35

APPENDIX A: EV Ride and Drive Event Campaign Survey Results 37

APPENDIX B: Funding Opportunities and Fleet Sheet 46

APPENDIX C: Potential Fleets for Electrification in Monterey Bay 51

LIST OF FIGURES

Page

Figure 1: CVRP Dashboard total rebate number and incentive $$ 2
Figure 2: MBARD EV Incentive Program totals 3
Figure 3: MBARD EV Demand 3
Figure 4: MBARD EV Ride and Drive Event 2 NDEW 5
Figure 5: MBARD EV Ride and Drive Event 2 NDEW 5
Figure 6: Monterey Bay Clean Air Fair, Ride and Drive Queue, Event 1 6
Figure 7: Monterey Bay Clean Air Fair, Event 1 7
Figure 8: City of Salinas, Event 3 8
Figure 9: City of Salinas, Event 3 9
Figure 10: San Benito County LTA, Event 4 10
Figure 11: San Benito County LTA, Event 4 10
Figure 12: Prundale DCFC Complex 12
Figure 13: Prundale DCFC Complex Metrics, as of September 2019 13
Figure 14: 1 of 4 Workplace Sites, Plantronics, Santa Cruz 13
Figure 15: 1 of 5 Destination Sites, Sunset Center, Carmel 14
Figure 16: 1 of 7 MUD Sites, Laurel Tree Apts., Salinas 14
Figure 17: Camp Roberts DCFC North and South Locations 16
Figure 18: Envision Solar, San Diego Facility, EV ARC™ 2020 Final Assembly 17
Figure 19: Camp Roberts South SRRA, EV ARC™ 2020 18
Figure 20: EV Infrastructure Code Outreach Locations in the Monterey Bay Region 21
Figure 21: EV Infrastructure Code Resources Tool-kit 24
Figure 22: School Fleets – Sample Slides 27
Figure 23: Gonzales USD – E-Lion Type C, 71 passenger 28
Figure 24: Transit and Paratransit – Sample OEM Information 28
Figure 25: Goods Movement – Sample Slides 29
Figure 26: Local Government – Sample Slides 30
Figure 27: E-Fleet Transition Plan Example – EV-Friendly Route Identification 31
Participant Demographics 37

LIST OF TABLES

Page

Table 1: Test Drive Tally 4
Table 2: Chargepoint Level 2 Metrics, as of October 2019 15
Table 3: EV Infrastructure Code Outreach Summary in the Monterey Bay Region 21
Table 4: E-Fleet Transition Plan Example – Vehicle Prioritization 31
Table 5: Sites Identified for EVSE Deployment in Support of E-Fleet Transition Plans 32
Electric Vehicle Funding Opportunities 46
Fleet Sheet 48

Note: If needed, insert a blank page so that Executive Summary begins on the right.

EXECUTIVE SUMMARY

In January 2017, the CEC awarded funding to the Monterey Bay Air Resources District (MBARD) to conduct electric vehicle and infrastructure implementation activities based upon key recommendations identified in the 2013 Plug-in Electric Vehicle Readiness Plan for Monterey, Santa Cruz, and San Benito Counties. Project tasks were scoped to enable increased all-electric travel in the region and accelerate the adoption of electric vehicles among consumers and fleets.

The goals of the Monterey Bay EV Acceleration Project are to:

1) Promote consumer awareness and adoption of PEVs

2) Develop a public charge network enabling convenient all-electric travel region-wide

3) Develop pre-wiring mandates for EVSE stub-outs above CalGreen minimums

4) Promote fleet adoption of PEVs and electrification of transit and goods movement. Anticipated actions to promote these goals include but are not limited to:

- Providing PEV-focused green car shows and "ride and drive" events.
- Providing site assessment and site coordination to expand the Monterey Bay EV charging network to help meet charging needs of light-, medium-, & heavy-duty vehicles.
- Assisting key cities to develop and adopt upgraded building codes to require expanded EVSE stub-outs in existing and new construction.
- Developing fleet electrification plans and EVSE siting plans.

The objectives of the Project are to:

- Provide enhanced PEV awareness and adoption by means of PEV-focused events (at a minimum, 4 events with more than 3,000 participants, including over 600 PEV Ride and Drive participants).
- Provide expanded regional charging infrastructure site assessments (at a minimum, 40 new EVSE ports serving light-duty fleet vehicles, as well as medium- and heavy-duty e-buses and e-trucks where feasible and appropriate).
- Assist the cities of Salinas, Monterey, & Santa Cruz to develop and adopt upgraded building codes requiring expanded EVSE stub-outs in new residential and commercial construction and major remodels.
- Develop fleet vehicle electrification plans (at minimum 10 major fleets).
- Develop fleet EVSE siting plans (at minimum 10 major fleets).

CHAPTER 1:
The EV Ride and Drive Experience

EV Incentive Programs

Since 2011, the state of California has implemented a large scale statewide incentive program for the purchase of a wide spectrum of electric vehicles. The Clean Vehicle Rebate Program (CVRP) administered by the Center for Sustainable Energy, San Diego (CSE), has incentivized the purchase of over half of the total amount of electric vehicles registered in the state:

Figure 1: CVRP Dashboard total rebate number and incentive $$

CALIFORNIA AIR RESOURCES BOARD

Center for Sustainable Energy

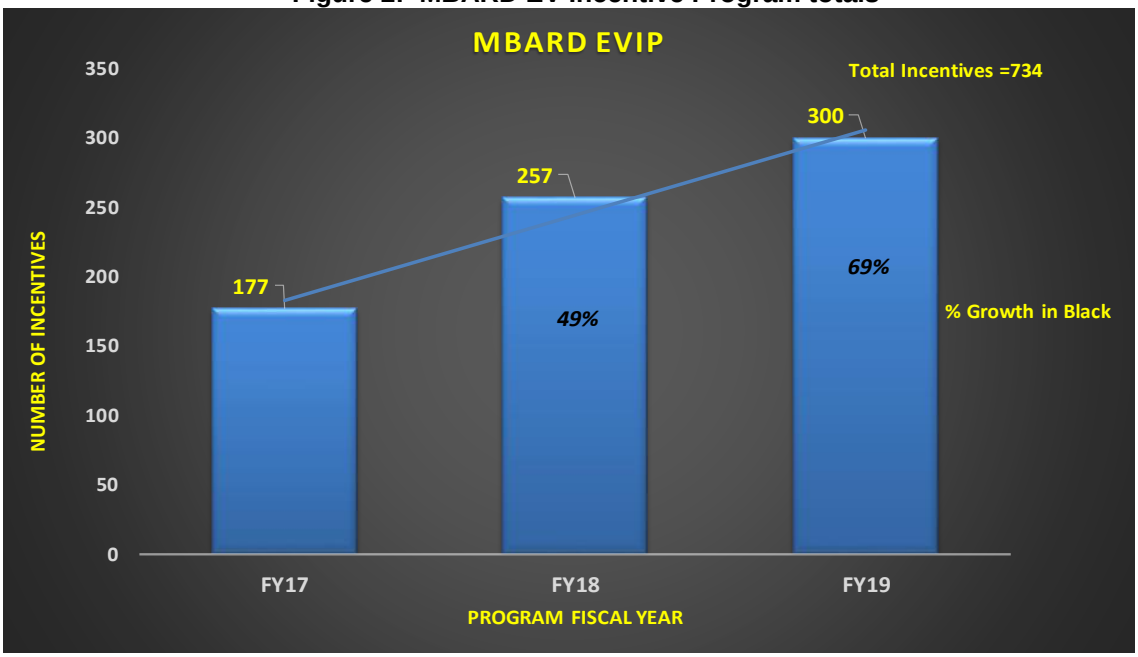
Rebates & Rebate Funding Issued or Approved to Date [1] (Life of Project)		
	Rebates	Funding
PHEV	123,258	$197,496,812
BEV	208,840	$540,938,898
FCEV	6,123	$31,287,168
Other	1,009	$1,882,350
Grand Total	339,230	$771,605,228

Rebates & Rebate Funding Issued or Approved to Date [1] (Filtered)		
	Rebates	Funding
PHEV	123,258	$197,496,812
BEV	208,840	$540,938,898
FCEV	6,123	$31,287,168
Other	1,009	$1,882,350
Filtered Total	339,230	$771,605,228

Source: CVRP website dashboard

Other incentive programs add further value to the potential EV buyer. MBARD launched an EV incentive program using AB2766 funds that is essentially a stackable incentive program to the CVRP. Initiated in FY 2017, the Monterey Bay Electric Vehicle Incentive Program (MBeVIP) has incentivized the purchase of over 700 electric vehicles.

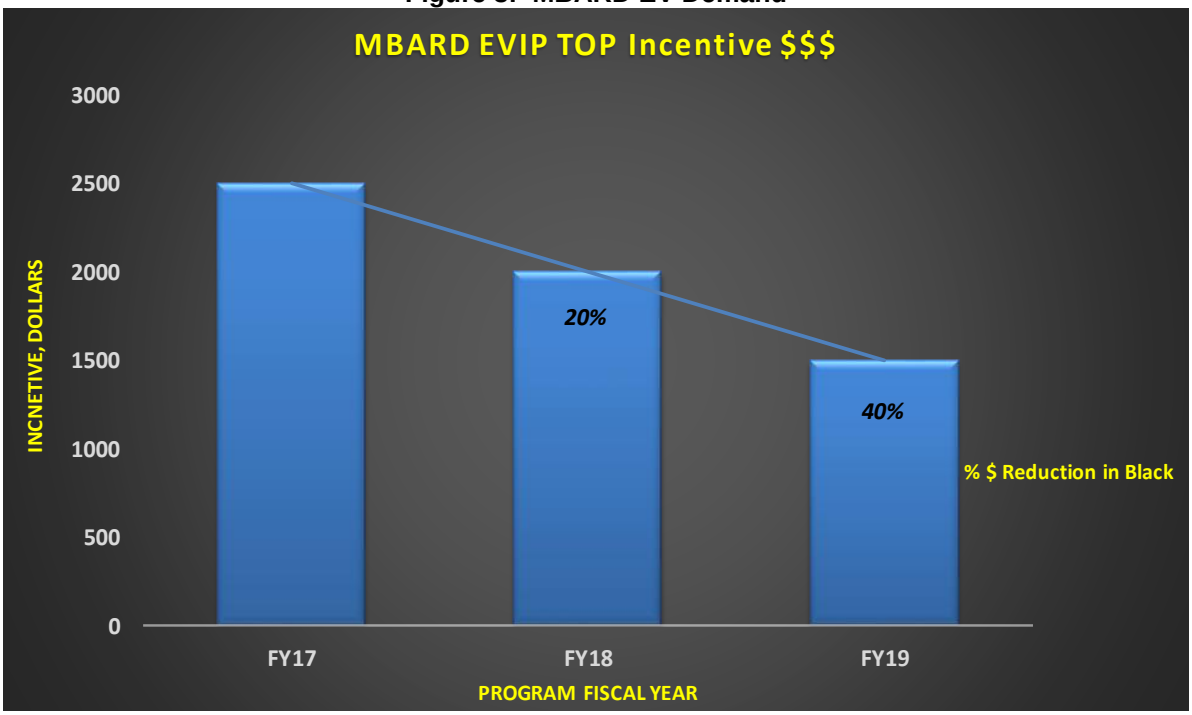
Figure 2: MBARD EV Incentive Program totals



Source: MBARD

To further illustrate the incentive power of cash rebates for EV purchase, MBARD continually lowered the available local incentive amounts with no negative affect on demand (see figure 3 below). Instead, EV demand actually increased as indicated in figure 2. MBARD has also offered incentives for used EVs over the last 3 incentive cycles.

Figure 3: MBARD EV Demand



Source: MBARD

Local residents within the air district are also able to stack a cash incentive from the local utility, PG&E. https://energyinsight.secure.force.com/cleanfuelrebateapplication/?_ga=2.143393077.1263596758.1572469102-474831956.1570732302

Monterey Bay Air Resources District EV Test Drive Campaign

Leveraging on the success of the EV incentive program, MBARD launched a plug-in electric vehicle test drive campaign, which consisted of four test drive events held from July 2018 to January 2019. The event locales were a mixture of public and workplace events that provided Monterey County residents the opportunity to learn about the latest PEV technology in an environment that combined the in-depth knowledge and enthusiasm of EV owners with a no-pressure sales environment. Each event was professionally produced by REACH Strategies, a firm specializing in EV consumer awareness and market acceleration.

Events were held across the Monterey Bay region to ensure the campaign reached as many residents as possible. Hosts included the Monterey Bay Community Power Clean Air Fair, a National Drive Electric Week event at the MBARD office, the EV day in Salinas, and the San Benito Council of County Governments Office.

Each test drive event was tailored to the specific needs of the location and host to ensure attendees had an enjoyable and safe experience. Ride and drives featured a wide range of vehicles from Tesla, Ford, BMW, Chevrolet, Nissan, Toyota, and Fiat Chrysler, among others. Electric buses, e-bikes, electric motorcycles, and other modes of sustainable transportation were also featured. Survey data from these events showed that these learning experiences increased consumer enthusiasm for PEVs and resulted in additional PEV sales.

Over the course of the campaign, 290 test drives were conducted with a total of 502 participants (including participant drivers and participant passengers). **Trailing surveys administered six months after the events showed participants subsequent behavior included: visiting dealerships, researching PEVs online, speaking with family and friends about the vehicles. Most importantly, 38% ultimately purchased or leased a vehicle within six months after the events.** These outcomes convey the importance of these events and demonstrate why MBARD is committed to providing ongoing direct-to-consumer EV awareness throughout the region. Full survey results can be found in Appendix B of this report.

Table 1: Test Drive Tally

Event	Test Drives	Passengers	Total
Monterey Clean Air Fair	89	110	**199**
National Drive Electric Week	70	31	**101**
EV Day in Salinas	114	61	**175**
San Benito Council of County Governments	17	10	**27**
Totals	**290**	**212**	**502**

Source: Reach Strategies

Figure 4: MBARD EV Ride and Drive Event 2 NDEW

Source: Reach Strategies

Figure 5: MBARD EV Ride and Drive Event 2 NDEW

Source: Reach Strategies

Figure 6: Monterey Bay Clean Air Fair, Ride and Drive Queue, Event 1

Source: Reach Strategies

Figure 7: Monterey Bay Clean Air Fair, Event 1

Source: Reach Strategies

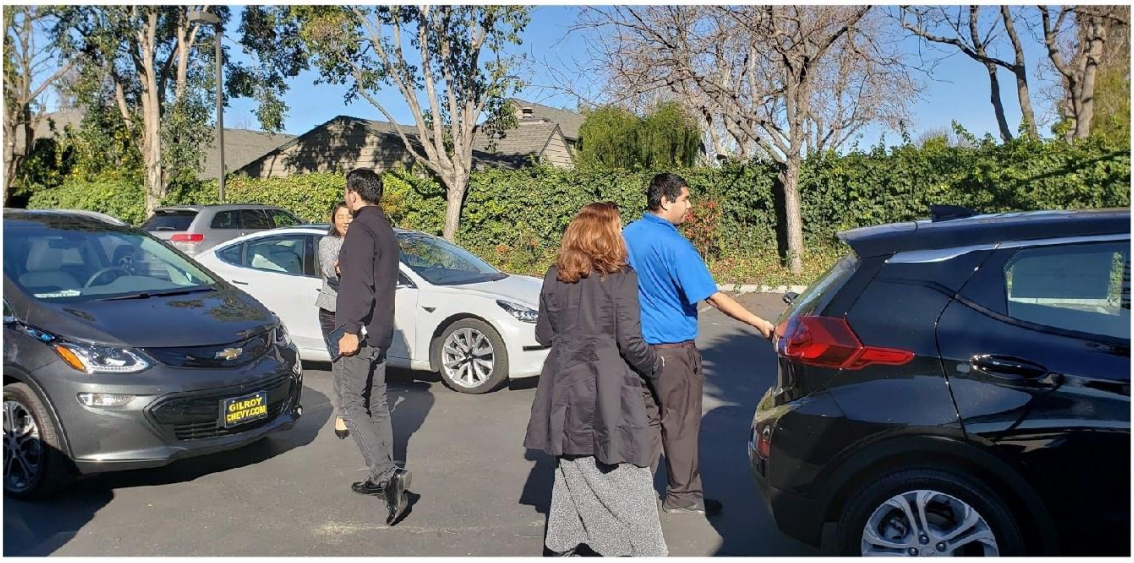
Figure 8: City of Salinas, Event 3

Source: Reach Strategies

Figure 9: City of Salinas, Event 3

Source: MBARD

Figure 10: San Benito County LTA, Event 4



Source: Reach Strategies

Figure 11: San Benito County LTA, Event 4

Source: Reach Strategies

CHAPTER 2:
EV Infrastructure

MBARD Plug-In Monterey Bay EV Infrastructure Installation Program

On October 8, 2015 Governor Brown signed into law SB513 (Beall), which became effective on January 1, 2016. The bill allowed air districts with an authorized AB923 program to collect a two-dollar fee pursuant to CA Health and Safety Code §44229 to be additionally used for: "*The funding of alternative fuel and electrical infrastructure projects solicited and selected through a competitive bid process*"[1]

A request for proposal (RFP) was issued by MBARD in March, 2016 which solicited a five-year agreement to deploy electric vehicle (EV) infrastructure subject to MBARD annual review. For year-one of the program, MBARD selected Recargo Inc. to perform DCFC EV infrastructure installation along the Highway 101 corridor and ChargePoint Inc. to install Level 2 EV infrastructure in workplace, destination and multiple unit dwelling (MUD) locations all within District boundaries. In January, 2017 MBARD executed professional service agreements to Recargo Inc. and Chargepoint Inc. to install EV infrastructure, respectively:

- A DCFC complex to be built by Recargo Inc. located at the Highway 101 and 156 inter-section on the Prunedale Shopping Center property. The design incorporated six 200kW stations with both CHAdeMO and SAE CCS plugs including a 600kW system for energy storage
- 40 dual port Level 2 networked charge stations to be deployed by Chargepoint Inc. at select workplace, destination and MUD locations

Both of the year-one contracts were completed with successful launch and operational deployments:

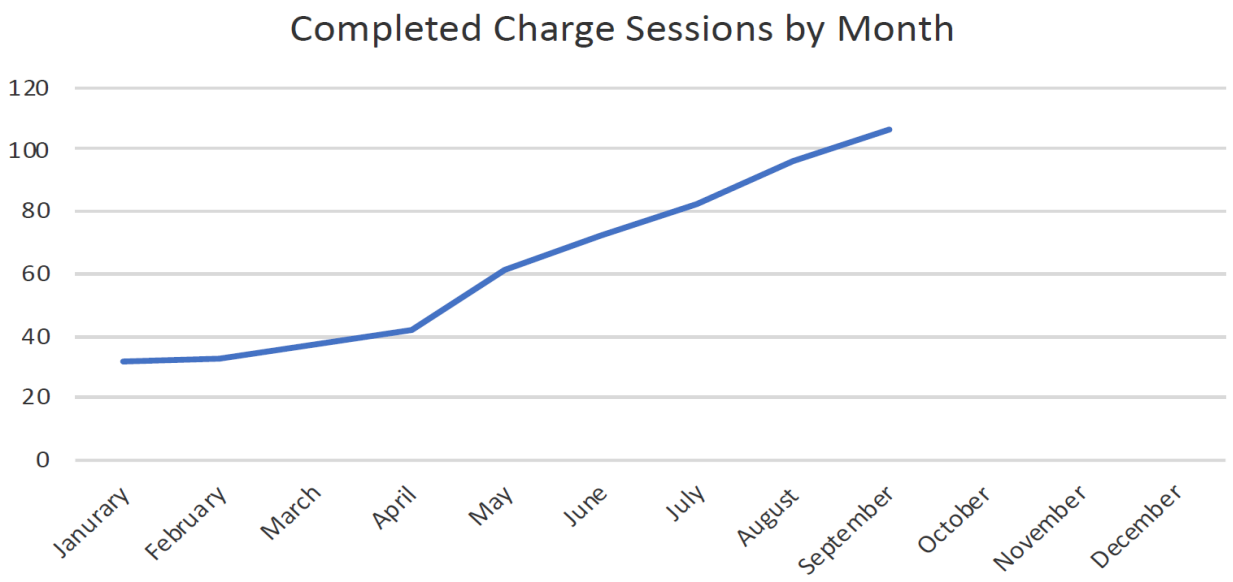
- The Prunedale complex has been continually operating since December 2018 and was the first operational high power DC fast charge station in the United States (before any Electrify America™ stations were activated).

1 2019 CA Health and Safety Code, §44229.6, p 336

Figure 12: Prundale DCFC Complex

Source: MBARD

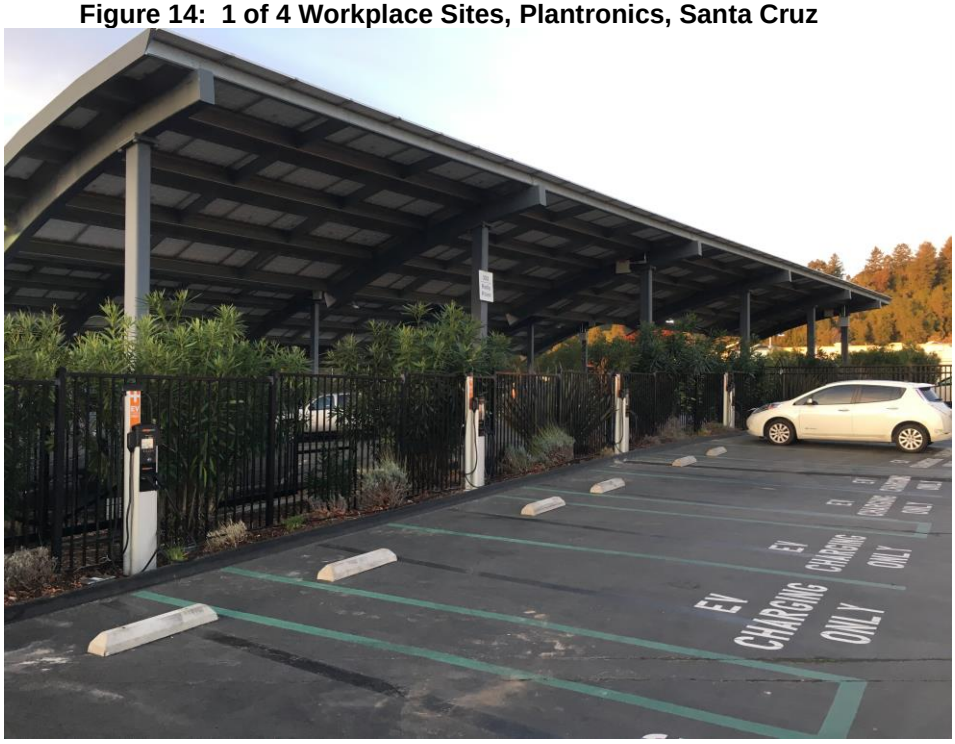
Figure 13: Prundale DCFC Complex Metrics, as of September 2019



Source: Recargo

40 Level 2 charging stations, 80 total ports, were installed and activated at 16 sites throughout the Monterey Bay Air District.

Figure 14: 1 of 4 Workplace Sites, Plantronics, Santa Cruz



Source: Chargepoint Inc.

Figure 15: 1 of 5 Destination Sites, Sunset Center, Carmel

Source: Chargepoint Inc.

Figure 16: 1 of 7 MUD Sites, Laurel Tree Apts., Salinas

Source: Chargepoint Inc.

Table 2: Chargepoint Level 2 Metrics, as of October 2019

	# of Sites	Avg Sessions/Month	Avg kWh/Month
Workplace	4	116	4,926
MUD	7	11	116
Destination	5	136	4,490

Source: Chargepoint Inc

Camp Roberts Safety Roadside Rest Area Solar Powered DCFC Stations

In March, 2012 Governor Brown issued Executive Order B-16-2012 which called for the expansion of the entire California EV fleet to 1.5 M vehicles by the year 2025. The Executive Order also directed state entities to facilitate rapid commercialization of zero-emission vehicles. EV fleet purchase targets were established at 10 percent by 2015 and 25 percent by 2020 during the normal course of agency fleet replacement. In order to support the Executive Order, a statewide contract was developed for electric vehicle charging stations to accommodate the increasing numbers of ZEVs in the state's fleet.

The updated 2016 ZEV Action Plan from the Office of the Governor outlines progress to date and identifies new actions state agencies will take in continued pursuit of the milestones in the Governor's Executive Order. CA Department of Transportation (Caltrans) was designated as the lead agency to install public DC fast chargers at a minimum of 30 locations, including highway rest stops and other strategically located Caltrans properties.[2]

After negotiations with Caltrans District 5, MBARD executed a professional service agreement in April, 2018 to Envision Solar, San Diego, for EV infrastructure installation via the Plug-In Monterey Bay Program. The $1.3 M contract was for the design, build and installation of two off-grid solar powered 50kW charge stations. Selected Caltrans District 5 locations were the north and south Camp Roberts safety roadside rest areas (SRRAs) located on Highway 101 in Monterey County.

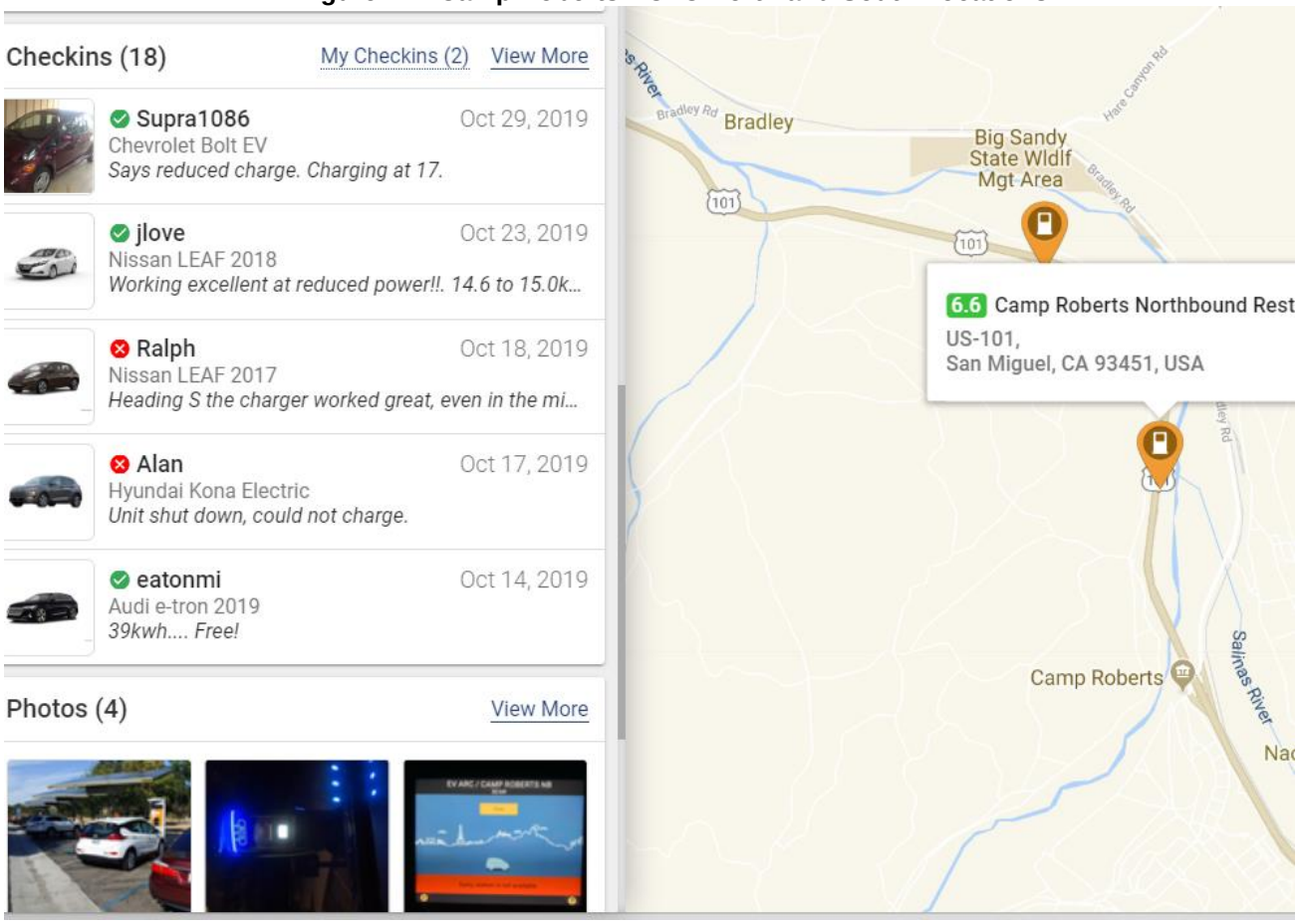
The design was based on the existing Envision Solar EV ARC™ platform. Four EV ARC™ arrays were daisy chained to a Chargepoint CP250 50kW dual charge port to accommodate both CHAdeMO and CCS connector protocols. Control electronics and battery configuration were re-designed for a 50kW output. Both systems were installed and were operational on September 20, 2019.

These systems are the first solar powered DCFC charge stations installed on a major roadway corridor anywhere in the United States. Envision Solar has branded this system and introduced it into their

2 Office of the Governor, 2016 ZEV Action Plan, p 27

product line as the EV ARC™ 2020. Caltrans District 5 intends to add two more to the SRRAs located in their jurisdiction at East Highway 46 at Shandon, CA in San Luis Obispo County. The local air district, San Luis Obispo APCD, will participate in funding the project. In retrospect, the Camp Roberts SRRA project scope and timeline were very challenging but the ability of MBARD, District 5 and Envision Solar to collaborate effectively as private and public entities is worthy of mention. The collaborative process and the end product have tremendous potential for becoming a value-added model for future siting of EV charging infrastructure at state-owned facilities.

Figure 17: Camp Roberts DCFC North and South Locations



Source: Plugshare website, https://www.plugshare.com/location/207881

Figure 18: Envision Solar, San Diego Facility, EV ARC™ 2020 Final Assembly

Source: Envision Solar

Figure 19: Camp Roberts South SRRA, EV ARC™ 2020

Source: MBARD

CHAPTER 3:
The EV Reach Codes Model

California Green Building Standards and the Reach Codes

Transportation is the largest source of greenhouse gas emissions in California. To promote the adoption of Zero Emission Vehicles, the CEC has made efforts to increase the infrastructure that is essential to charging EVs. One strategy the CEC is pursuing is to encourage and assist local jurisdictions in adopting ordinances that go beyond what is already required in the California Green Building Standards (CALGreen) regarding EV charging infrastructure. These additional requirements are typically referred to as "Reach Codes."

In general, the Reach Codes make the voluntary sections of the code mandatory, require modifications to the electrical service to include allowances for future charging stations, and require the installation of conduit in parking lots to allow for future installation of charging stations.

An additional benefit of the Reach Codes is that they would require that EV Ready spaces meet accessibility requirements to the extent required by state law.

EV adoption is growing and the cost of ownership is typically less than that of a comparable gas vehicle, especially if a used EV is purchased. If the price of gasoline rises, the cost of EV ownership will, by comparison, be even more attractive. This natural adoption of EVs can be accelerated by any municipality and can spread to low income residents through agency programs. As adoption increases, the demand for charging stations is expected to increase drastically. Any infrastructure required by code is likely to be utilized as California transitions to five million electric vehicles by 2030.3

The burden placed on developers by Reach Codes does not seem unmanageable or overly costly. The Reach Codes will save building owners and developers money in the long run; as the demand for EV charging infrastructure increases, there is no need to go back and retrofit conduit and panel capacity when EV charging stations are installed in the future.

The adoption of Reach Codes will have no direct financial impact to the municipality and should have a relatively minor impact to the developments that are required to comply with the ordinance. The burden is slight enough that developers will likely still pursue projects.

3 Former Governor Edmund G. Brown Jr. Executive Order B-48-18 set the goal of 5 million zero-emission vehicles on California's roads by 2030.

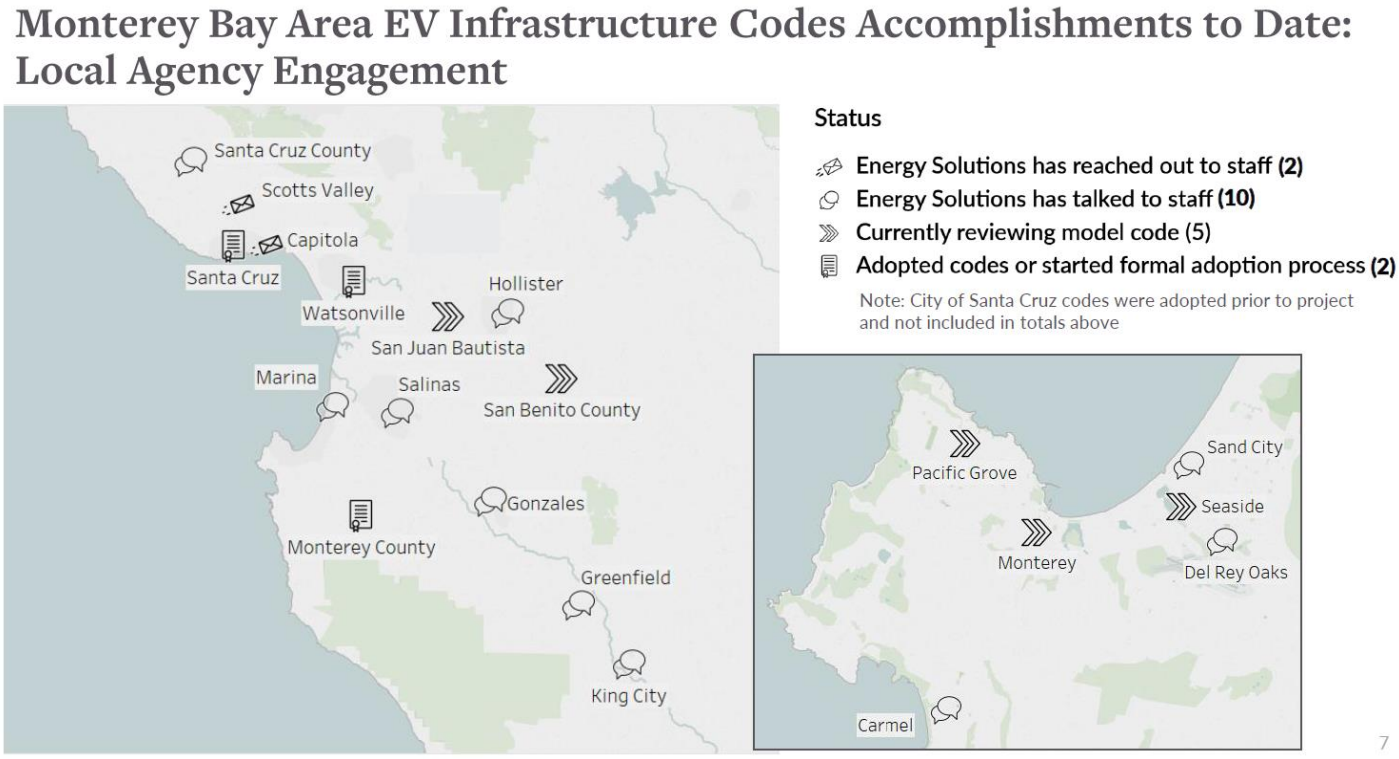
Reach Code Presentations to Key Municipalities

MBARD contracted with Energy Solutions to support local governments in the Monterey Bay region who are interested in adopting local Plug-In Electric Vehicle (PEV) ready building codes. Energy Solutions, a consulting company in Oakland, CA, has worked extensively on local PEV infrastructure building codes. This work has included cost-effectiveness modeling, developing code options and language, preparing sample staff reports, training agency staff, and providing public outreach materials. Energy Solutions provided brief overviews of code adoption examples and options, and summarized the resources available to local governments.

Services provided under the contract with Energy Solutions included the following:

- Presenting at in-person meetings with policy-makers about PEV ready building codes.
- Providing information about opportunities to adopt local government enhancements based on codes adopted in other cities
- Providing jurisdictions with a Model Code Adoption Package to help facilitate code adoption.
- Responding to inquiries from local government staff to support code adoption by elected officials.
- Using the CalGreen PEV Infrastructure Cost-Effectiveness Model to demonstrate the costs and benefits of the model code option for jurisdictions.
- Providing findings to use when submitting the codes to the California Building Standards Commission for acceptance as local government code amendments.

Figure 20: EV Infrastructure Code Outreach Locations in the Monterey Bay Region



Source: Energy Solutions

Table 3: EV Infrastructure Code Outreach Summary in the Monterey Bay Region

Summary of Outreach Efforts (November 2017 thru March 2019)	
Number of in-person meetings we held	8
Number of phone meetings we held	28
Number of different jurisdictions we talked to	18
Number of different stakeholders we talked to	41**

** Note: some meetings involved multiple stakeholders from the same jurisdiction.

Source: Energy Solutions

The EV Infrastructure Reach Code Model

Definitions:

"EV Capable" refers to a parking space with conduit installed and allocated 208/240V, 40-amp panel capacity for a future electric vehicle charging station.

"EV Ready" refers to a parking space served by a full circuit with 208/240V, 40-amp capacity including panel capacity, conduit, wiring, receptacle, and overprotection devices, with an endpoint near the parking space.

"EVCS" means electric vehicle charging station as defined in the California Code of Regulations, Title 24 Chapter 11B.

Table 4: Electric Vehicle Requirements by Project Type

Project Type	Project Requirements
Single Family New Construction	Comply with CALGreen Measure A4.106.8.1.
Single Family Additions and Alterations	If the project will modify the main electrical service panel, remove more than 50% of the exterior walls, or add more than 500 square feet of living space, comply with CALGreen Measure A4.106.8.1.
Multifamily New Construction	For projects with 2-10 onsite parking spaces, build 2 parking spaces to be EV Ready and build the remaining spaces to be EV Capable. [1] OR For projects with greater than 10 onsite parking spaces, build 10% of spaces to be EV Ready and build the remaining spaces to be EV Capable. [1]
Multifamily Additions and Alterations	If the service panel is modified, add capacity to serve 208/240V 40-amp circuits for 20% of parking spaces. If more than 25% of the parking lot surface is modified, all modified parking spaces must be EV Ready up to 10% of the total number of post-project parking spaces and the remainder of modified parking spaces must be EV Capable. Where existing electrical service will not be upgraded in the existing project scope, designate electrical panel capacity to the maximum extent that does not require an upgrade to existing electrical service.
Commercial New Construction	For projects with 2-10 onsite parking spaces, build 2 parking spaces to be EV Ready and build the remaining spaces to be EV Capable. [1] OR For projects with greater than 10 onsite parking spaces, build 10% of spaces to be EV Ready and build the remaining spaces to be EV Capable. [1]
Commercial Additions and Alterations	If the main electrical service panel is modified, add capacity for 20% of parking spaces. If more than 25% of the parking lot surface is modified, all modified parking spaces must be EV Ready up to 10% of the total number of post-project parking spaces and the remainder of modified parking spaces must be EV Capable. Where existing electrical service will not be upgraded in the existing project scope,

Table 4: Electric Vehicle Requirements by Project Type	
Project Type	Project Requirements
	designate capacity to the maximum extent that does not require an upgrade to existing electrical service.
All projects subject to Chapter 24, Section 11B	Construction documents shall indicate how many accessible EVCS would be required under the California Code of Regulations Title 24, Chapter 11B, if applicable, in order to convert all EV Capable and EV Ready spaces required under Section 10 to EVCS. Construction documents shall also demonstrate that the facility is designed such that compliance with accessibility standards, including Section 11B accessible routes, will be feasible for the required accessible EVCS at the time of EVCS installation. Surface slope for any area designated for accessible EVCS shall meet slope requirements in Section 11B and vertical clearance requirements in Section 11B at the time of original building construction.[2]

[1]Electrical service capacity shall be able to deliver a minimum 40 amperes at 208 or 240 volts multiplied by 20% of the total number of EV Spaces. The panel board(s) shall have sufficient space to install a minimum of one 40-ampere dedicated branch circuit and overcurrent protective device per EV space, up to a minimum of 20% of the total number of EV Spaces. The circuits and overcurrent protective devices shall remain reserved exclusively for EV charging. An EV load management system may be necessary in order to provide EV charging at more than 20% of EV Spaces.

[2]Section 11B-812 of the 2016 California Building Code requires that a facility providing EVCS for public and common use also provide one or more accessible EVCS as specified in Table 11B-228.3.2.1. Chapter 11B applies to certain facilities including, but not limited to, public accommodations and publicly funded housing (see section 1.9 of Part 2 of the California Building Code). Section 11B-812 requires that "Parking spaces, access aisles and vehicular routes serving them shall provide a vertical clearance of 98 inches (2489 mm) minimum." It also requires that parking spaces and access aisles meet maximum slope requirements of 1unit vertical in 48 units horizontal (2.083 percent slope) in any direction at the time of new building construction or renovation. Section 11B-812.5 contains accessible route requirements. In addition, Chapter 24 Part 11 Section 4.106.4.2 requires that developers meet certain aspects of accessibility requirements at the time of new construction for a limited number of parking spaces.

Source: Energy Solutions

Figure 21: EV Infrastructure Code Resources Tool-kit

There are many Resources to help with EV infrastructure costs!

The California Capital Access Program (CalCAP) EV Charging Station Financing Program's goal is to expand the number of electric vehicle charging stations installed by small businesses in California. This 2 million dollar financing program provides incentives to small business owners (and landlords) to install EVCS for employees, clients, and tenants. For more information see https://bit.ly/2KKf1GX

Electrify America, LLC selected the Santa Cruz metro area in its Cycle 2 California ZEV Investment Plan for EV charging infrastructure investment, featuring 150kWh and 350kWh charging capability, at commercial retail establishments. Electrify America public EV charging stations accept all forms of electronic payment and are equipped to charge all commercially available light-duty ZEVs in the United States. For more detailed information about Electrify America's investment plans in the Santa Cruz metro area please contact Matthew Nelson, Director of Government Affairs, at Matthew.Nelson@electrifyamerica.com

Monterey Bay Air Resources District (MBARD) offers a program called Plug-In Monterey Bay which grants five-year contracts to OEM and installers for installing EV infrastructure equipment from approved manufacturers. These are professional services contracts which are amended every year and the current approved manufacturers are Recargo, ChargePoint, and others. Contact: Alan Romero, aromero@mbard.org, (831) 647-9411

Commercial customers in the Santa Cruz, San Benito, and Monterey County service areas will have access to valuable resources and generous incentives for installing or upgrading EV charging stations. Detailed program information will be available in August 2019; customers can apply for funding beginning October 2019. Businesses interested in accelerative EV adoption are encouraged to contact MBCP for more information at programs@mbcp.org

Tesla is leading the EV market and its share is increasing. In order to continue driving adoption, Tesla's rapidly growing Supercharging network unlocks both long distance travel and ownership in dense urban cities. Since October 2012, Tesla has installed over 11,300 Superchargers across more than 1,350 Supercharger stations; over 99% of the US population is within reach of a Supercharger. Tesla is willing to co-invest in these projects with the site host and may subsidize capital investment and/or operating expenses. Contact Dan Cronin with questions if you are interested in learning more about the program at dcronin@tesla.com

Source: Energy Solutions

CHAPTER 4:
The E-Fleet Accelerator

E-Fleet Accelerator Approach and Results

The E-Fleet Accelerator project was designed to address multiple challenges faced by fleets when transitioning to electric vehicles. The first, and most basic, is lack of information about EV options. While sedans marketed for consumers are gaining attention in popular media, EV utilization in fleets receive minimal attention. A key element of the EV Accelerator was information outreach. The project team made numerous calls to fleets in the Monterey Bay region to introduce fleet managers and owners to the potential benefits of EVs in their fleets. Additionally, the project team developed four industry-specific presentations exploring the unique application of EVs in different industries, and presented to over 20 fleets.

In addition to information outreach, the E-Fleet Accelerator sought to address the question of *how* a fleet should transition to EVs. By collaborating with fleets to deliver customized Fleet Transition Plans, the project team worked with interested fleets to address the logistical and financial hurdles of electrification. These Fleet Transition Plans prioritized the best EV options for different fleets, as well as which vehicles would deliver the most savings from electrification. These plans also identified funding options for each fleet.

Finally, the project team identified locations for future EVSE installation. With the EVSE Site Identification Report, the project team highlighted sites for EVSE installation that would be most beneficial. In addition, the Fleet Sheet, which was distributed to all fleets contacted throughout the project, provided a summary of available EV options for diverse medium- and heavy-duty vehicle types as well as an overview of available local, state, and federal funding opportunities and incentives.

Fleet Outreach

The first strategy to support fleets in overcoming the hurdle of lack of awareness was an outreach campaign, in which EV Alliance contacted over 100 fleets. In this initial communication, EV Alliance introduced fleets to the potential benefits of electrification, and laid the groundwork for relationships that would drive other project activities.

To complete this outreach, EV Alliance developed a master list of potential fleets with the help of FleetSeek, a proprietary commercial database utilized by MBARD in previous outreach efforts. Previous lists developed by Ecology Action, a Santa Cruz area nonprofit organization and other relevant data sources were also used in the outreach effort. The team also explored websites of over 200 local organizations to identify expressed commitments to sustainability and environmental goals. The Alliance team then directly contacted over 100 of the largest and most promising fleets throughout the three Monterey Bay area counties. Finally, as outreach progressed, the team asked interested fleet managers for additional fleet manager leads.

The team attempted to contact a wide diversity of fleet types throughout the three counties. Because of their larger populations, however, Monterey and Santa Cruz Counties both had the largest fleets.

Following direct outreach by e-mail and phone, the team was able to directly speak with key managers at 46 of the 100+ fleets initially contacted.

The team developed a method to communicate the environmental and operational advantages of EVs as well as deliver information on incentives and available vehicles to the fleets. Fleet managers were asked if they currently have EVs in their fleet or plans to add them, and were also asked to identify the main barriers to electrification. The EV Alliance team also informed fleet managers about opportunities for sector-specific E-fleet informational presentations and the opportunity to participate in the development of a fleet transition plan. At the end of each conversation the team asked the fleet manager to provide their fleet data spreadsheet to enable the provision of more tailored information about EV opportunities.

The Task 4 tracker contains a list of all fleets contacted with notes and includes links to uploads of all the fleet spreadsheets that were provided to the team. The tracker also includes links and information on the fleet presentations, fleet plans, and other project deliverables. MBARD will be sharing this data with other relevant stakeholders where appropriate to enable coordination of incentives and other forms of E-fleet transition assistance. These stakeholders may include (but are not limited to) the Monterey Bay Electric Vehicle Alliance, Monterey Bay Community Power, Ecology Action, and other Monterey Bay area partners working on electric vehicle readiness.

Presentations

Throughout the initial outreach process, the project team publicized formal presentations about the benefits of electrification. The team developed high-level PEV presentations aimed at these key vertical markets: Local Governments, Transit and Paratransit operators, Delivery Services, and School Bus Fleets. Customized presentations were delivered to over 20 local fleets. Four webinars were hosted, along with individual meetings and phone calls.

The presentations were tailored for each sector and discussed the state EV policy goals, overall benefits and challenges of fleet electrification, EV models available, existing and pending incentive programs for vehicles and charging and case studies. Ample time for questions and feedback was provided at the end of each presentation.

The Task 4 tracker includes a list of all presentation dates, fleets that attended, and links to PDFs of the presentations. Presentation-specific details are below:

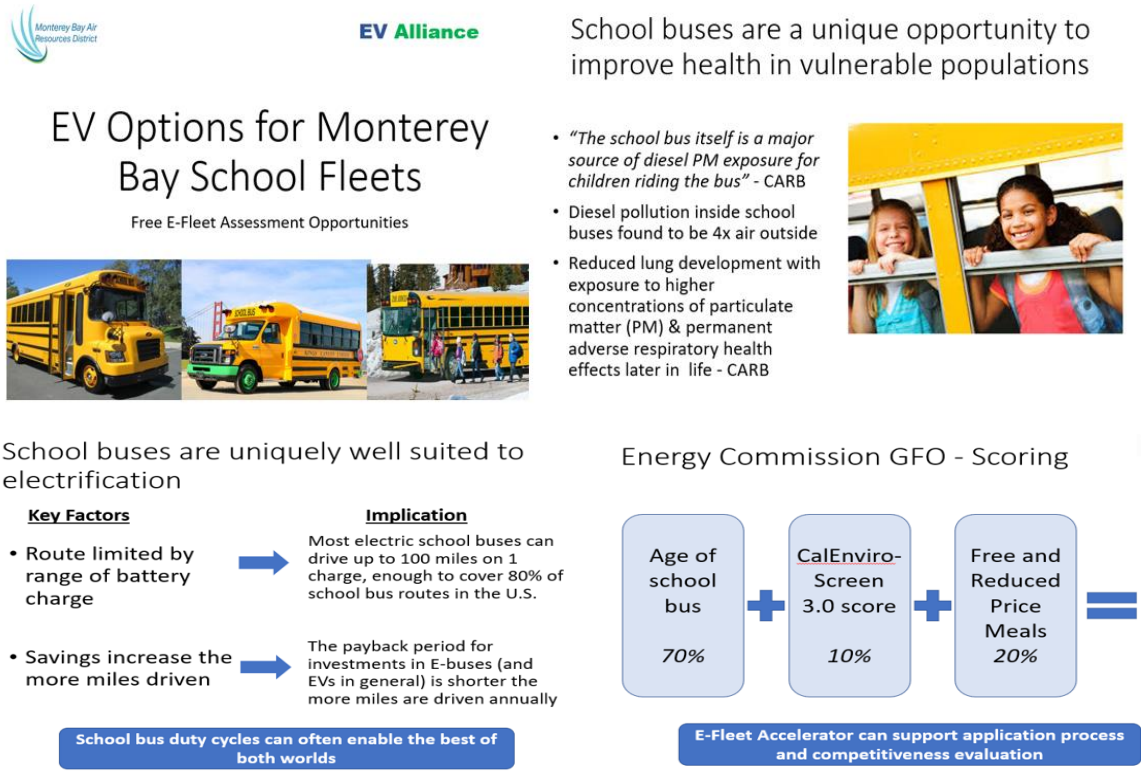
School Bus Fleets

In 2018, the CEC released GFO-17-607, the *School Bus Replacement for California Public School Districts, County Offices of Education, and Joint Power Authorities Program*. Through this solicitation, the CEC requested school bus data from fleets across the state, which it ranked based on vehicle age, CalEnviroscreen 3.0 score, and the percent of students on free or reduced lunch. Highest-ranking vehicles were deemed eligible for replacement with an electric school bus (E-bus).

The project team used this solicitation as an opportunity to drive outreach. School fleets, which usually fund bus replacements through local, state and federal programs were keen to learn about this opportunity. GFO-17-607 provided a useful conversation starting point with school fleet managers who were interested in the school bus fleet electrification process. To address this need, the project team

held a school fleet-focused webinar on July 20th, 2018. A few of the slides utilized in the webinar are presented below.

Figure 22: School Fleets – Sample Slides



Source: EV Alliance

The school fleet presentation not only provided fleets with information about the benefits of electric vehicles, but also with clear guidance about how to apply for the CEC funding. As a result, several fleets submitted vehicle information to the Energy Commission, and a few ranked highly in the competition. The CEC plans to keep the information provided by school districts for future funding opportunities and it is anticipated that several Monterey Bay area districts will get an early start on school bus electrification as a result of the E-Fleet Accelerator outreach and MBARD funding. Ten school districts within MBARD jurisdiction have been awarded all-electric school buses via the air district's Zero-Emission School Bus Program (ZESBP) using AB923 funds, https://www.mbard.org/zero-emission-school-bus-program. Four of the e-buses are currently in operation.

Figure 23: Gonzales USD – E-Lion Type C, 71 passenger

Source: MBARD

Transit and Paratransit

On July 30th, 2018, the project team presented on the benefits of EVs for paratransit deployments. This presentation featured representatives from some of the major paratransit EV manufacturers, Zenith and Phoenix. Both described their respective product lines and examples of EV paratransit deployments. Monterey Salinas Transit has received MBARD funding for three electric transit buses (two built by BYD and one built by Gillig). The two BYD buses are currently in operation. Sample slides are presented below.

Figure 24: Transit and Paratransit – Sample OEM Information

Paratransit Van

Manufacturer	Zenith
Model	Passenger Van
Range	80-135 mi
Capacity	9-16
Availability	Current

Paratransit Shuttle Vehicles - Class 4

Manufacturer	Phoenix
Model	Zeus
Range	110 mi
Capacity	16-20
Availability	Current

Manufacturer	Motiv
Model	E450
Range	75 mi
Capacity	20
Availability	Current

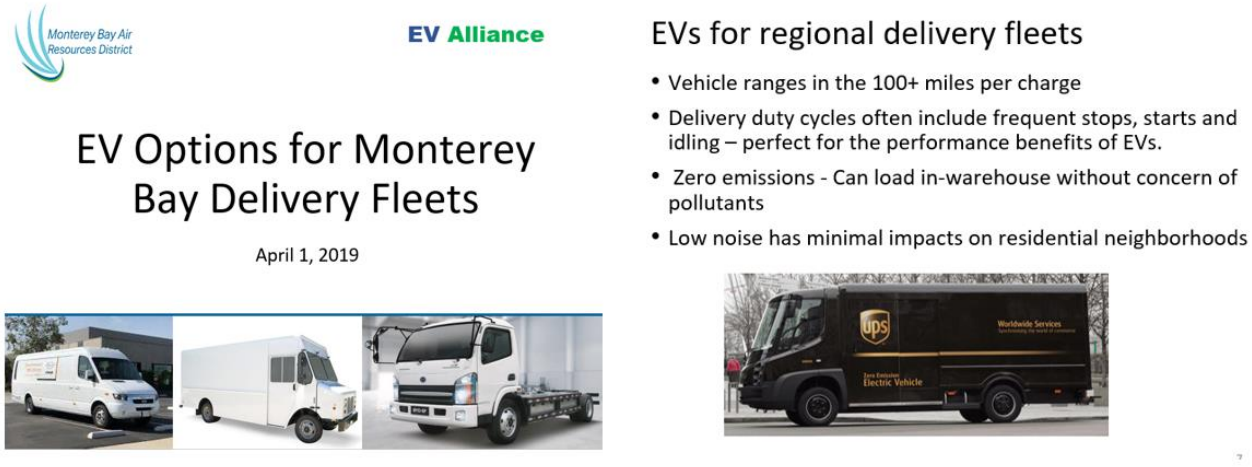
Source: EV Alliance

The project team strongly advocated EV adoption for paratransit fleet operators. Given the often shorter but frequent daily trips of paratransit vehicles, they achieve both high annual mileage within EV-friendly ranges. When managed correctly, paratransit vehicles can deliver rapid savings to fleet managers.

Goods Movement

On April 1st, 2019, the project team presented to several local goods movement fleets on EV options for delivery services. The team focused both outreach and presentation content on medium-duty delivery vehicles for intra-regional applications. Agriculture in the Monterey Bay region drives a significant regional delivery economy. The duty cycles of regional delivery vehicles also make them a better fit for current battery ranges than long-haul goods movement fleets. Additionally, the frequent stops and periods of low-speed travel of many regional delivery routes optimize the efficiencies offered by electric powertrains.

Figure 25: Goods Movement – Sample Slides



Source: EV Alliance

In addition to EV Alliance content, the goods movement presentation featured a segment by Ryder. Ryder operates locally out of Salinas and has partnerships with a variety of leading EV truck manufacturers, including Chanje, Workhorse, and Lightening Systems. Through Ryder, fleets can lease an electric vehicle to test out EV deployment in fleet applications. In addition, Ryder has partnered with "charging as a service" companies to complement their vehicle solutions. Throughout both the presentations and E-Fleet Transition Plans, the Alliance team introduced many fleets to Ryder's solution. For fleets wanting a more flexible or shorter-term EV arrangement than purchasing a vehicle, Ryder's EV and charging service can be an ideal solution.

Local Governments

Finally, the project team presented to Monterey Bay cities, counties and public agencies about available fleet options, which occurred on April 29th, 2019. Key to this conversation was a discussion of MBARD's AB 2766 funding opportunity that was currently open for public fleets. In September 2019, MBARD awarded the City of Salinas a $382,032 AB2766 grant to the City of Salinas to purchase three medium-duty all-electric trucks. MBARD's Plug-In Monterey Bay EV Infrastructure program using AB923 funds will also be used to install Level 2 and DCFC charging infrastructure for the e-fleet vehicles, which includes four light-duty EVs (LDEV) as well. The LDEVs were also funded via the MBARD AB2766 grant program. MBARD has also funded the first two all-electric trolleys in Santa Cruz operated by the City, which will be delivered at the end of 2019.

Figure 26: Local Government – Sample Slides

Source: EV Alliance.

In this presentation, the project team included a brief discussion of maintenance savings, one of the often overlooked but significant drivers of the EV value proposition. To illustrate broader themes with fleet-specific examples, the project team presented data from both New York City and Contra Costa County fleets, which demonstrated between 2x and 4x maintenance savings compared to conventional ICE vehicles.

During this webinar, the project team was also joined by a representative from the Climate Mayor's Electric Vehicle Purchasing Collaborative, Sarah Reed. Ms. Reed presentation focused on collaborative purchasing options and the Drive EV Fleets tool (www.DriveEVFleets.org), a useful application to assist fleets with their electrification planning. The project team provided the Drive EV Fleets tool and summary information to project participants.

E-Fleet Transition Plans

Through fleet data analysis conversations with fleet managers, the project team identified the most motivated and interested fleets for transition plans. Several of these fleets were school districts, which often rely on special-purpose funding to purchase school buses such as MBARD ZESBP. As there was a CEC grant solicitation to pay for the entire cost of hundreds of EV school buses statewide, the project team used this opportunity to engage many districts. Pajaro Valley Unified School District in Watsonville did extremely well in this solicitation, and is scheduled to be awarded funding for eight electric school buses. Alisal Union, Salinas City Elementary and Salinas Union High school districts were other CEC awardees in the Monterey Bay region, with one bus awarded each.

The remaining fleet transition plan participants were cities and counties, public transit agencies, an agricultural producer, a regional beverage distributor, and non-profits. Unfortunately, many non-profits were challenged by the upfront capital required to purchase new vehicles.

The Alliance team scheduled initial conversations with fleet participants to learn more about individual fleet composition, driving cycles, motivations, and goals. The project team then developed the fleet transition plans in the form of PowerPoint presentations and Word documents, which included background information, photos and lists of available EVs and customized advice on which vehicles should be prioritized for electrification. Age of vehicles, driving cycle, and availability of EV product

were key determinants in the prioritization process, as noted in the table below. The project team also included a section on programs and incentives to help pay for the vehicles and charging infrastructure.

Table 4: E-Fleet Transition Plan Example – Vehicle Prioritization

12-16A/2WC
Van
28A/2WC

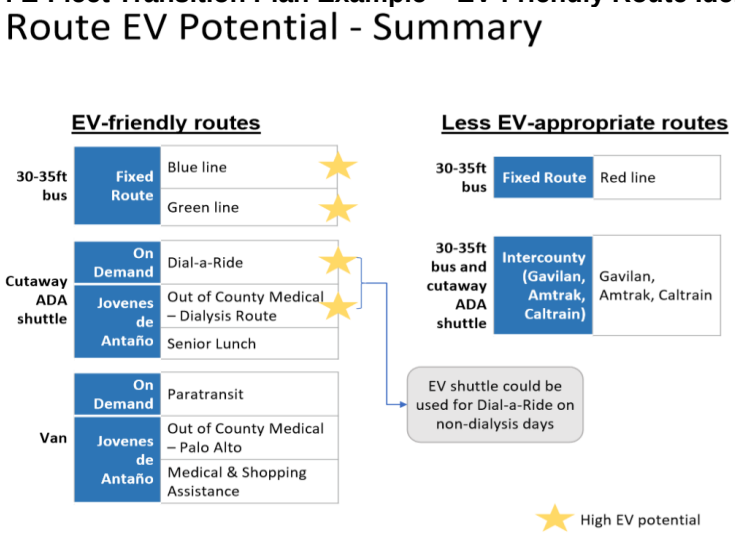
Prioritized vehicles

Vehicle	Age	Total mileage	Estimated Replacement Date	Condition	Option	Rank
#47 2008 Starcraft Allstar	11	259,571	2015	Fair	BEV	1
#59 2010 Starcraft Allstar	9	255,133	2017	Fair	BEV	2
#48 2008 Starcraft Allstar	11	241,106	2013	Entry Doors Work Sporadically	BEV	3
#57 2008 Glaval Titan	11	230,870	2016	Recently Overheated	BEV	4
#46 2008 Starcraft Allstar	11	199,831	2014	No Rear A/C Heater Core Issue	BEV	5
#64 2013 Glaval Freightliner	6	143,571	2018	Issue with Drive Line and Interlock	BEV	6
#733 2008 Starcraft Allstar	11	141,917	2015	Fair	BEV	7
#737 2013 Dodge El Dorado	6	120,711	2021	Fair	PHEV	8
#735 2010 Glaval Universal	9	118,592	2017	Fair	BEV	9
#736 2010 Braun Entervan	9	110,340	2020	Fair	PHEV	10

Source: EV Alliance, excepted form the San Benito County Express E-Fleet Transition Plan

Fleet duty cycles and existing vehicle types were assessed along with routing patterns to identify which vehicles would be most easily and cost-effectively substituted with EVs. This analysis was only feasible with adequate data and therefore was only conducted with fleets that were able to provide the relevant data within the project timeframe. A summary of route electrification eligibility from the San Benito County Express E-Fleet Plan is provided below.

Figure 27: E-Fleet Transition Plan Example – EV-Friendly Route Identification



Source: EV Alliance, excerpted from the San Benito County Express E-Fleet Transition Plan.

The team then presented E-Fleet Transition Plans to fleet managers, sustainability staff, and other internal stakeholders. In these presentations, the team reviewed the E-Fleet Plans and answered a broad range of questions about fleet electrification. Tab 1 of the Task 4 tracker includes a listing of these fleet presentation dates, as well as PDFs of the plans.

Finally, the project team compiled a list of sites that would be ideal locations for level 2 and fast chargers based on specific fleet duty cycles. These sites were prioritized for fleets most likely to electrify in the next few years. These sites were submitted in the EVSE Site Report, and detailed below.

Table 5: Sites Identified for EVSE Deployment in Support of E-Fleet Transition Plans

Host	Address	Charging level	Notes
Pajaro Valley Unified School District	2910 Union Road Paso Robles CA 93446	Level 2	PVUSD has been connected with PG&E's FleetReady program. Based on challenges with PG&E infrastructure upgrades in the past, additional support navigating the PG&E program will be important.
San Benito County Express	3240 Southside Rd Hollister, CA 95023	Level 2	San Benito County Express currently has many EV-friendly routes, and is planning for the integration of EVs in the next few years. To support this transition, they will require the addition of charging infrastructure in their depot.
	Gavilan College or Gilroy Caltrain Greyhound Station	DCFC	To enable conversion to EVs for San Benito County Express's Intercounty transit line, DCFC opportunity charging would likely need to be installed at either Gavilan College or the Gilroy Caltrain/Greyhound Station.
	2320 Technology Pkwy, Hollister, CA 95023	DCFC	The County Child Support Services office is the northern most stop on the Red Line. While San Benito County Express could explore longer range Proterra vehicles to electrify the Red Line, they could also explore mid-route opportunity charging at locations such as the Child Support Services office.
Grey Bears	2710 Chanticleer Ave, Santa Cruz, CA 95065	Level 2	Grey Bears would likely need external funding to support the acquisition of EVs. However, the vehicles' duty cycle would lend itself extremely well to an onsite solar PV-supported charging solution.
Live Earth Farm	172 Litchfield Lane, Watsonville, CA 95076	Level 2	Like Grey Bears, Live Earth Farm would likely not be able to purchase a medium- or heavy-duty EV without support to close the funding gap between a conventional diesel and an EV plus needed charging infrastructure. However, if they were able to

			procure an EV at comparable up-front cost, their duty cycles would enable significant savings.
	San Francisco	DCFC	To enable Live Earth Farm's longest route to be electrified, they will need to locate consistently available DCFC charging in the City of SF. This will enable electrification of their 250-mile route to and from the City.
Aromas – San Juan Unified School District	2300 San Juan Hwy, San Juan Bautista, CA 95045	Level 2 or DCFC in collaboration with San Benito County Express	In the event that Aromas – San Juan USD moves forward with electrification, their chargers could also be used to provide opportunity charging for San Benito County Express's intercounty route during the stop at Anzar High School.
Couch Distributing	104 Lee Rd, Watsonville, CA 95077	Level 2	Couch Distributing is eager to explore electrified transportation once vehicles have been tested by larger fleets. After an early deployment of Smith EVs, which were unsupported after the manufacturer closed operations, they plan to temper their enthusiasm for electric trucks with caution.
	King City, CA (potentially San Lorenzo Park, or another municipal site)	DCFC	Couch Distributing's longest route is from their depot in Watsonville to King City and back, a trip of ~140-150 miles. There is currently no reliable charging infrastructure in King City. To electrify this trip with the heavy-duty trucks expected to be commercialized in the next few years, charging infrastructure would likely be needed in King City.

Source: EV Alliance

CHAPTER 5: Observations, Recommendations and Conclusions

Observations

The cost of new electric vehicles and the additional cost and complexity of installing charging stations was a top barrier encountered in conversations with fleets. While light-duty vehicles (LDVs) are approaching up-front price parity and charging infrastructure for LDVs is becoming more widely available, the infrastructure costs and total cost of ownership (TCO) analysis for medium- and heavy-duty vehicles is more complex. In most cases, the information gaps among fleet managers were significant. Some fleet managers were unaware of California's Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), uncertain how to monetize the federal tax credit and unaware of other programs such as the Low Carbon Fuel Standard.

Fleet manager behavior was also a factor. Because fleet managers were generally worried about employees running out of charge and being stranded, they unnecessarily restricted existing EVs to limited usage. Further, they did not put policies in place to make sure EVs were well utilized even within their range constraints. For example, one County agency fleet currently has two Nissan Leaf electric vehicles that are very lightly utilized, with only 266 and 336 miles each in 2018. Policies to increase mileage on these vehicles need to be enacted immediately to realize the significant financial and environmental benefits of EVs.

In the light-duty category, there are now over 40 EV models available in California with electric ranges up to 370 miles. Most of these are sedans. SUV selection is more limited, though some new offerings in 2019 and 2020 provide more opportunities for electrifying fleets. Many public fleets have significant numbers of light-duty trucks. While there are currently no all-electric pick-up truck options on the market, OEMs including Ford, Tesla, Rivian and BYD and others have committed to delivering light-duty electric trucks to the mass market starting in 2020.

Lack of appropriate EV models was a large barrier for many fleets especially in the medium and heavy-duty sectors. For medium/heavy duty vehicles there are limited options from major manufacturers even though there are many offerings from smaller OEMs many of which are assisted with substantial funding from the California HVIP program. Fleet managers are hesitant to deploy vehicles from smaller start-up companies, however, because of high pricing and uncertainty if the company will survive into future years and honor warranties.

School and transit buses are the most mature of medium- and heavy-duty EV technologies and are seen as a "beachhead" sector. School districts benefited from the CEC and the MBARD ZESBP opportunities for EV school bus replacements. Transit agencies are supported by major incentives, such as the well-established federal, state and MBARD AB2766 funding programs. The Innovative Clean Transit (ICT) regulation from ARB becomes effective January 1, 2020, which mandates that all California transit districts to ramp up new bus purchases to 100 percent electric by 2029. The ICT regulation will be a significant factor with the OEMs in meeting electric transit bus demand.

Another major observation was that fleet managers are often risk-averse, as their primary job duties are to maintain existing vehicles in reliable working order within established budget categories and constraints. Many have also had challenging experiences with past alternative fuels such as CNG or biodiesel and are cautious about expending resources on electrification until the vehicles are fully proven and charging infrastructure is robust and affordable. Unlike in the transit sector, there is not yet a state fleet electrification mandate and ambitious internal green fleet goals and policies are lacking in most organizations even those with established sustainability programs.

Additionally, most fleet managers have limited time to research new technologies and funding programs even if these would ultimately yield savings or help with sustainability goals. For example, one key employee at San Benito County Express was independently juggling 20+ grant projects. While San Benito County Express would have been an excellent candidate for MBARD's AB 2766 funding opportunity, this lack of human resource availability ultimately resulted in the fleet declining to apply for funding.

Recommendations and Conclusions

Continue to Accelerate Development of EV Fleet Goals and Mandates

Until the state accelerates the phase-out of ICE vehicles, it will be up to local stakeholders to strongly encourage and support boards of directors and senior executives of public and private organizations to go "all in" on deep and rapid decarbonization goals. This will require public pressure that combines high-ambition goal-setting, such as the "climate emergency declarations" recently passed by many major California cities and increased resource allocation to fleet electrification.

Many public and private fleets have sustainability goals, but these are often vague when it comes to vehicle electrification such as the requirement to "consider" low emission vehicle options. By contrast, specific EV goals can help drive meaningful adoption. A leading example of robust EV goals is the California Department of General Services (DGS) goal of purchasing 25% electric light-duty vehicles by 2020, and 50% by 2025. Another approach is to identify how many EVs a fleet will need to meet their share of California's goal of deploying 5 million on-road EVs by 2035. However, it will require significantly increased and ongoing advocacy on the part of MBARD, Monterey Bay Electric Vehicle Alliance (MBEVA), local businesses, civic and environmental leaders to move these goals forward.

Continue to Develop Comprehensive E-Fleet Transition Plans

E-Fleet transition plans are essential to provide the needed work plan, timeline, and strategy for acquiring EVs and building out charging infrastructure. These plans should establish clear electrification goals and prepare organizations to take full advantage of various EV incentives. Fleet managers can leverage the findings and analysis in comprehensive E-Fleet Transition Plans to enhance their success in attracting funding and accelerating their journey to an all-electric fleet. Optimally, E-Fleet Transition Plans should also include employee charging. Many large employers contacted by the project team have hundreds of employees and commuting is often a larger user of fuel than the organization's fleet. To ensure ongoing effectiveness of E-Fleet transition plans, the CEC, MBARD, local utilities, municipalities, other public agencies and fleet operators themselves are strongly urged to provide the necessary resources to assist in E-Fleet transition plan development and implementation.

Continue to Leverage the Use of Local, State and Federal Funds for Incentivizing EV Purchases and Installing EV Infrastructure

Since 2015, MBARD has funded the purchase of over 50 light-duty fleet vehicles to municipalities in all the three counties within the air district. Funding comes from The Public Agency EV Voucher Replacement Program, which operates using AB2766 local funds and continues to run every year. Mentioned earlier in the report, MBARD has funded an all-electric medium-duty truck project for the City of Salinas and an all-electric trolley project for the City of Santa Cruz. The MBARD LDV EV incentive program for residents within the air district has run successfully for the last three years. Opportunity to combine incentive funds and therefore increase EV purchases is potentially available from local agency collaboration between the local Community Choice Aggregate (CCA), Monterey Bay Community Power (MBCP) and MBARD.

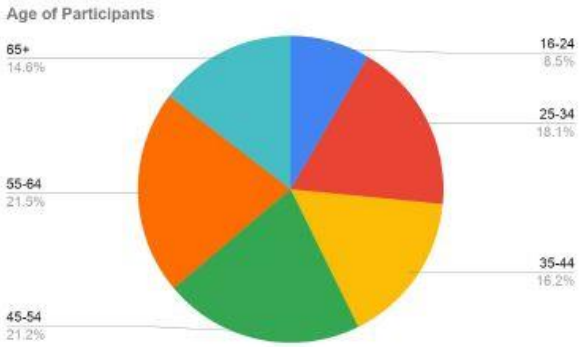
By combining the use of local funds (AB2766 and AB923), MBARD has also funded two all-electric transit buses to Monterey-Salinas Transit and four all-electric school buses in Santa Cruz and Monterey counties. Six more school buses will be awarded by year-end 2019.

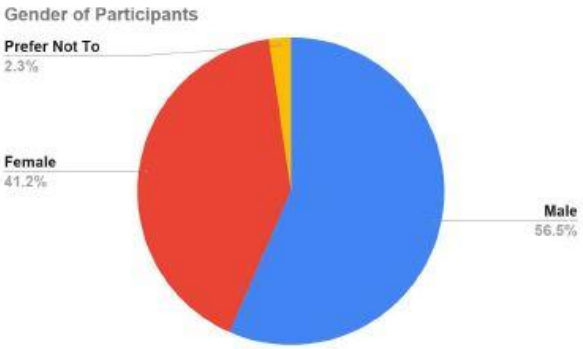
Key Level 2 and DCFC infrastructure projects have been successfully deployed via the Plug-In Monterey Bay EV Infrastructure Program (AB923) and are currently fully operational. The use of these MBARD local funds are critical to meet the charging requirements of the EV fleet as it continues to grow in the air district and California. For example, in 2016, the CEC awarded block funding for DCFC infrastructure along major north-south and east-west highway corridors in the state, which included Highway 101 through MBARD boundaries (GFO-15-603). MBARD will look very closely at leveraging local funding to further add and grow DCFC infrastructure at those key locations in that sector via the Plug-In Monterey Bay Program. Meeting this objective will ensure adequate DCFC infrastructure availability along the corridor. Going forward, it should be incumbent on state and local agencies and the private sector to collaborate and leverage every opportunity to grow the EV fleet and the charging infrastructure needed to keep EVs traversing the roadways throughout California and beyond.

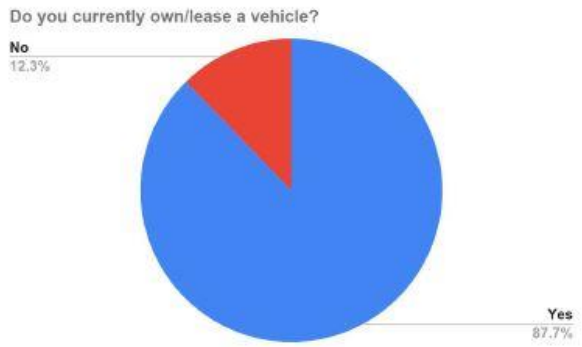
APPENDIX A: EV Ride and Drive Event Campaign Survey Results

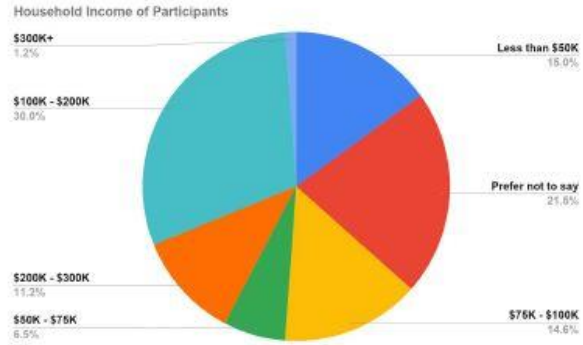
A survey given to participants before and after their test drive provided an overview of the event attendees and their attitudes towards PEVs. Below are the survey findings across the campaign.

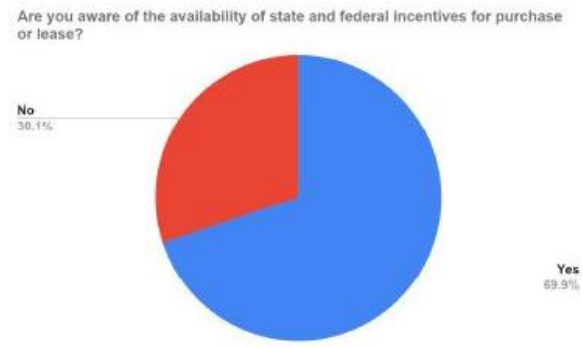
Participant Demographics

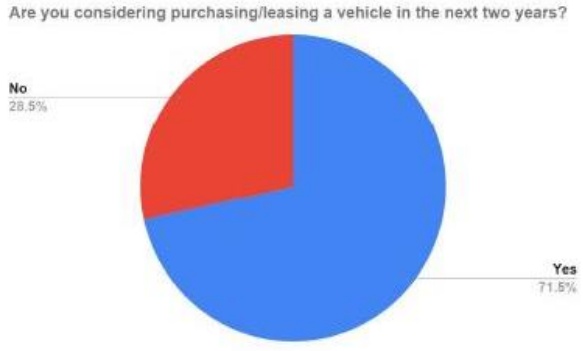


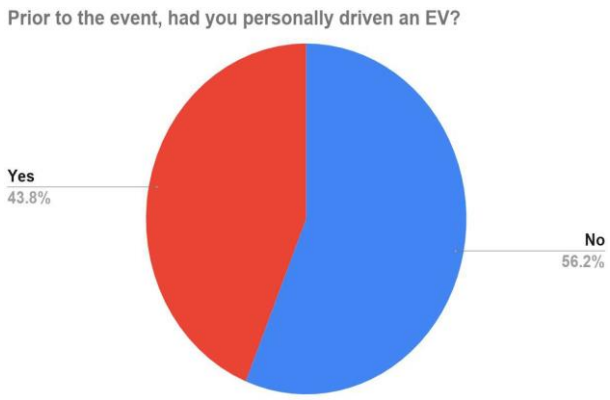


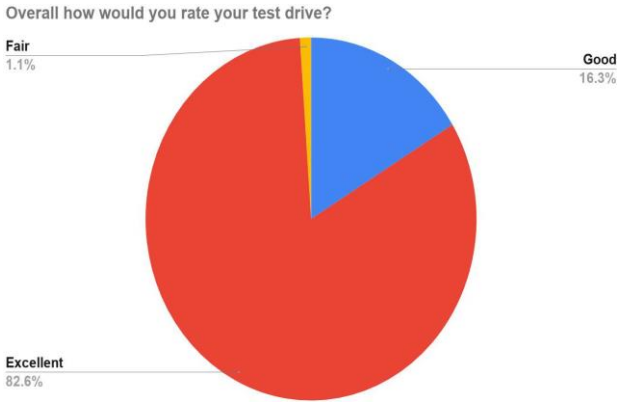


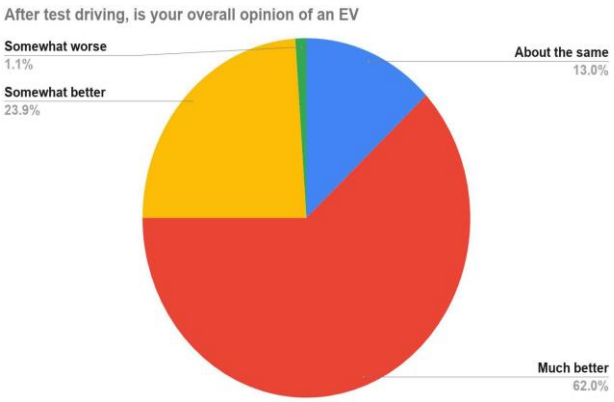


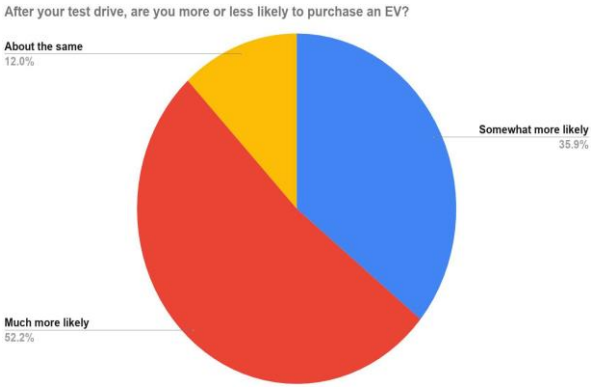






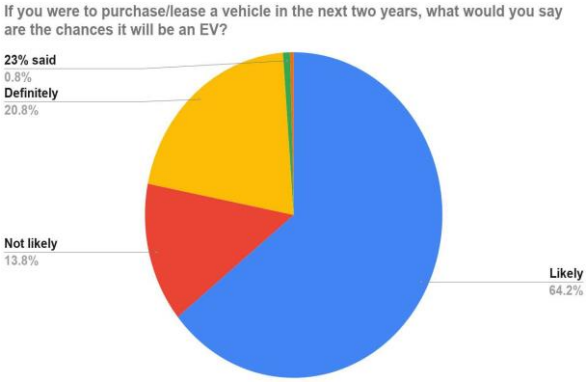


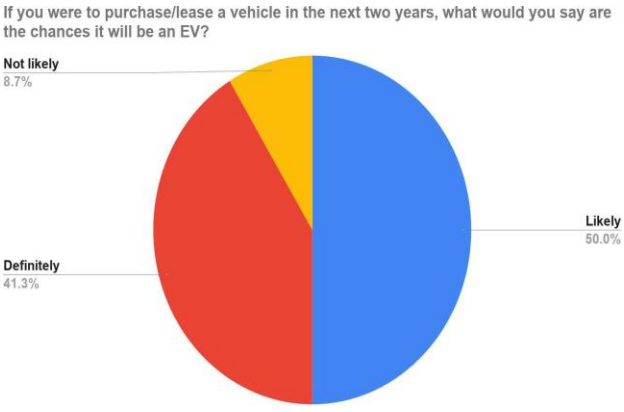




Pre-Test Drive

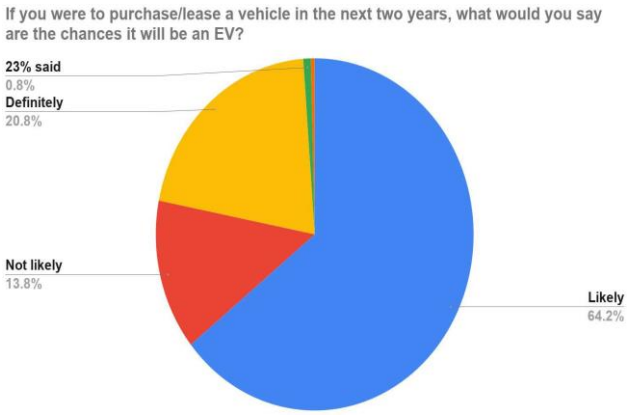
Post-Test Drive

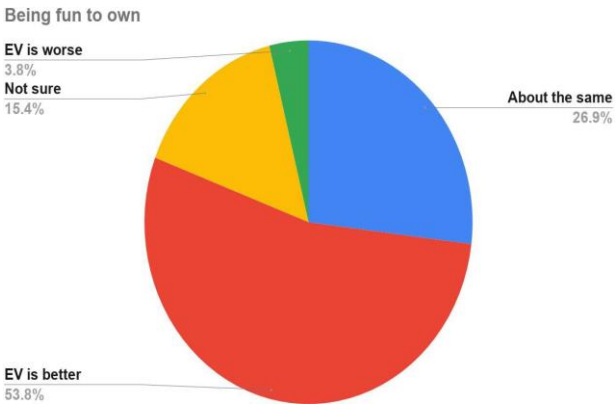




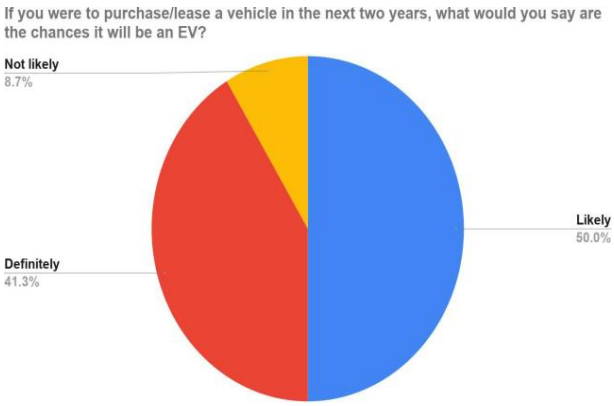
EV Perceptions

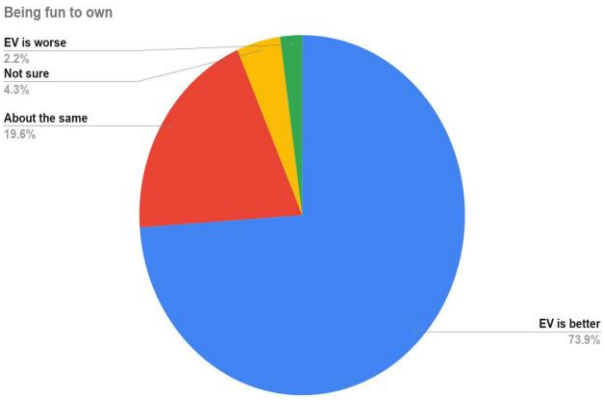
Pre-Test Drive

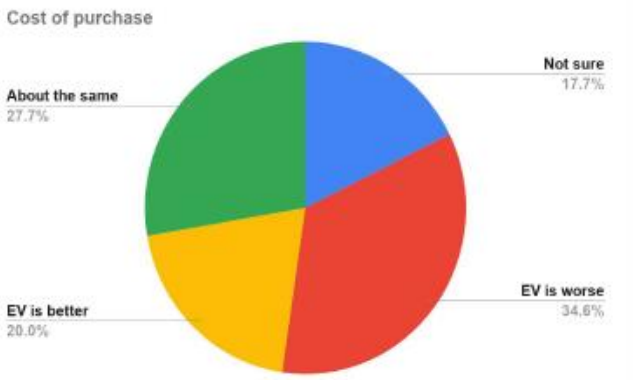


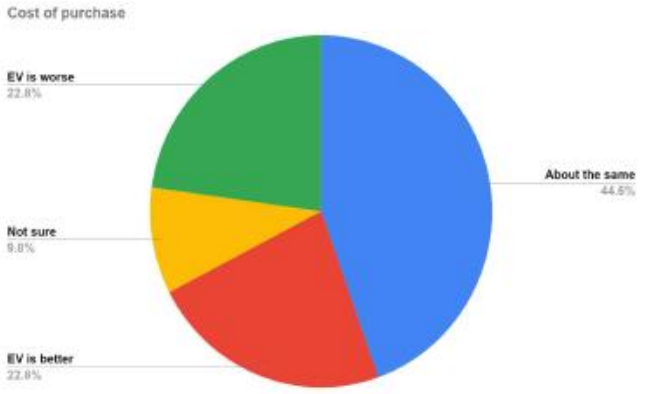


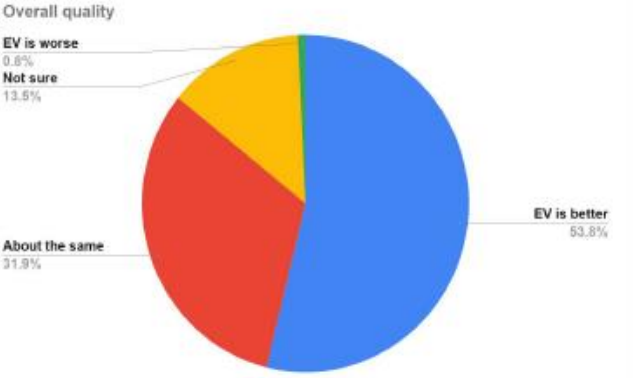
Post-Test Drive

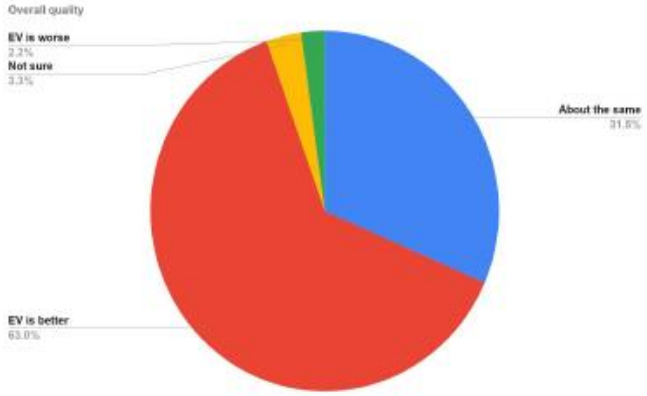


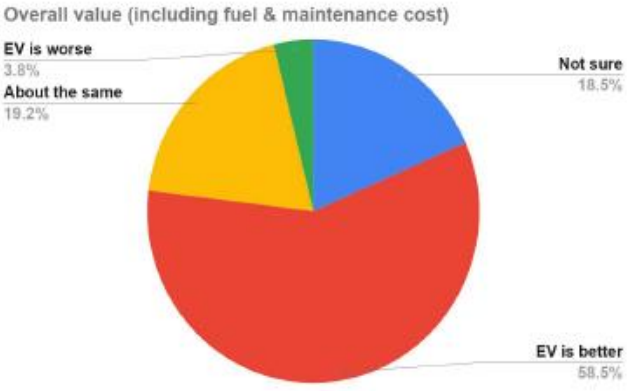


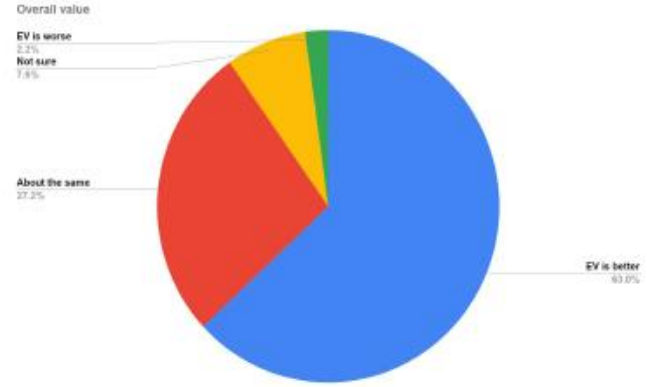

Cost of purchase
Not sure
17.7%
About the same
27.7%
EV is worse
34.6%
EV is better
20.0%


Cost of purchase
EV is worse
22.8%
About the same
44.6%
Not sure
9.8%
EV is better
22.8%

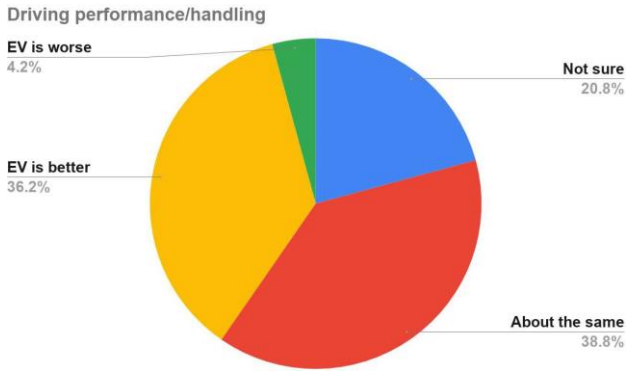

Overall quality
EV is worse
0.8%
Not sure
13.5%
EV is better
53.8%
About the same
31.9%


Overall quality
EV is worse
2.2%
Not sure
3.3%
About the same
31.8%
EV is better
63.0%

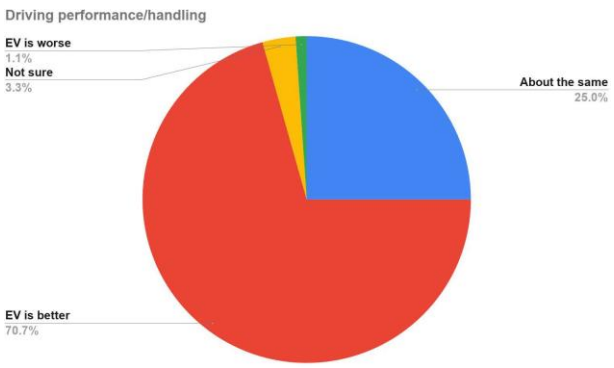

Overall value (including fuel & maintenance cost)
EV is worse
3.8%
About the same
19.2%
Not sure
18.5%
EV is better
58.5%


Overall value
EV is worse
2.2%
Not sure
7.6%
About the same
27.2%
EV is better
63.0%

Pre-Test Drive

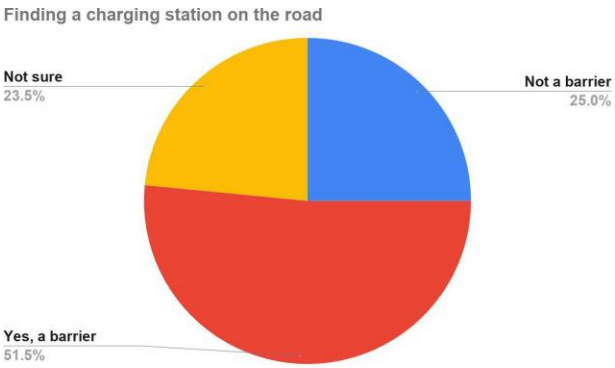


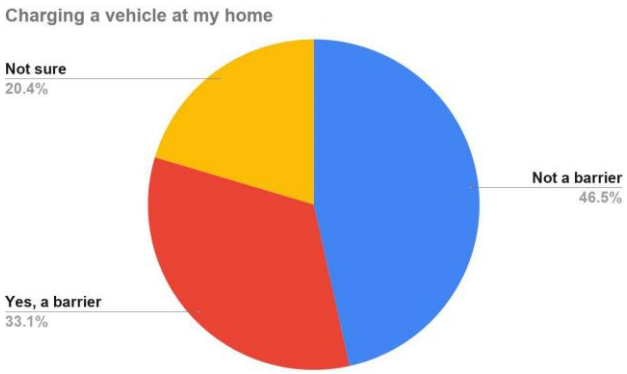
Post-Test Drive



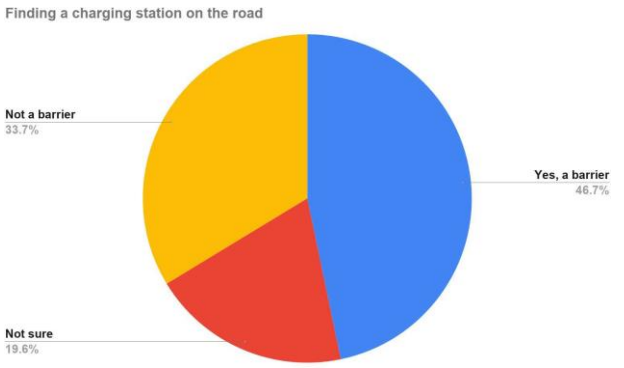
EV Barriers

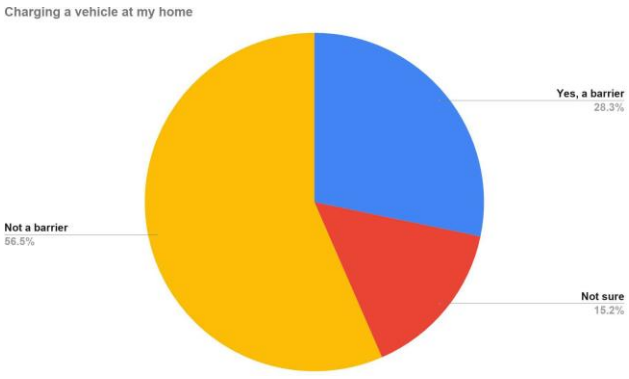
Pre-Test Drive



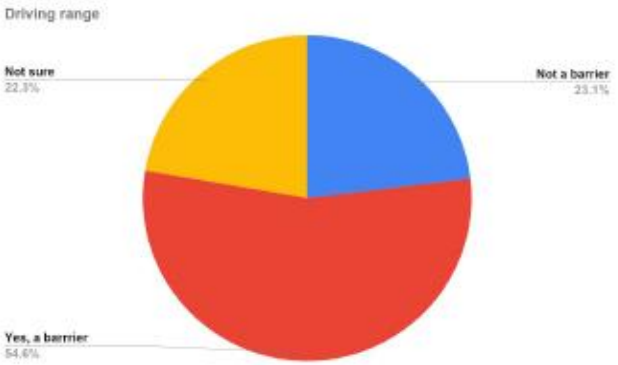


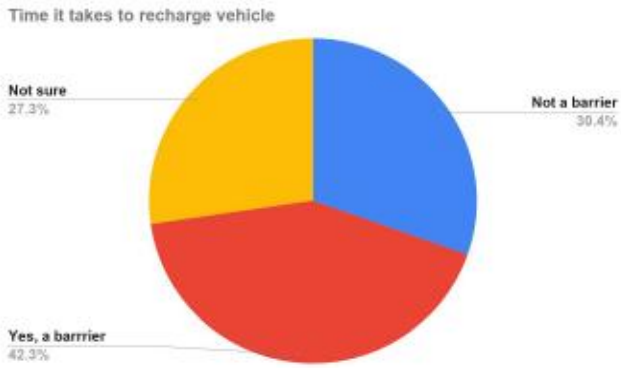
Post-Test Drive



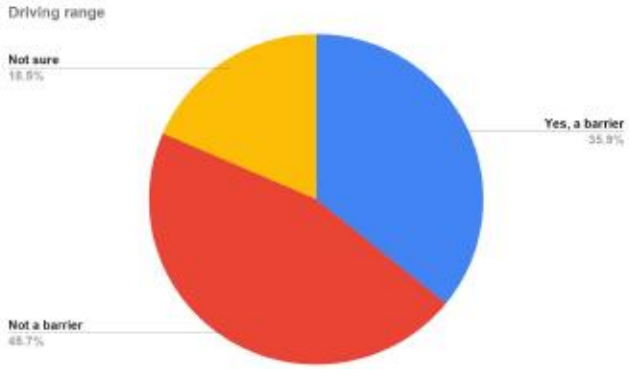


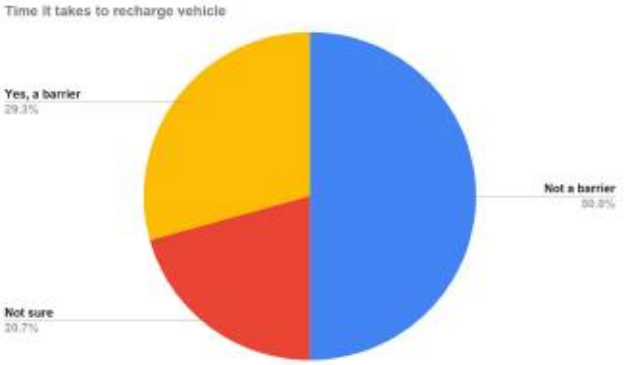
Pre-Test Drive





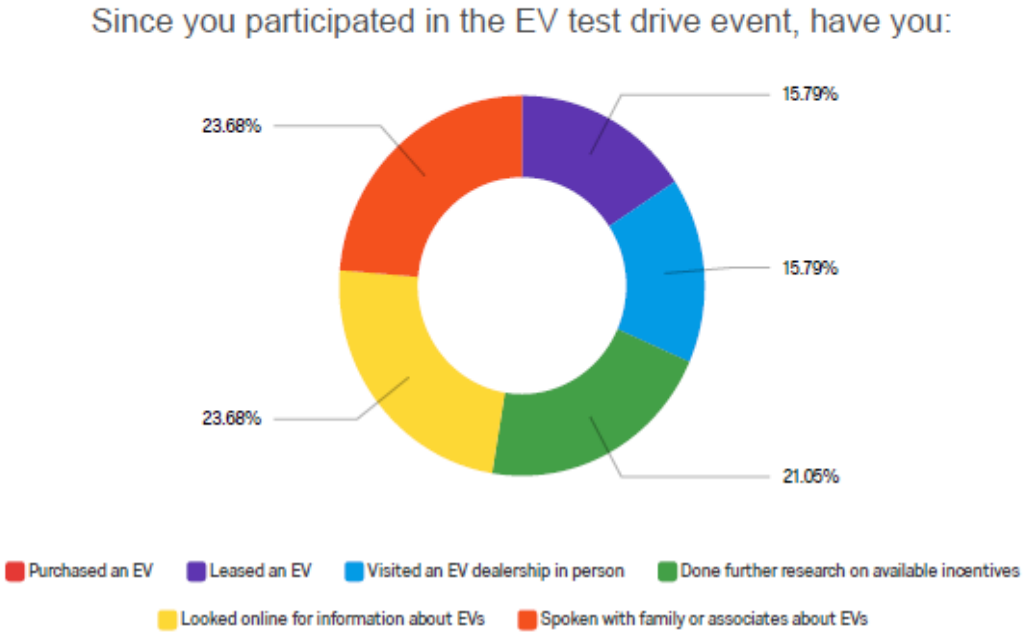
Post-Test Drive

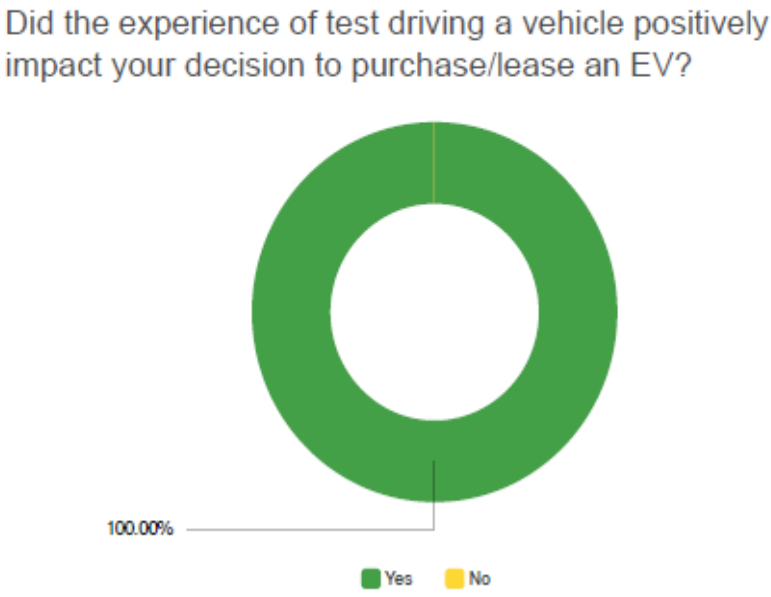




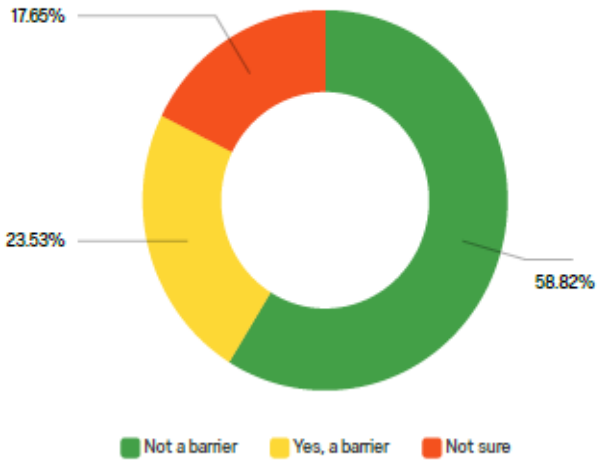
Follow Up Survey Results

A follow-up survey was sent to participants six months after each event. Below are the cumulative results from across the campaign.

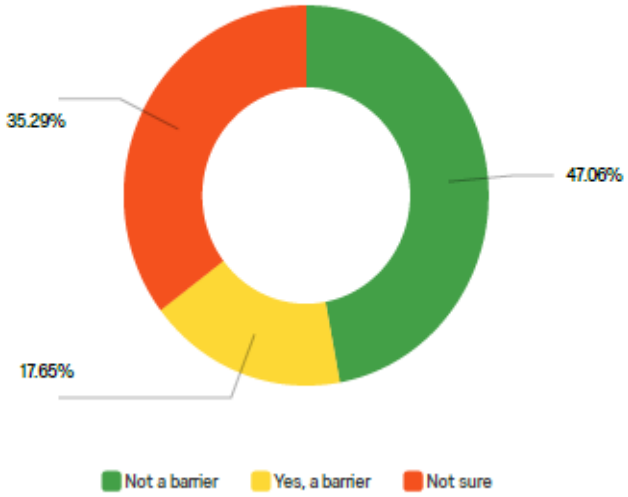




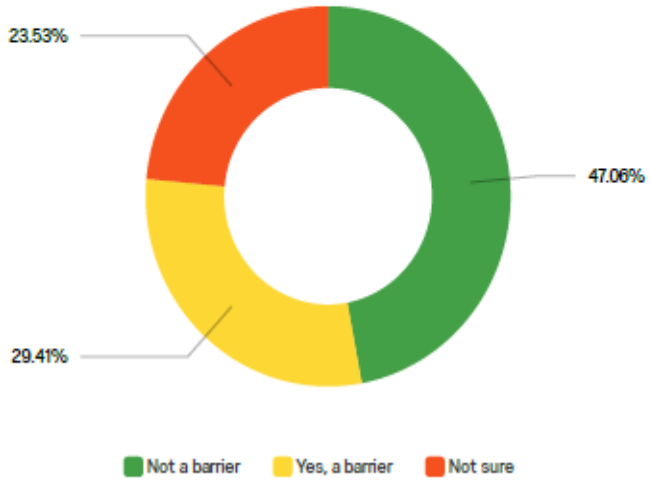
Is difficulty finding a charging station on the road a barrier to you purchasing an EV?



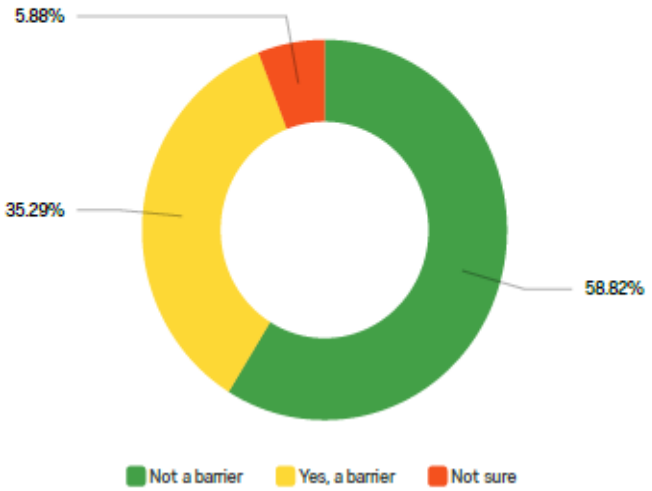
Is difficulty charging a vehicle at my home a barrier to you purchasing an EV?



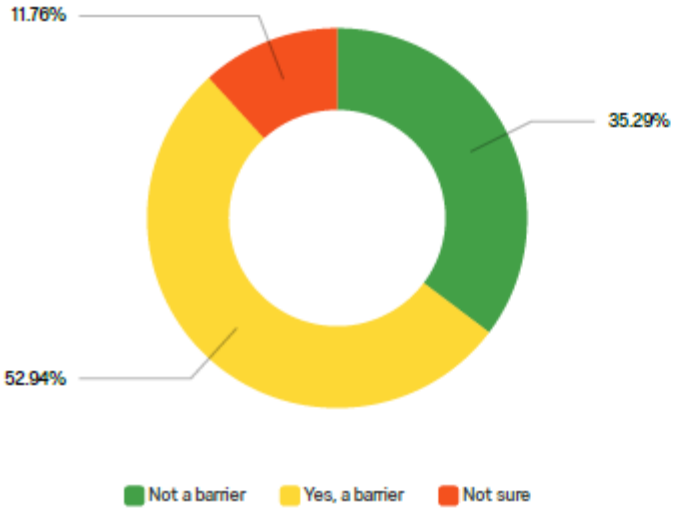
Is concern that the vehicle will run out of electricity while on the road a barrier to you purchasing an EV?



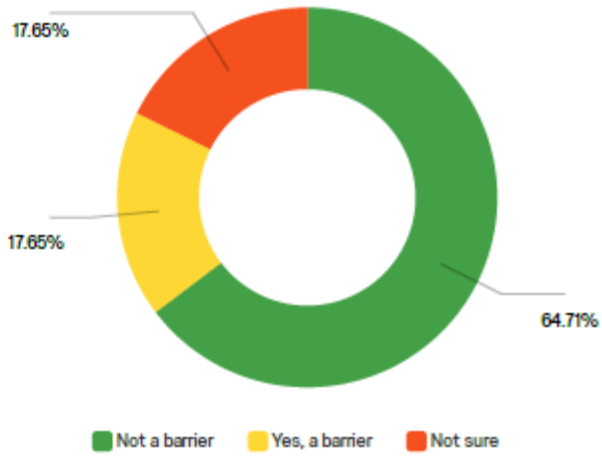
Is limited driving range a barrier to you purchasing an EV?



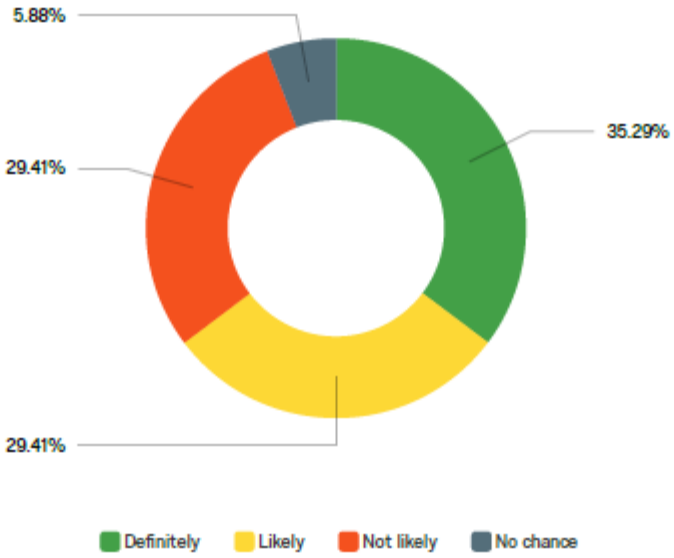
Is cost of purchase a barrier to you purchasing an EV?



Is time it takes to recharge vehicle a barrier to you purchasing an EV?



If you were to purchase/lease a vehicle in the next two years, what would you say are the chances it will be an EV?



APPENDIX B: Funding Opportunities and Fleet Sheet

Electric Vehicle Funding Opportunities

Category	Name	Sponsor	Details	Link
Light Duty	CALIFORNIA CLEAN VEHICLE REBATE PROJECT	California Air Resources Board	$1,500+ PHEV $2,500+ EV	https:// cleanvehicle rebate.org
	MONTEREY BAY COMMUNITY POWER eVIP MONTEREY BAY AIR RESOURCES DISTRICT	Monterey Bay Community Power	Incentives of up to $4,500 per vehicle through July, 2019; $1,000 per vehicle thereafter	https://www.mbcommunitypower.org/electric-vehicles/
	Monterey Bay Air Resources District	Monterey Bay Air Resources District	Program start date in August, 2019	https://www.mbard.org/monterey-bay-electric-vehicle-incentive-program
	IRS Federal Tax Credit	IRS	$7,500 tax credit – Seller can pass to gov't agencies	https://www.fueleconomy.gov/feg/taxevb.shtml
	CALIFORNIA AIR RESOURCES BOARD Low Carbon Fuel Standard Credits	**Fleets:** California Air Resources Board	Fleets can sell credits	https://www.arb.ca.gov/fuels/lcfs/lcfs.htm
		Individuals: PG&E	$800 rebate provided via PG&E	https://www.pge.com/en_US/residential/solar-and-vehicles/options/clean-vehicles/electric/clean-fuel-rebate-for-electric-vehicles.page

Medium / Heavy-Duty	Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP)	California Air Resources Board	First Come, First Served Up to $150,000+ $30,000 charger	https://www.californiahvip.org/
	Carl Moyer Funds / AB 923 / AB 617	Monterey Bay Air Resource District	Opportunities vary by year, contact Alan Romero at Monterey Bay Air Resources District at aromero@mbard.org or (831) 718-8030	
	Volkswagen Mitigation Trust	Volkswagen	$130 million available for transit/school/ shuttle EV Buses. 50% for DACs.	https://www.arb.ca.gov/msprog/vw_info/vsi/vw-mititrust/vw-mititrust.htm

Transit / Schools	Carl Moyer Funds / AB 923 / AB 617	Monterey Bay Air Resource District	Opportunities vary by year, contact Alan Romero at Monterey Bay Air Resources District at aromero@mbard.org or (831) 718-8030	
	NoLo and 5310 grants	US Department of Transportation	Can fund 80-90% costs, only for qualified vehicles	https://bit.ly/2mtjWeT, https://bit.ly/2LQKkf9

Fleet Sheet

Cat	Model	Manufacturer	Fuel Type	Class/GVWR	Electric Range	Battery Size	Retail Price	HVIP	Link
Light/Medium Pickup trucks									
LDVs	W-15	Workhorse	PHEV	7,200 lbs	80mi	60 kWh (Panasonic Li-Ion)	$52,000	N/A	http://workhorse.com/pickup/
	Bison	Havelaar	BEV					N/A	http://www.havelaarcanada.com/bison/
Work/Single Unit Truck									
Class 6	Work Truck	Motiv	BEV	14,500 lbs.	up to 85 or 100 miles	106 / 127 kWh (Motiv EPIC)		$80-95K	http://www.motivps.com/motivps/portfolio-items/work-truck/
Class 4	Electric Utility Vehicle-Zeus	Phoenix	BEV	14,500lb	Up to 100 mi	105 kWh (Chasis: Ford E450)	~$212K	$80,000	http://www.phoenixmotorcars.com/products/#1505308785414-38579dc5-df17
Box trucks									
Light	eCanter	FUSO	BEV	~15,000lb	100 mi	90 kWh			https://www.daimler.com/products/t
Class 4	Box Truck	Motiv	BEV	14,500lb	up to 100 miles	106 or 127 kWh		$80,000	http://www.motivps.com/motivps/portfolio-items/box-truck/
Class 5	T5	BYD	BEV	16,000lbs GVWR	155 mi	145 kWh (Iron-Phosphate)	$165,000	$80,000	http://en.byd.com/usa/wp-content/uploads/2017/06/t5-final.pdf
Class 6	T7	BYD	BEV	23,600lbs GVWR	124 m	175 kWh (Iron-Phosphate)	$195,000	$90,000	http://en.byd.com/usa/wp-content/uploads/2017/06/t7-final.pdf
Passenger Van									
		Zenith	BEV	10,050 lbs	80-135	51.8 - 70 kWh (LiFePO4)		$50,000	http://www.zenith-motors.com/wp-content/uploads/2013/05/Brochure122017.pdf
Step/Walk-in Van									
Class 4	E-Gen	Workhorse	PHEV	14,500/ 19,500/ 23,500 lbs.	Up to 100 Miles	123 KWhr		NA	http://workhorse.com/stepvans
Class 5	E-100	Workhorse			100 Miles	123 KWhr	$133,000	80,000.00$	https://wattev2buy.com/electric-vehicles/workhorse-electric-vehicles-nasdaq-wkhs/workhorse-e-100-ev-truck-specs-range-battery-price/
Class 4-6	Step Van	Motiv	BEV	22,000 lbs	Up to 90mi	106 – 127 kWh		$80-95K	http://www.motivps.com/motivps/portfolio-items/walk-in-van/
	E Step Van	Zenith	BEV	22,000 lbs	85-95 miles	100 kWh (LiFePO4)		N/A	http://www.zenith-motors.com/wp-content/uploads/2013/05/Brochure122017.pdf
Panel Van									
MDV	N-Gen	Workhorse	PHEV	10,000 lbs GVWR	100 mi				http://workhorse.com/ngen
	E Cargo Van	Zenith	BEV	10,050 lbs	80-135 mi	51.8 - 70 kWh (LiFePO4)		$50,000	http://www.zenith-motors.com/wp-content/uploads/2013/05/Brochure122017.pdf
	V8100	Chanje	BEV	6,000 lbs (payload)	150 mi	13.2 kWh (onboard charger)	$145-170K	$80,000	https://chanje.com/vehicles/
Yard tractors									
	Terminal	BYD	BEV	102,000 lbs GCWR	15 hours	209 kWh (Iron-Phosphate)		$150,000	http://en.byd.com/usa/wp-
	T Series	Orange EV	BEV	81K lbs GCVW		Sized to meet the needs of your site.		$150,000	https://orangeev.com/t-series-new/
Combination Tractors									
Sleeper	Semi Truck	Tesla	BEV	Class 8, 80,000 lbs	300 miles				https://www.vox.com/2017/11/16/16665266/tesla-electric-truck-announced-self-
	Nikola One	Nikola	Hydrogen	Class 8, 18,000 - 21,000 lbs	500-1,000 miles	240 kWh -320 kWh			https://nikolamotor.com/one#motor-specs-bottom
Daycab	T9	BYD	BEV	Class 8, 120,000 lbs GCWR	92 mi	188 kWh (Iron-Phosphate)	$300,000	$150,000	http://en.byd.com/usa/wp-content/uploads/2017/06/t9-final.pdf
	Nikola Two	Nikola	Hydrogen	Class 8, 18,000 - 21,000 lbs	500-1,000 miles	240 kWh -320 kWh			https://nikolamotor.com/two#motor-specs-bottom
Transit buses									
	K7	BYD	BEV	22,487 lbs (Curb Weight)	135 miles	195.6 kWh		$101,000	http://en.byd.com/usa/bus/k7-electric-transit-bus/

30 Ft	EV250	GreenPower	BEV		175 mi	210 kWh (LiFePO4)			http://www.greenpowerbus.com/product-line/
35 Ft	K9S	BYD	BEV	29,217 lbs (Curb Weight)	≥230 miles	350 kWh		$126,000	http://en.byd.com/usa/bus/k9s-electric-transit-bus/
	XE35	New Flyer		29,300 lb (Curb Weight)		(Rapid Charge) 100 kWh - 200 kWh (Long Range Charge) 280 kWh - 454 kWh		$122,000	https://www.newflyer.com/buses/xcelsior-charge/
	BE35	Proterra	BEV	39,500 lbs	Up to 276, depending on configuration	up to 440 kWh depending on configuration		$120,000	https://www.proterra.com/products/35-foot-catalyst/
	EV300	GreenPower	BEV		175 mi	260 kWh (LiFePO4)			http://www.greenpowerbus.com/product-line/
40 Ft	XE40	New Flyer		30,500 lb (Curb Weight)		(Rapid Charge) 100 kWh - 200 kWh (Long Range Charge) 280 kWh - 545 kWh		$152,000	https://www.newflyer.com/buses/xcelsior-charge/
	K9	BYD	BEV	30,865 lbs (curb weight)	≥255 mi	500 kWh		$150-156K	http://en.byd.com/usa/bus/k9-electric-transit-bus/#specs
	BE40	Proterra	BEV	43,650 lbs	Up to 390 depending on configuratoin	up to 660 kWh depending on configuration		$150,000	https://www.proterra.com/products/40-foot-catalyst/
	EV350	GreenPower	BEV	31,320 lbs (Curb Weight)	185 mi	320 kWh (LiFePO4)		$150K	http://www.greenpowerbus.com/product-line/
45 Ft	EV400	GreenPower	BEV		185 mi	320 kWh (LiFePO4)			http://www.greenpowerbus.com/product-line/
60 Ft	K11	BYD	BEV	48,822 lbs (Curb Weight)	230 miles	652 kWh		$175-181K	http://en.byd.com/usa/bus/k11-electric-transit-bus/#specs
	XE60	New Flyer		45,500 lb (Curb Weight)		(Rapid Charge)250 kWh (Long Range Charge) 640 kWh - 818 kWh			https://www.newflyer.com/buses/xcelsior-charge/
40-45ft Double	EV550	GreenPower	BEV		240 mi	478 kWh (PG Porous Polymer Graphene)		$150K	http://www.greenpowerbus.com/product-line/
Buses - shuttle									
Class 4	Shuttle Bus	Motiv	BEV	14,500 or 22,000 lbs	Up to 90mi	106 or 127 kWh		80,000.00$	http://www.motivps.com/motivps/portfolio-items/shuttle-bus/
36.5 Ft	Synapse Shuttle	GreenPower	BEV		75 -140 mi	100 kWh - 200 kwh Li-Ion, (NMC or LiFePO4)		$120,000	http://www.greenpowerbus.com/product-line/
27 Ft	EV27	AVM	BEV	24k GVWR; 17,645 curb weight	200 mi	46-210 kWh		NA	https://static1.squarespace.com/static/5a131611d74cff363a3cc76b/t/5ade5f4a70a6ad52326b8528/1524522828365/AVM_Spec+Sheet_Website_2+18+18+style+guide+update040b8b1482d87894d83e0b58005745308d023bd2c38fba1cfc2bec8027c44f1f.compressed.pdf
Class 4	Zeus	Phoenix	BEV	14,500 lbs.	100 mi	105 kWh (Chasis: Ford E450)		$80,000	http://www.phoenixmotorcars.com/products/#1504526529831-d1c9ab72-86fe
Buses - motor coach									
23 Ft	C6	BYD	BEV	13,779 lbs curb weight	Up to 124 miles	121 kWh		$80,000	http://en.byd.com/usa/bus/c6-electric-motor-coach/
25 Ft	EV Star	GreenPower			125 - 200 mi	70 kWh - 95 kWh Li-Ion (NMC)			http://www.greenpowerbus.com/product-line/
40 Ft	C9	BYD	BEV	36,376 lbs curb weight	Up to 200 miles	352 kWh		$150,000	http://en.byd.com/usa/bus/c9-electric-motor-coach/#specs
45 Ft	C10	BYD	BEV	42,990 lbs curb weight	Up to 230 miles	446 kWh			http://en.byd.com/usa/bus/c10-electric-motor-coach/
Buses - school									
	EPIC 4 Trans Tech	Motiv	BEV	14,500 lbs.	up to 85 miles	106 kWh		NA	http://www.motivps.com/motivps/portfolio-items/typeaschoolbus/
Type A	Micro Bird G5 (CHEVY/GMC)	Blue Bird/Adomani /EDI	BEV	12,300 lbs / 14,200 lbs	100mi	600 & 770 CCA			https://blue-bird.com/buses/microbird/micro-bird-g5

Type C	Micro Bird G5 (Ford)	Blue Bird/Adomani /EDI		11,500 lbs /14,500lbs	100 mi	118 kWh		220,000.00$	https://www.businesswire.com/news/home/20180407005037/en/Blue-Bird-Electric-School-Buses-Road-
	Synapse 72	GreenPower	BEV		75 -140 mi	100 kWh - 200 kwh Li-Ion, (NMC or LiFePO4)		220,000.00$	http://www.greenpowerbus.com/product-line/
	Saf-T-Liner	Thomas Built/EDI	BEV		100 mi	100-160 kWh			https://thomasbuiltbuses.com/bus-news-and-events/news/thomas-built-buses-debuts-new-saf-t-liner-2017-1104/
	EPIC 6 Starcraft	Motiv		22,000 lbs	up to 90 miles	127 kWh		150,000	http://www.motivps.com/motivps/portfolio-items/typecschoolbus/
	eLion	Lion	BEV	30,000 lbs.	50-100mi	LG Chem - Lithium-ion (NMC)		220,000.00$	https://thelionelectric.com/documents/en/technical%20spec.pdf
Type D	All American	Blue Bird/Adomani /EDI	BEV	up to 36,200 lbs	up to 120 miles				https://www.blue-bird.com/Uploads/Public/Documents/electric-re-spec-sheet1.pdf
	Synapse 72	GreenPower	BEV		75 -140 mi	100 kWh - 200 kwh Li-Ion, (NMC or LiFePO4)		220,000.00$	http://www.greenpowerbus.com/product-line/

APPENDIX C: Potential Fleets for Electrification in Monterey Bay

With the help of FleetSeek, a spreadsheet provided by MBARD from previous outreach efforts, and other relevant data sources, and contacted over 100 of the largest fleets throughout the three Monterey Bay area counties the results of this effort can be found in a publicly accessible spreadsheet available here.