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ENERGY COMMISSION**



California Energy Commission
Clean Transportation Program

FINAL PROJECT REPORT

The Bay Area Charge Ahead Project 2

**A Project of the California Electric Vehicle
Alliance**

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California Energy Commission

Richard Schorske

Primary Author

California Electric Vehicle Alliance

2605 Albany Avenue

Davis, CA 95618

Agreement Number: ARV-13-032

Lindsee Tanimoto

Commission Agreement Manager

Mark Wenzel

Office Manager

ADVANCED VEHICLE INFRASTRUCTURE

Hannon Rasool

Deputy Director

FUELS AND TRANSPORTATION

Drew Bohan

Executive Director

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 - City of Hayward
 - City of Richmond
 - Town of Yountville
 - City of Petaluma
 - City of San Leandro
 - Napa County Transportation and Planning Authority
 - Barker Pacific

PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC 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 about \$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 nonroad 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 CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued PON-13-606 to provide funding opportunities for the development of a region-wide electric vehicle charger network. In response to PON-13-606, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards and the agreement was executed as ARV-13-032 on December 31, 2016.

ABSTRACT

The Bay Area Charge Ahead Project 2 installed 38 dual-port electric vehicle charging stations with 76 Level 2 ports in eleven cities at 25 separate sites located in the San Francisco Bay Area. Sites were located in the cities of Benicia, Berkeley, Fremont, Hayward, Napa, Novato, Palo Alto, Petaluma, Richmond, San Leandro, Yountville.

The purpose of project was to improve the availability of electric vehicle charging in publicly accessible locations -- thereby promoting the use of plug-in electric vehicles. The project investigated the effect of assessing fees to electric vehicle drivers for use of the charging stations as well as various fee structures. The project also tracked the process and cost of purchasing, installing, operating, and maintaining charging stations.

Site Hosts were predominantly comprised of local government agencies (36 sites), with one privately owned but publicly accessible site. Hosts were selected for the project based on strategic location and ability to commit to ongoing operation of the stations when the project is complete.

Keywords: California Energy Commission, AB 32, plug-in electric vehicles, California Electric Vehicle Alliance, Bay Area Charge Ahead Project, greenhouse gas emissions, charging stations

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TABLE OF CONTENTS

	Page
Acknowledgements	i
Preface	ii
Abstract	iii
Table of Contents	v
List of Figures	vi
List of Tables	vi
Executive Summary	1
CHAPTER 1: The BayCAP Project	5
1.1 Problem Statement	5
1.2 Goals of the Project	5
1.3 Objectives of the Project	5
1.4 Prime Contractor	6
1.5 Major Subcontractor: ABM	6
1.6 Site Hosts	6
1.7 Site Host Agreements	8
1.7.1 Site Host Responsibilities	8
1.8 Installation	9
1.9 Data Collection and Analysis	9
CHAPTER 2: Analysis of Electric Vehicle Charging Data	10
2.1 Pricing Policy	10
2.1.1 Free Charging: Palo Alto Free Stations	10
2.1.2 Analysis	12
2.1.3 Effect of pricing on behavior	12
2.2 Operating Costs Covered by Fees	13
2.3 Multiple Daily Usage Peaks	15
2.4 Profile of a Typical Station	15
CHAPTER 3: Project Outcomes	16
3.1 Provide, install, and provision PEV charging ports in 20 key Destination Sites	16
3.2 Coordinate with local and regional agencies and site owners to support regional plans for PEV charging	16
3.3 Train and support site hosts	16
3.4 Track and measure station adoption and utilization rates	17
3.5 Track and calculate equivalent greenhouse gas emission reductions, air quality improvements, and gasoline displaced by grant funding	17
3.6 Analyze usage trends to plan future station locations	17
3.7 Demonstrate utilization of Level 2 chargers in demand management applications	17

3.8 Support the regional “Experience Electric” Campaign to grow PEV sales.....	17
CHAPTER 4: Conclusions and Recommendations	19
4.1 Installation Process	19
4.1.1 Recommendation	19
4.2 Pricing.....	19
4.2.1 Recommendation	20
4.3 Installation Costs.....	20
4.3.1 Recommendation	20
4.4 Data Collection.....	20
4.4.1 Recommendation	20
Glossary.....	21
APPENDIX A: Site Host Agreement Template	A-1

LIST OF FIGURES

	Page
Figure 1: Energy Expended in 30-Day Period	11
Figure 2: Average Charging Session Timing	12
Figure 3: Total Number of Charging Sessions in 30-Day Period.....	13

LIST OF TABLES

	Page
Table 1: Fees, Energy Delivered, and Maintenance Costs	3
Table 2: List of Site Hosts and Station Locations	7
Table 3: Actual Usage for Each Electric Vehicle Charging Stations.....	14
Table 4: Average Station Usage and Fee Data.....	14
Table 5: Typical Usage Characteristics for BayCAP Charging Ports	15
Table 6: The Second BayCAP Maintenance Plan Discount Pricing Years 1 - 2	A-9

EXECUTIVE SUMMARY

The Bay Area Charge Ahead Project 2 installed 37 dual-port electric vehicle charging stations (for a total of 74 charging ports) in ten communities and twenty separate sites located in the San Francisco Bay Area. The communities included the following:

- City of Benicia
- City of Berkeley
- City of Fremont
- City of Hayward
- City of Richmond
- Town of Yountville
- City of Petaluma
- City of San Leandro
- Napa County Transportation and Planning Authority
- Barker Pacific

Objectives

The Bay Area Charge Ahead Project was designed to promote the increased adoption and use of plug-in electric vehicles by addressing three key challenges to the development of a robust electric vehicle ecosystem: 1) range anxiety; 2) charger siting optimization; and, 3) charge network sustainability. To address these challenges, the project identified sites in high-visibility, high-utilization commercial, workplace, and destination locations. The project team also encouraged implementation of a model use fee policy to ensure that electric vehicle supply equipment was utilized efficiently from the site host perspective yet economically from the driver perspective, and we assessed demand management strategies to help site hosts mitigate possible utility demand charges. In fulfilling the latter objective, we jointly developed a “demand management pilot study” in collaboration with our colleagues at the Bay Area Climate Collaborative / Prospect Silicon Valley, which was lead agency on our sister project, known as the Bay Area Charge Ahead Project 1.

Methodology

Site Hosts included a combination of city and county agencies and private site hosts, were selected for this project based on established need, the ability to provide locations, commitment to continuing the operation of the stations when the project is complete, and the ability to pay for software licenses and additional installation charges (where necessary). ChargePoint supplied the charging stations at a 25 percent discount, which provided most the matching funding. ABM supplied the installation engineering and labor. To clarify mutual obligations, the project lead agency (California Electric Vehicle Alliance) led the collaborative development of a standardized Site Host Agreement signed by ABM and each participating agency prior to installation.

Data Collection

Each charging station supplied usage data via the ChargePoint network and a special ChargePoint account that provided anonymized usage monitoring. The data was collected and

analyzed by California Electric Vehicle Alliance over a period of time to determine usage patterns and energy consumed by plug-in electric vehicles that used the system.

Major Findings

- Once installation was completed, electric vehicle charging stations were put into immediate use. As expected, downtown areas in larger cities showed a higher usage level than lower-density rural and suburban areas. Typical station utilization across the Bay Area Charge Ahead Project 1 and Bay Area Charge Ahead Project 2 projects is indicated below:
 - 4.3 charging sessions per day
 - 31.2 kilowatt-hours delivered per day
 - 7.26 kilowatt-hours delivered per session
 - 61.3 unique users per month
- Total installation costs billed by ABM were substantially under the budgeted amount, and an additional electric vehicle station was installed beyond the CEC contracted number, which was 37. However, individual site costs varied substantially from the average site costs, with approximately 50 percent of sites being below the anticipated costs, and half above. The higher cost scenarios were due largely to inadequate electrical service at the sites. In many cases the site locations had to be changed and this caused delays in the project due to multiple site visits and related amendments of various site host agreements. In some cases, the cities decided to provide additional funding to cover unanticipated expenses related to electrical service upgrades.
- The permitting process varied widely from jurisdiction to jurisdiction. In some cases, the permit process was very smooth but in others there was a longer process that required engineering documents to be provided before the permit was issued. Engineering documents can represent a significant expense of several hundred dollars or more per site and can be a significant factor in adding unnecessary delay and site host cost.
- Fees assessed for charging vehicles had a pronounced positive effect on the availability of charging stations for multiple daily sessions, and they appear to cover the cost of operation and maintenance based on the initial data available. The project required that the site host have a plan for maximizing the use and availability of the charging stations that were installed as part of the project. Most cities adopted the standardized pricing approach developed as a guideline by the Electric Vehicle Alliance. While the project partners did not dictate the price nor the pricing strategy, the most widely adopted strategy was the recommended approach of basing the fee on the amount of time the vehicle is connected to the charging station. The time-based fee structure was, in most cases, augmented by time limit after which the hourly fee was increased. Other possibilities included a one-time “connection” fee, an energy-use based fee, or a combination of time-based and energy-based connection fees. Table 1 shows amount of fees assessed, energy delivered, and maintenance costs for 29 stations that assessed access fees for electric vehicle charging over a 3-month period.

Table 1: Fees, Energy Delivered, and Maintenance Costs

Connection Duration	9,570 Hours
Charging Time	6,406 Hours
Energy Delivered	12,436 kilowatt-hours
Fees Collected	\$12,560
Estimated Electricity Cost (at \$0.20 / kilowatt-hour) ¹	\$2,487
Maintenance Costs (service contract)	\$3,900
Estimated Net (Fees Collected – Operations and Management)	\$6,173
Estimated annual net profit per station, before demand charges, if any	\$851

Source: ChargePoint Network.

Recommendations

- 1. Encourage site hosts to assess fees for charging to maximize availability to drivers actually in need of charging (and not merely in need of a parking space).** The most effective fees are time-based fees (e.g.: \$1.00+ per hour) with an increase in the hourly amount after a period of time, usually 2-4 hours. Other methods of ensuring maximum availability of the charging station to drivers in need include limiting the amount of time to park at the station (by law or by escalating fees). This approach discourages casual “opportunity use” whereby a driver may park the vehicle at the charging station in order to get a desirable parking spot even though the vehicle may not need to be charged.
- 2. Encourage lower-cost and streamlined permitting to minimize project complexity, cost, and time-to-completion.** Some local governments have already streamlined the permitting process and treat electric vehicle supply equipment in the same manner as any electrical appliance. In these cases, “over the counter” permits and self-inspection of finished work was typically accepted. In other locations, the permitting process required extensive electrical engineering documents that required multiple site visits as well as visits to the permitting agency and a final inspection before activation of the charging station.
- 3. Leverage cost sharing with public utilities to reduce installation costs to site hosts.** In several cases there was insufficient electrical service to economically install the electric vehicle supply equipment at originally identified host sites. In some cases,

¹ Pacific Gas and Electric Company tariffs in use vary, however the most common tariffs are A-1, A6, A-10, and E-19 which offer a range of electrical costs from \$0.08 to \$0.54 per kilowatt-hour based on time-of-use and rate schedule. For purposes of the analysis a high estimated average cost of \$0.20 / kilowatt-hour was used based on actual rates charged during the analysis period. The calculations do not include demand charges which can vary significantly based on the total load associated with the meter serving the electric vehicle supply equipment.

this resulted in charging station be located in less desirable locations. The investor-owned utilities have proposed adding the cost of electric vehicle supply equipment-related electrical service upgrades and pre-wiring to the rate base, which would provide funding to run service, conduit, and wiring to potential charging station locations. Implementation of these proposals will reduce the cost to property owners and accelerate deployment of new electric vehicle supply equipment.

- 4. Encourage use of smart charging platforms and services,** such as the eMotorWerks JuiceNet platform. As the electrical grid shifts toward renewables, and peak leveling becomes increasingly important to mitigate demand charges, electric vehicle charging will play an important part in balancing the supply and demand of electricity on the grid. A number of companies are pursuing smart charging pilots and operating programs with the utilities that will enable utilities and electric vehicle service providers – to modulate charging within customer-defined parameters. One such electric vehicle supply providers, known as eMotorWerks, operates a service called JuiceNet that provides drivers with approximately \$100 per year in return for providing some flexibility to modulate charging at times of peak demand and low-cost supply.

CHAPTER 1:

The BayCAP Project

1.1 Problem Statement

Since the passage of California Assembly Bill 32, counties, municipalities, and regional public agencies have sought ways to reduce greenhouse gas emissions across all key sectors of the economy, especially the transportation sector, which accounts for approximately 53 percent of regional emissions. In support of these emissions reduction goals, the Bay Area Charge Ahead Project (BayCAP) was developed to support build-out of a robust region-wide charging network for plug-in electric vehicles (PEVs), aligned with the PEV Readiness Plan completed under the oversight of the Bay Area Electric Vehicle Strategic Council and the Bay Area Air Quality Management District. The Readiness Plan revealed an immediate need for 1,000-2,000 more publicly accessible charge ports in the region to accommodate the rapid growth in PEVs (expected to reach more than 100,000+ by 2020).

1.2 Goals of the Project

The goals of the second BayCAP project were to:

- Develop a ubiquitous, convenient, sustainable, and well-maintained region wide PEV charger network
- Reduce greenhouse gas emissions and improve air quality
- Increase market penetration of PEVs

1.3 Objectives of the Project

The objectives of the second BayCAP project were to cost-effectively achieve the following:

- Provide, install, and provision PEV charging ports in 20 key Destination Sites - in locations that are easily accessible to the public, safe, well lit, well maintained, and likely to be well-utilized.
- Coordinate with local and regional agencies and site owners to support regional plans for PEV charging and integrate with California's network of existing and planned stations.
- Train and support site hosts on siting, Americans with Disabilities Act access, usage of station hardware and software, operations and management, and pricing strategies to enable site hosts to generate adequate revenue to cover operations and management costs, maximize station usage, reliability, and "up-time," and to ensure customer convenience.
- Track and measure station adoption and utilization rates over the duration of the project.
- Track and calculate equivalent greenhouse gas emission reductions, air quality improvements, and gasoline displaced by grant funding, with special reference to air quality in disadvantaged communities.
- Analyze usage trends to plan future station locations in the region based on siting principles and data in the Bay Area PEV Readiness Plan.
- Demonstrate utilization of Level 2 chargers in demand management applications that enable site hosts to minimize energy costs and manage grid impacts.

- Support the regional “Experience Electric” Campaign to grow PEV sales, achieving the regional goal of 100,000 electric vehicles deployed by 2020.

1.4 Prime Contractor

The California Electric Vehicle Alliance was the Prime Contractor for the second BayCAP project. The Alliance was responsible for administration, reporting and invoicing, data collection and analysis, providing site host personnel training, and this final report. The California Electric Vehicle Alliance provided coordination between the Major Subcontractor and the Site Hosts.

1.5 Major Subcontractor: ABM

ABM was chosen to be the Major Subcontractor for the BayCAP project. ABM is a ChargePoint distributor, reseller, and installer. ABM provided the charging stations, site engineering, installation, and commissioning of the charging stations. ChargePoint, the manufacturer of the charging stations, provided a 25 percent discount on the stations, which was passed through by ABM to the project in the form of matching funds. ABM also provided matching funds in the form of reduced maintenance pricing and warranty costs.

1.6 Site Hosts

Site Hosts – including nine public agencies and one private entity – provided the locations for the charging stations to be installed. The Site Hosts were identified prior to the grant award based on the need for charging stations, available locations that met the objectives of the grant, and commitment to provide necessary permits and funds to operate and maintain the charging stations for the duration of the project.

Although locations were specified prior to the grant award, it was necessary to change some of the locations due to inadequate electrical service and / or prohibitively high installation cost and complexity. A list of Site Hosts and Station Locations is found in Table 2.

Table 2: List of Site Hosts and Station Locations

Charging Station Address	Site #	Charge Ports	Station #	# of Electric Vehicle Supply Equipment on Site
Benicia - City Hall (L Street)	1	2	1	1
Benicia - Bus Hub (Industrial Way)	2	2	2	1
Richmond - Public Library (450 Civic Center Plaza)	3	2	3	1
Napa - Park and Ride Lot (corner of California & Solano Ave)	4	4	4 - 5	2
Napa - Socol Gateway Transit Center (625 Burnell Street)	5	4	6 - 7	2
San Leandro - Downtown Parking Garage (122 Estudillo Ave)	6	4	8 - 9	2
San Leandro - Water Pollution Plant (300 Davis St.)	7	2	10	1
Yountville - Community Center (6515 Washington St.)	8	2	11	1
Yountville - Town Hall (6550 Yount Street)	9	2	12	1
Petaluma - City Hall West (11 English Street)	10	4	13 - 14	2
Petaluma - Community Ctr. (320 North McDowell Blvd.)	11	4	15 - 16	2
Petaluma - Keller Garage (99 Keller Street)	12	2	17	1
Novato - Hangar 3 (3 Hamilton Landing)	13	2	18	1
Novato - Hangar 5 (3 Hamilton Landing)	14	2	19	1
Novato - Hangar 7 (3 Hamilton Landing)	15	2	20	1
Novato - Hangar 9 (3 Hamilton Landing)	16	2	21	1
Hayward - Executive Airport (20301 Skywest Dr.)	17	2	22	1
Fremont - Development Services (39550 Liberty St.)	18	2	23	1

Charging Station Address	Site #	Charge Ports	Station #	# of Electric Vehicle Supply Equipment on Site
Fremont - Central Park (1 Sailway Drive)	19	2	24	1
Fremont - Downtown Curbside (3600-3800 Capitol Ave)	20	12	25 - 30	6
Berkeley - Oxford Garage (Kittredge St.)	21	4	31 - 32	2
Berkeley - Telegraph & Channing Garage (2450 Durant)	22	6	33 - 35	3
Berkeley - Marina Parking Lot (201 University Ave)	23	2	36	1
Berkeley - West Branch Berkeley Library (1125 University Ave.)	24	2	37	1
Palo Alto - City Parking Garage (528 High Street)	25	2	38	1
TOTAL # of Sites	25			
TOTAL # of Charging Ports		76		
Total # of Stations				38

Source: ChargePoint Network.

1.7 Site Host Agreements

Each of the Site Hosts signed a Site Host Agreement with the Major Subcontractor prior to the installation of the charging stations. The Site Host Agreement set forth the terms and conditions for installing the charging stations.

1.7.1 Site Host Responsibilities

- Provide the locations for the charging stations that met the objectives of the project in terms of public access.
- Provide building permits for installing the stations.
- Provide electricity for powering the stations and charging the electric vehicles.
- Procure software licenses required by the charging station manufacturer. The software gives the site hosts network access to each charging station to control user authentication, access fees, and usage data.
- Pay for out-of-scope installation expenses where needed to install in originally identified location – or provide alternative location within original cost parameters.

1.8 Installation

Once site locations were finalized and Site Host Agreements were completed, and permits obtained, ABM proceeded to install the charging stations. Following permitting, the installation of the charging stations typically required one to two weeks including commissioning of the stations. However, the entire installation process took nearly two years to complete due to these factors:

- Lengthy negotiation and review period for completion of many of the Agreements with city attorneys
- Identification of electrical capacity requirements and (in some cases) utility service upgrades
- Authorization of additional funds (in some cases where needed) to complete the installation process
- Permitting
- Identification of new sites (in some cases) due to cost and complexity issues associated with the initially chosen sites.

The Major Subcontractor worked with each Site Host individually and completed the installation at each site as it became available. Thus, many of the stations began operation early in the project while some were installed closer to the end of the project.

After each charging station was installed, commissioning was required. This process involved testing and connection (typically via cellular networks) to the ChargePoint Network. Once commissioned, the station was immediately available for use by the public.

1.9 Data Collection and Analysis

Each charging port provides usage information through the ChargePoint Network. The usage information includes a timestamp for plugging in, plugging out, energy consumed (kilowatt-hour), and duration of energy delivery. Note that the duration of energy delivery does not necessarily correspond to the amount of time that the vehicle was plugged in. For example, a PEV may require only an hour of charging but may be plugged in for five hours.

ChargePoint provides access to the usage data through a web portal and a sophisticated report generation system. Under normal circumstances, data from the stations is available only to the owners of the stations. However, for the BayCAP project a special ChargePoint account was created that allowed the Prime Contractor to aggregate data from all of the stations that were installed as part of the BayCAP project.

CHAPTER 2:

Analysis of Electric Vehicle Charging Data

2.1 Pricing Policy

BayCAP required that participating agencies or site hosts devise a means to ensure that electric vehicles were moved to a different parking spot once charging was complete. The underlying purpose of this requirement was to ensure that the charging stations were available to those most in need of charging and to encourage drivers to vacate stations when charging needs were satisfied. A secondary goal was to discourage electric vehicles that did not need to be charged from parking in an electric vehicle parking spot. In areas where parking is difficult to find, many electric vehicle drivers choose charging station equipped parking spots even though they do not actually need to charge their vehicles.

To accomplish these goals, it was recommended that the site hosts develop a policy to charge a fee for charging vehicles, and that fees increase after a certain period of time and/or after the vehicle is fully charged.

The ChargePoint charging stations and ChargePoint network that were used in the project provide a simple and flexible means for site hosts to establish fees. The fees can be based on any or all of the following criteria:

1. Connection time (how long the vehicle is connected to the station regardless of whether the vehicle is charging or fully charged);
2. Energy delivered (kilowatt hours delivered to the vehicle);
3. A one-time connection fee

These three fee schemes can be combined. For example, a site host could establish a connection fee of \$1.25 plus an energy fee of \$.25 / kilowatt-hour (as in the case of the City of San Jose). Also, the ChargePoint system provides a means of increasing the fee after a certain period of time.

Most agencies chose to charge a parking fee (hourly fee) plus an energy fee. In some cases, they chose to increase the parking fee after a reasonable time of 2-4 hours. This encourages the owner to move the vehicle once the charging is complete. However, two of the agencies across the two BayCAP sister projects (the first BayCAP – managed by the bay Area Climate Collaborative – and the second BayCAP managed by the Electric Vehicle Alliance) did not charge a fee for the use of the charging stations. Palo Alto (in the first BayCAP) had an installed base of charging stations that had been historically offered at no charge to users, and City staff concluded that it did not make sense to charge for some stations and not for others. The City of Berkeley – which is of similar size and electric vehicle density – chose to implement a fee. Both cities have a dense downtown core with municipal parking garages where the charging stations are installed. The demographics of both cities are similar. But while Palo Alto does not charge a fee, Berkeley implemented a fee structure.

2.1.1 Free Charging: Palo Alto Free Stations

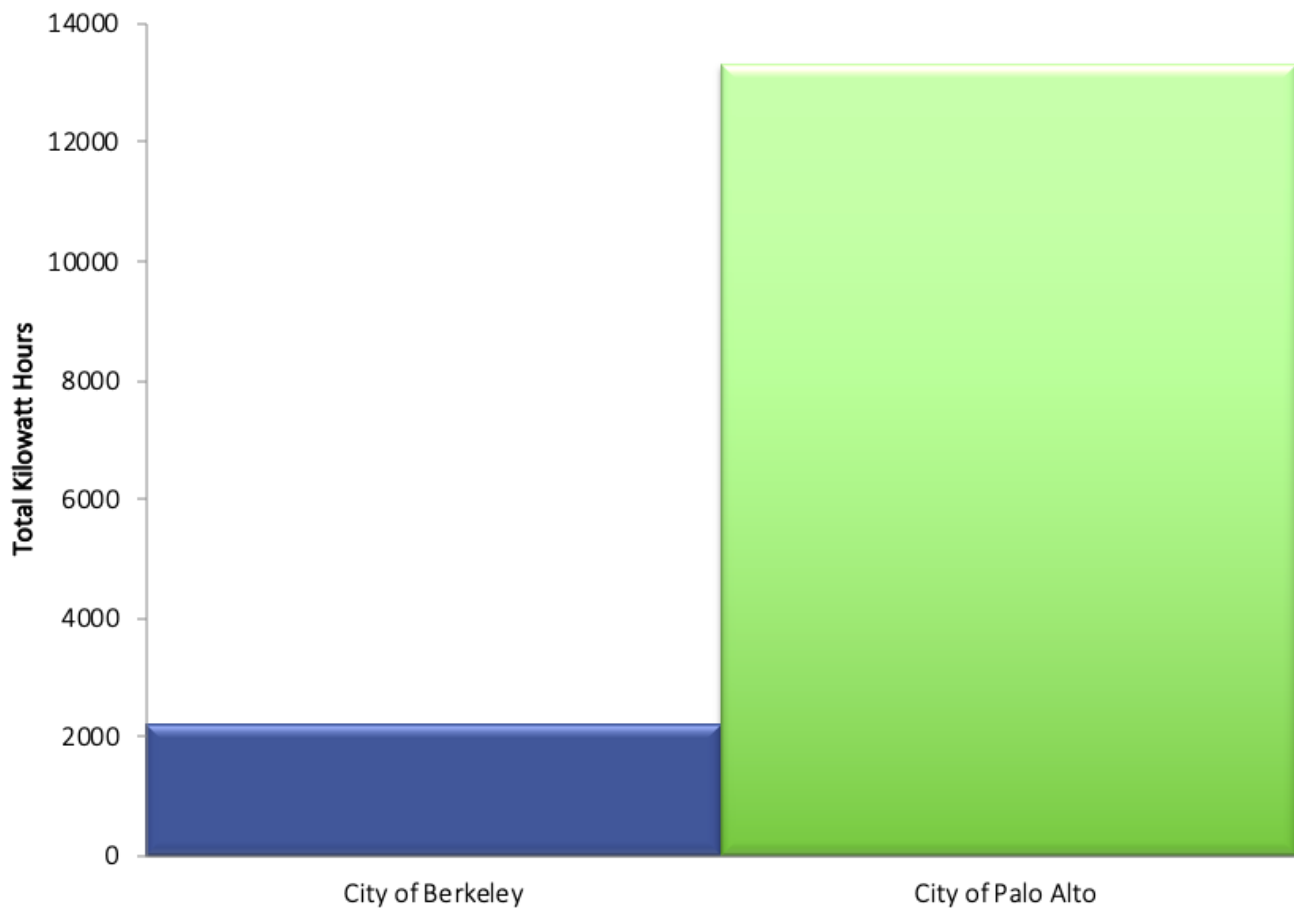
The City of Palo Alto is currently providing free charging to residents. As a result, the six stations in Palo Alto from the first BayCAP are much more highly utilized than any other

stations in the two BayCAP projects. However, electric vehicles in Palo Alto stayed at the charging stations longer and there were fewer “unique users” during the analysis period than comparable stations, which implies that longer dwell times may have resulted from free usage.

To illustrate the effect of free charging on overall utilization, we compared overall usage for the six Palo Alto stations over a 30-day period compared to the six BayCAP stations in the City of Berkeley. As mentioned above, in both cases the stations are located in downtown areas where parking is competitive, however the average charging session in Berkeley was just over an hour and a half and costs \$3.01 compared to charging in Palo Alto, which was free and lasted as much as 4 hours.

Palo Alto’s six BayCAP stations accommodated 1376 more charging sessions than the City of Berkeley’s six stations, expending 11,086 kilowatt-hours of electricity more than in Berkeley stations (Figure 1).

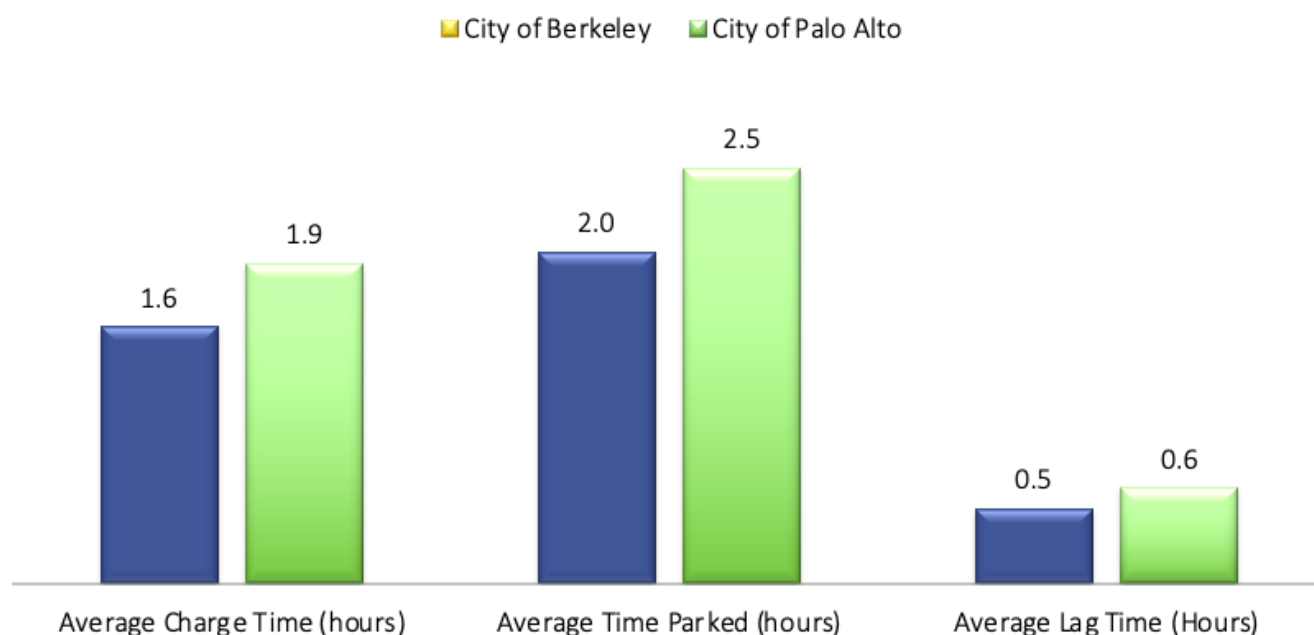
Figure 1: Energy Expended in 30-Day Period



Source: ChargePoint Network.

In Palo Alto, the average charging session lasts 23 minutes longer, and vehicles remain parked at stations 31 minutes longer than at Berkeley stations (Figure 2).

Figure 2: Average Charging Session Timing



Source: ChargePoint Network.

2.1.2 Analysis

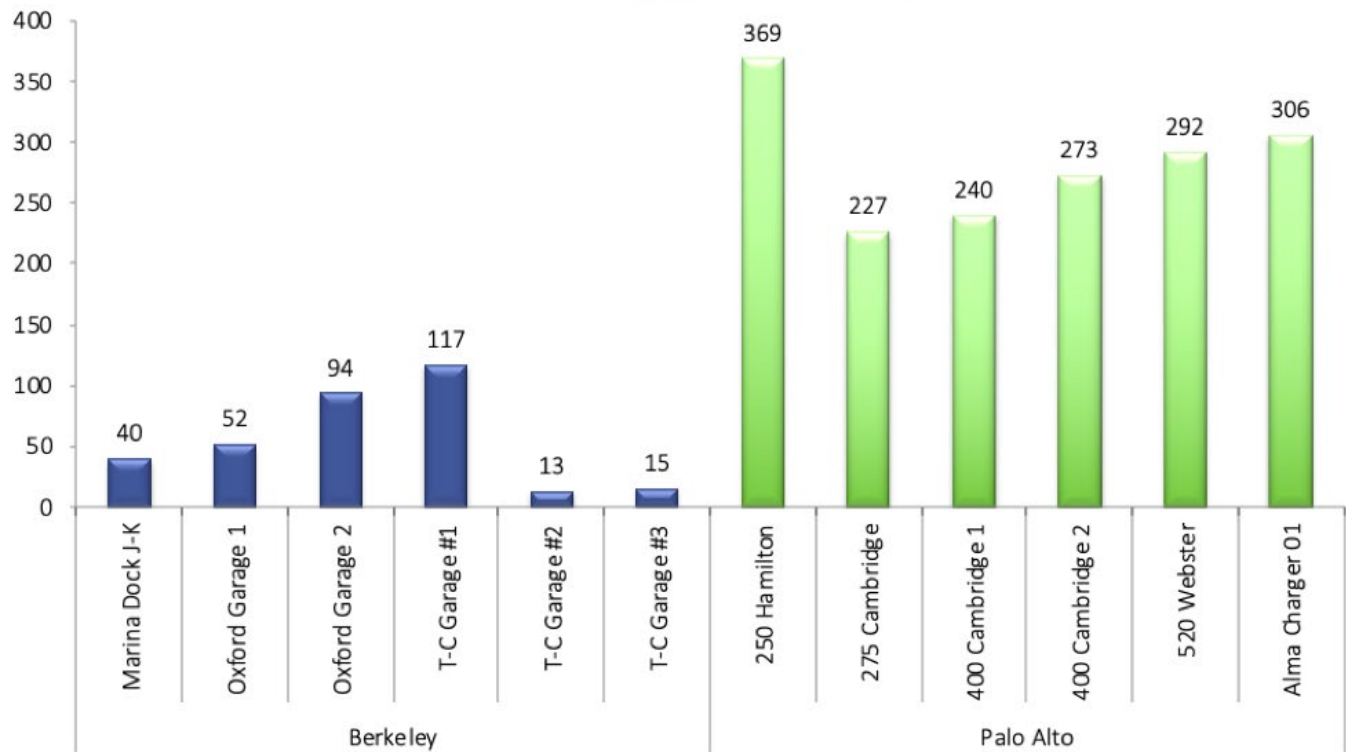
This data indicates that charging a fee results in lower usage of the electric vehicle charging stations. However, high utilization is not inherently better. It can be inferred that charging stations in Berkeley are *more available* for use by electric vehicles that genuinely need to be charged rather than by electric vehicles that are taking advantage of the parking spots reserved for electric vehicles in crowded parking garages. Further investigation revealed that electric vehicle owners who lived in or near downtown Palo Alto were taking advantage of the free charging by parking their cars overnight at city-owned charging stations. This information is based on data showing that the same vehicles used the same location on a nightly basis and remained plugged in overnight. This may reflect on the fact that most residential housing in downtown Palo Alto is in multi-unit developments, most of which do not have charging stations installed in their parking garages. If this assumption is correct, it leads to the conclusion that there remains an unmet need for electric vehicle charging at multi-unit dwellings.

2.1.3 Effect of pricing on behavior

One of the key benefits of fee-based charging is that it encourages owners to move their vehicles once charging is complete. Note that in Berkeley the average time parked was 30 minutes less than in Palo Alto. It is believed that Palo Alto lag times would have been even higher if they did not have a 4-hour parking limitation for all their downtown garages.

2.2 Operating Costs Covered by Fees

Figure 3: Total Number of Charging Sessions in 30-Day Period



Source: ChargePoint Network.

While the cost of charging station acquisition and installation was largely covered by the CEC through BayCAP, property owners in the program were required to cover the cost of maintaining and operating the stations. This is an additional reason why property owners are encouraged to charge a fee for electric vehicle charging. Data collected from the property owners that are assessing charging fees show that the fees will cover the cost of Maintenance and Operation. At the time that the data analysis was undertaken, eight organizations that were assessing fees had three or more months of usage data available, and three organizations that were not assessing fees had three or more months of usage data available. We used these data sets to illustrate how assessing fees can offset the cost of maintenance and operations.

Average station usage and fee data for eight organizations that are assessing charging fees. (29 stations, 58 ports monitored between April 23, 2016 and July 22, 2016).

Table 3 shows the actual usage by station over the three-month analysis period for the eight cities that were assessing fees for electric vehicle charging in the BayCAP sites assessed. Note that several cities have multiple stations.

Table 3: Actual Usage for Each Electric Vehicle Charging Stations

Connection Duration	9,570 Hours
Charging Time	6,406 Hours
Energy Delivered	12,436 kilowatt-hours
Fees Collected	\$12,560
Estimated Electricity Cost (@ \$0.20 / kilowatt-hour) ²	\$2,487
Maintenance Costs (service contract)	\$3,900
Estimated Net (Fees Collected – Operations and Management)	\$6,173
Estimated annual net profit per station, before demand charges, if any	\$851

Source: ChargePoint Network.

Table 4 shows the average station usage and fee data for three organizations that are not assessing charging fees. (10 stations, 20 ports monitored between April 23, 2016 and July 22, 2016).

Table 4: Average Station Usage and Fee Data

Connection Duration	14,957 Hours
Charging Time	9816 Hours
Energy Delivered	53,053 kilowatt-hours
Fees Collected	0
Estimated Electricity Cost (@ \$0.20 / kilowatt-hour) ¹	\$10,610
Maintenance Costs (service contract)	\$1,000
Estimated Net (Fees Collected – Operations and Management)	-\$11,610
Estimated annual net loss per station, before demand charges, if any	-\$4,644

Source: ChargePoint Network.

The communities that are assessing fees paid for all operating and maintenance costs and netted an estimated \$850 per year per station. The organizations that are not assessing fees had estimated losses of nearly \$4,644 per year per station.

² Pacific Gas and Electric Company tariffs in use vary, however the most common tariffs are A-1, A6, A-10, and E-19 which offer a range of electrical costs from \$0.08 to \$0.54 per kWh based on time-of-use and rate schedule. For purposes of the analysis a high estimated average cost of \$0.20 / kilowatt-hour was used based on actual rates charged during the analysis period. The calculations do not include demand charges which can vary significantly based on the total load associated with the meter serving the electric vehicle supply equipment.

Due to this finding it is recommended that site hosts assess a fee for charging electric vehicles. If charging stations incur a loss for the site host to maintain and operate, they may be abandoned in future years due to budget constraints.

2.3 Multiple Daily Usage Peaks

Data indicates that most stations have four daily usage peaks: mid-morning, late morning, early afternoon and late afternoon. This suggests that:

- peak demand charges are minimized through distribution of charging demand across the day – if there were a single peak it would likely be much higher which would cause higher demand charges;
- fee-based charging is likely encouraging usage among a variety of use cases (fleet vehicles, shoppers and employees). Employees tend to charge when arriving to work (the first peak), shoppers charge throughout the day (second and third peaks), and fleet vehicles tend to charge at the end of the workday (fourth peak);

usage of energy storage and solar energy would likely be an effective means to curtail facility and grid impacts of the charging stations, especially if implemented in tandem.

2.4 Profile of a Typical Station

One of the goals of BayCAP was to document the usage characteristics of the typical electric vehicle charging station. For this analysis we eliminated some of the stations due to extremely high or low usage levels and averaged the remaining usage statistics. Table 5 shows the usage characteristics for the “typical” charging port in BayCAP (each charging station has 2 charging ports).

Table 5: Typical Usage Characteristics for BayCAP Charging Ports

Average sessions/month:	139 (4.3 / day)
Average energy delivered per session:	7.26 kilowatt-hours
Average greenhouse gas savings per session:	3.05 kilograms
Average charge time per session:	1.76 hours
Average plug-in time per session:	2.39 hours

Source: ChargePoint Network.

CHAPTER 3:

Project Outcomes

The BayCAP lasted nearly three years during which time 37 dual-port charging stations were installed at 20 host sites. These charging stations added 74 Level 2 charging ports in publicly accessible parking lots and parking garages in ten communities in the greater San Francisco Bay Area. The vast majority of these stations are serving more than two charging sessions per day while generating sufficient income for the participating site hosts to continue operating and maintaining the charging stations indefinitely. A description of the project outcomes follows.

3.1 Provide, install, and provision PEV charging ports in 20 key Destination Sites

The project installed 38 charging stations (for a total of 76 ports) at 25 key locations, thereby exceeding the originally mandated total by one station. The site hosts determined the locations that would best serve their communities and customers. The users of the stations varied from community to community. In some cases, the users were people who needed to charge their vehicles while shopping, attending meetings, or going to appointments. In other cases, the users were employees who needed to charge their vehicles while at work. In a few cases, the charging stations are likely being used by residents who do not have access to a charging station at home.

3.2 Coordinate with local and regional agencies and site owners to support regional plans for PEV charging

The project coordinators worked with each community to find sites that supported the overall regional plan. Only one community (St. Helena) originally engaged in the program was not able to follow through on the provision of sites in their community. Sites in the City of Richmond were substituted when St. Helena was unable to perform. The regional plan called for substantial increase in the availability of Level 2 charging stations in publicly accessible parking lots and garages. The project focused on two key areas: 1) areas where the demand for charging was very high – typically downtown areas; and 2) destination sites in more peripheral locations (e.g. the Napa Valley) where electric vehicle drivers did not previously feel comfortable taking their electric vehicles due to lack of charging facilities.

3.3 Train and support site hosts

Most of the site host communities had not yet installed electric vehicle charging stations in their garages and had little experience regarding issues such as Americans with Disabilities Act access, usage of station hardware and software, operations and maintenance, and pricing strategies. The project held a series of training sessions in the form of webinars for the site hosts that covered these topics. In addition, the Major Subcontractor spent time with each site host to train them on remotely managing their charging stations. The result of these training sessions is that all site hosts are now able to manage their stations effectively. Using the ChargePoint network portal, site hosts are able to set pricing, monitor usage, and detect problems that the stations may be encountering. The experience gained during the installation enabled the communities to feel confident in moving ahead with additional charging stations

as well as understand many key issues regarding signage, accessibility, and location determination.

3.4 Track and measure station adoption and utilization rates

The Prime Contractor set up a special ChargePoint Network portal to monitor all stations that are part of the project for usage. As a result of this ability, it was very easy to determine usage in terms of number of sessions per day, amount of energy delivered by each station each day, peak periods, and which stations were being underutilized.

3.5 Track and calculate equivalent greenhouse gas emission reductions, air quality improvements, and gasoline displaced by grant funding

The same special ChargePoint Network portal that is discussed in 3.4 above is used for determining total amounts of energy that is being delivered by the BayCAP charging stations. Analysis of the energy data provides a basis for determining air quality improvements and greenhouse gas reduction based on the amount of fossil fuels that are displaced by electricity.

3.6 Analyze usage trends to plan future station locations

The usage trends show that the dense downtown areas of the site host communities still have insufficient electric vehicle charging capacity. However, many site hosts discovered that they had insufficient electrical service to add more charging stations to the existing locations. The location of future stations will have to be planned around areas with high levels of electrical service or take advantage of emerging utility electric vehicle readiness programs. New or renovated parking garages should be constructed with a plan to add charging stations to a much higher percentage of the available parking spots than current garages can support. This will require a higher level of electrical service and – to reduce future installation costs – pre-wiring parking spots to accept electric vehicle charging stations.

3.7 Demonstrate utilization of Level 2 chargers in demand management applications

This objective was only partially realized. The challenge encountered across the BayCAP and Central Coast Charge Ahead projects is that host sites could not support enough charging stations to engage in demand response programs from the utility companies. On the positive side, demand charges were not an impediment to economical operation of the chargers. The Analysis section shows that average demand was very consistent throughout the day. Had there been very high peaks and low valleys in the demand over the course of a day there may have been more opportunity for developing demand management strategies. Importantly, the use of networked chargers provides the necessary communications channels to determine current use and to manage load in a smart charging environment.

3.8 Support the regional “Experience Electric” Campaign to grow PEV sales

PEV sales grew substantially during the project period. We believe that the availability of charging stations in public parking lots has had a positive effect on consumer confidence in electric vehicles. However, it is noted that there are still insufficient charging stations in the project area to support the number of vehicles that are in the area at a satisfactory ratio of

chargers to electric vehicles. Environments requiring additional charging facilities include multi-dwelling unit housing, large employer parking lots, and the busiest central city locations.

CHAPTER 4:

Conclusions and Recommendations

Analysis of the data collected from the BayCAP Project electric vehicle charging stations indicate that the Charge Ahead projects have been very successful. With only a few exceptions the charging stations are being highly utilized in terms of energy delivered and number of individual sessions per day. The benefit to the Bay Area is that more people can use electric vehicles for their day-to-day driving. This in turn lowers the amount of fossil fuels used and substantially reduces greenhouse gases and other tailpipe emissions.

The following is a list of conclusions and recommendations based on the experience gained from BayCAP.

4.1 Installation Process

Each community had differing requirements for permits and different processes for obtaining the permits and inspections. In some cases, communities did not yet have a process for installation of electric vehicle charging stations. This lack of process and/or complex and time-consuming processes made it difficult to get the charging stations installed.

4.1.1 Recommendation

The State of California could require adoption of uniform guidelines for electric vehicle supply equipment related electrical code, parking requirements, signage requirements, and building inspections. These guidelines could be adopted by each community to streamline the process of installing charging stations.

4.2 Pricing

Most of the host sites were initially in favor of not assessing fees for charging of electric vehicles. The thought process was that free charging would encourage electric vehicle use and many communities who already had charging stations had been following this course of action. In this project it was discovered that assessing a fee for electric vehicle charging had several benefits:

- 1. Encourages drivers to move their cars when it was complete.** This makes the charging station available for other electric vehicle drivers who need to charge.
- 2. Discourages drivers from using the charging station if their car does not need to be charged.** Many drivers will “top up” if there is no cost for using the charging station even when their car may not need to be charged to complete their trip. In areas that have parking shortages, electric vehicle drivers will use the electric vehicle equipped parking spot rather than a non-equipped spot due to availability unless discouraged from doing so by differential fees for parking. Assessing a fee will discourage this behavior and make charging stations available to those who need them.
- 3. Provides funds for operation and maintenance.** Although electricity cost is low, charging stations have additional operating costs including network fees and maintenance costs and extended warranties. Funding maintenance and operation through usage fees provides an ongoing revenue stream to ensure that the charging station does not fall into disrepair or become the victim of budget cutting.

4.2.1 Recommendation

Future projects for installing electric vehicle charging stations could require that the users of electric vehicle charging stations be assessed a fee for the use of the charging station.

4.3 Installation Costs

BayCAP assumed that the average cost to install a dual-port charging station would be about \$5,000. In nearly half the cases this was insufficient, and the site host community had to make up the difference. The average cost to install, including labor and miscellaneous parts and materials, was \$7,815.

One of the difficulties faced in installing electric vehicle charging stations is that it is nearly impossible to predict the installation cost of a specific station without doing an in-depth site survey to determine some of the variables such as distance from the panel, trenching, and available electrical service. This survey can require several hundred dollars of time by a qualified electrician or contractor. The CEC grant did not allow time or money to do this initial site survey, so an average installation cost was estimated. The lack of more comprehensive site surveys caused project delays and cost overruns.

4.3.1 Recommendation

Future projects for installing electric vehicle charging stations could require initial site surveys to ensure that costs are contained, and projects do not get delayed.

In addition, future projects could leverage cost sharing with public utilities to reduce installation costs to site hosts. In several cases there was insufficient electrical service to economically install the electric vehicle supply equipment at originally identified host sites. In some cases, this resulted in charging stations to be located in less desirable locations. The investor-owned utilities have proposed adding the cost of electric vehicle supply equipment-related electrical service, conduit, and wiring to potential charging station locations. Implementation of these proposals will reduce the cost to property owners and accelerate deployment of new electric vehicle supply equipment.

4.4 Data Collection

Site usage data was easily accessed because the charging stations selected use a cloud-based application to control the stations as well as monitor usage. Historical data is available so that future projects can look at usage data from the beginning of the project up to the present time. This capability is essential to the success of the project as well as informing future projects.

4.4.1 Recommendation

All future projects for installing electric vehicle charging stations could require that the charging stations be networked to provide the communications for load management and a web-accessible database for collecting usage data. A number of companies are pursuing smart charging pilots and operating programs with the utilities that will enable utilities and electric vehicle service providers – to modulate charging within customer-defined parameters. One such electric vehicle supply providers, known as eMotorWerks, operates a service called JuiceNet that provides drivers with approximately \$100 per year in return for providing some flexibility to modulate charging at times of peak demand and low-cost supply.

GLOSSARY

BAY AREA CHARGE AHEAD PROJECT (BayCAP)—In support of emission reduction goals outlined in California Assembly Bill 32, the Bay Area Charge Ahead Project (BayCAP) was developed to support the build-out of a robust region-wide charging network for plug-in electric vehicles, aligned with the Plug-In Electric Vehicle Readiness Plan completed under the oversight of the Bay Area Electric Vehicle Strategic Council and the Bay Area Air Quality Management District.³

CALIFORNIA ENERGY COMMISSION (CEC)—The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The CEC's five major areas of responsibilities are:

1. Forecasting future statewide energy needs.
2. Licensing power plants sufficient to meet those needs.
3. Promoting energy conservation and efficiency measures.
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels.
5. Planning for and directing state response to energy emergencies.

Funding for the CEC's activities comes from the Energy Resources Program Account, Federal Petroleum Violation Escrow Account, and other sources.

PLUG-IN ELECTRIC VEHICLE (PEV)—A general term for any car that runs at least partially on battery power and is recharged from the electricity grid. There are two different types of PEVs to choose from—pure battery electric and plug-in hybrid vehicles

³ [Bay Area Climate Collaborative website](http://baclimate.org/impact/electric-vehicles/bay-area-charge-ahead-project-2/). (<http://baclimate.org/impact/electric-vehicles/bay-area-charge-ahead-project-2/>).

APPENDIX A:

Site Host Agreement Template



California Electric Vehicle Alliance



Bay Area Charge Ahead Project 2 – Approval to Proceed
Installation of Level 2 Electric Vehicle Supply Equipment

Date	March__, 2016
Site Host Entity	
Address of Site Host Entity	
Primary Contact Name & Title	
Primary Contact Phone	
Primary Contact Email	
Authorizing Official Name & Title	
Authorizing Official Phone	
Authorizing Official E-mail	

I. Project Summary

The Bay Area Charge Ahead Project 2 is a multi-jurisdictional project led by the California Electric Vehicle Alliance to procure and install Level 2 Electric Vehicle Supply Equipment – a.k.a., electric vehicle chargers – in specified locations throughout the greater Bay Area. The project is funded by the California Energy Commission via the PON-13-606 solicitation award approved on May 14, 2014. Upon completion, the Bay Area Charge Ahead 2 project will install a total of 38 dual port Level 2 chargers, for a total of 74 Level 2 charge ports.

II. Purpose of this Approval to Proceed

This document provides the approval for ABM to ship and install the CEC-funded Level 2 charging stations at the approved addresses identified by the Site Host; and identifies for each of the relevant parties (the California Electric Vehicle Alliance, the Site Host, ABM, and ChargePoint) the roles, responsibilities, terms, and conditions for installation, maintenance, and operation of the charging stations.

III. Partner Roles

1. **The California Electric Vehicle Alliance** – a California nonprofit corporation, is the awardee of California Energy Commission grant support. The California Electric Vehicle Alliance will provide overall project management services, including contract oversight, fiscal administration, and reporting to the CEC. The California Electric Vehicle Alliance has contracted with ABM for charging installation services, and with the Bay Area Climate Collaborative for project management support.
2. **Site Hosts:** Site hosts for the electric vehicle charging stations in the second BayCAP include the cities of Benicia, Berkeley, Fremont, Hayward, St. Helena, Yountville, Petaluma, San Leandro, the Napa County Transportation and Planning Authority, and Barker Pacific (a commercial property owner located in the Hamilton Landing area of Novato.)
3. **ABM**, a national leader in electric vehicle infrastructure and energy management services, will provide installation, commissioning, and maintenance services for the project charging stations, and will provide a portion of the required matching funds.
4. **ChargePoint** – a leading charging equipment manufacturer – will provide Level 2 networked chargers and network operating services, including payment processing, cloud-based charge station information services, and software upgrades.
5. **The Site Host Entity** will:
 - A. **Complete required California Environmental Quality Act documentation** specified by the California Energy Commission.
 - B. **Provide access to charge station locations in their jurisdiction** designated in the PON-13-606 application (or a suitable alternative in the event that the original site is deemed infeasible to install.)
 - C. **Provide all necessary permits for the project**
 - D. **Collaboratively identify the most appropriate location for the chargers within the designated site**, taking into account convenience for both the electric vehicle driver and other users of the facility, visibility, accessibility, and installation cost. (Please note that site cost guidelines are highlighted below in the Siting Requirements and Scope of Work sections.) In the event that a location preferred by the Site Host cannot be installed by ABM within the project budget, a new site will be selected which is responsive to the Siting Guidelines indicated below. The California Electric Vehicle Alliance will assist the parties in coming to consensus on final siting as needed.

- E. **Provide charging station signage (per the requirements defined below) and striping (where needed to clearly designate the space for electric vehicle use).** A minimum of one sign per electric vehicle supply equipment-equipped parking space is required by the California Energy Commission and the California Electric Vehicle Alliance, which shall indicate that the space is “reserved for electric vehicle charging.” The relevant signage must comply with the Manual on Uniform Traffic Control Devices and California Vehicle Codes, ensuring that signs are high enough, easily visible, and provide clear and accurate information on parking and charging policies.
- F. **Provide adequate electrical capacity** and any other items deemed necessary to complete the electric vehicle supply equipment installation that are otherwise excluded from the standard ABM installation services as specified in the Siting Requirements and Scope of Work sections of this Agreement. Any such items or services, if needed, will be further specified in this agreement (following the joint site inspection by ABM and the Site Host). Additional items (if any) to be provided for by the Site Host shall be summarized in Exhibit C. Items (if any) that are contracted for with ABM for an additional fee are summarized in the form of a work order in Exhibit B, subject to the terms listed in Exhibit B.
- G. **Oversee installation with ABM**, and assign an administrative contact authorized to set up the ChargePoint online station management account before the stations are activated.
- H. **Contract with ChargePoint to provide charge station network operating services** during the 2014-2016 project performance period – as defined in the attached Master Software Services Agreement and in fulfillment of CEC local match requirements affirmed in the Site Host Letter of Participation included as part of the CEC-PON-13-606 grant submittal. The ChargePoint’s Master Software Services Agreement needs to be “accepted” online as part of the electric vehicle station activation process after payment is made. As a reference, a copy of the ChargePoint’s Master Software Services Agreement is attached as Exhibit E of this document.
- I. **Maintain public accessibility for all chargers** on a 24 / 7 basis.
- J. **Maintain stations in good operating condition** during the 2014-2016 project operating period.
- K. **Operate the chargers in compliance with a *Site Host Pricing Policy*** that meets grant requirements defined in the California Electric Vehicle Alliance response to PON-13-606 and summarized herein.

IV. Siting Requirements

ABM will install Level 2 ChargePoint charging stations at the designated sites identified through collaboration between the Site Host and ABM. In the event that these sites are deemed by ABM to be cost-prohibitive, or pose other obstacles to effective installation, maintenance, or operation, a new site will be identified that meets the selection criteria identified by the CEC and by the California Electric Vehicle Alliance, and which is mutually satisfactory to the Site Host, CEC, California Electric Vehicle Alliance, and ABM. Alternatively, the Site Host may

choose to perform or contract additional services as outlined below in Section V / Additional Services:

- **Location:** Select a high-demand, high-visibility location that conforms to CEC criteria for safety, ease of access/ingress, shelter, lighting, and Americans with Disabilities Act access.
- **Electricity:** Select a location where alternating current Level 2 (240 Volts / 40 Amps) electrical supply is or can be made available with relative ease and minimal cost. (Note that the average cost of installation is projected at a market value of approximately \$4500 per site, which will limit panel upgrades and conduit runs.) More cost details are available in the ABM Scope of Work (Section V below).
- **Equipment Protection:** Electric vehicle chargers should be placed where they can be best protected from physical damage by such measures as curbs, wheel stops, setbacks, bumper guards, and concrete-filled steel bollards, while simultaneously taking into consideration ease of access to the charger, mobility of users, and foot traffic in the area.
- **Public Safety:** Chargers should be located in areas with proper ventilation and away from potential hazards including traffic, explosive materials, flammable vapors, liquids and gases, combustible dust or fibers, materials that ignite spontaneously on contact with air, flood-prone areas, and areas that might be prone to vandalism.
- **Duration of Use:** Alternating current Level 2 charger sites should focus on locations where PEV owners will be parked for significant, though shorter, periods of time (e.g., one to six hours).
- **Shelter:** When possible, choose locations with nearby shelter to protect users from weather when connecting their vehicle to the charger. (However, chargers are designed to be safely operated in exposed locations in the rain, with no danger of electrical shock.)
- **Accessibility:** To the extent feasible, electric vehicle charger locations within a site will be accessible in accordance with the draft Governor's Office of Planning & Research guidelines on Americans with Disabilities Act access.
- **Security:** Locations should be selected that are secure for users at all times of day and night and relatively secure from vandalism (e.g., in well-lighted, well-traveled areas.)
- **Cell Coverage:** Chargers require cell phone signals for networked operation and repeaters may be installed to provide signals if the site does not have coverage.

If no qualifying site is identified within the Site Host jurisdiction that satisfies the requirements of all parties, then the California Electric Vehicle Alliance, with the concurrence of the California Energy Commission, may propose a new site in another jurisdiction.

V. ABM Scope of Work

Under contract with the California Electric Vehicle Alliance, ABM will provide the following installation and related services at designated Site Host locations:

- Turn-key electric vehicle supply equipment installation project management
- Delivery, installation and activation of ChargePoint stations
- Site analysis, station placement recommendation (in collaboration with Site Hosts), engineering, and installation management
- Quarterly maintenance (see description herein)

- ChargePoint warranty support
- Provide proper insurance and liability coverage information to Site Hosts as per standard contractor requirements.

ABM installation services funded by the second BayCAP will be provided within the parameters outlined below for each Site Host. All chargers in the program are ChargePoint dual-port Level 2 stations (see illustration below). Station configuration and installation profile options are listed below:

- **Wall-Mount vs. Pedestal-Mount Configurations:** ChargePoint CT4023 Wall-Mount or CT4021 Bollard-Mount units will be provided as appropriate to siting circumstances. Please note that the "bollard-mount" units are also interchangeably referred to as "pedestal mount." These units are not to be confused with *protective bollards*, which are separate devices such as a metal or concrete pole or blocking device, which may be installed separately to prevent damage to the charging station.
- **"Gateway" vs. "Drone" Charging Station Models:** Each ChargePoint CT4000 series model is available as either: a) a "Gateway" unit, which includes the internal cellular communications equipment to connect to the public network; or, b) as a "Drone" unit that wirelessly communicates to the Gateway when installed within appropriate proximity and line-of-site locations. Multiple Drone units are typically added near one Gateway unit to form a multi-station charging group or array. Note that slight variations in the maximum length of conduit indicated in the scenarios below (Options 1-3) may be accommodated in limited situations at the sole discretion of ABM and the California Electric Vehicle Alliance. Standard installation options include:
- **Installation Profile Option #1: Surface Mount Installation**

Install Pedestal ("Bollard") or Wall-Mounted dual charging station on existing concrete with anchors. Two (2) 40-Amp Standard Circuit Breakers will be provided and installed in existing electrical panel with available space and amperage. Two (2) 60-Amp Disconnects will serve as local disconnecting means. A maximum of eighty (80) feet of ¾ inch Electrical Metallic Tubing surface mount conduit and wire will be provided and installed.

- **Installation Profile Option #2: Underground Installation**

Install Pedestal ("Bollard") dual charging station on new concrete base. One (1) new concrete base will be constructed per charger. Two (2) 40-Amp standard circuit breakers will be provided and installed in existing electrical panel with available space and amperage. Two (2) 600-Amp Disconnects will serve as local power disconnecting means. A maximum of forty-five (45) feet of underground trenching in planter and ¾ inch polyvinyl chloride underground conduit and wire will be provided and installed from existing electrical panel to new concrete base.

- **Installation Profile Option #3: Partial Surface and Underground Installation**

Install Pedestal ("Bollard") dual charging station on new concrete base. One (1) new concrete base will be constructed. Two (2) 40-Amp standard circuit breakers will be provided and installed in existing electrical panel with available space and amperage. Two (2) 60-Amp Disconnects will serve as local disconnecting means. A maximum of forty (40) feet of ¾ inch electrical metallic tubing surface mount conduit and wire will be provided and installed onto

the existing structure with straps in surface mounted configuration -- and a maximum of up to twenty-five (25) feet of underground trenching will be provided in planter and ¾ inch polyvinyl chloride underground conduit and wire will be installed from structure to new concrete base of electric vehicle supply equipment.

▪ **Additional ABM or Site Host Provided Services**

- a) The Site Host may also opt to self-perform additional scope beyond Installation Profile Option #1, #2, or #3. This additional scope, if needed, is referenced as Exhibit C of this document.
- b) If upon the site survey conducted by ABM, it is determined that there is additional required work beyond the scope detailed in Installation Profile Options #1, #2, or #3 above, ABM will provide an additional estimate for costs to complete the electric vehicle supply equipment installation. These proposals, if desired, will be added as Exhibit B to this Agreement, while Site Host approval is included as Exhibit A of this document.
- c) In the event that the Site Host's site does not have sufficient electrical infrastructure to support the addition of electric vehicle charging infrastructure, ABM may offer options or potential solutions that would help reduce or balance current electrical loads within a facility. Some options are designed to free up electrical capacity while others are designed to minimize peak load spikes and their resulting demand fees. Any such solutions will be implemented only upon Site Host approval.
- d) In the case of additional services by either party, ABM will cooperate with the Site Host to coordinate satisfactory completion of the installation of the electric vehicle supply equipment pursuant to the requirements of the project.

▪ **ABM Exclusions and Qualifications**

Unless specifically noted otherwise:

- a) Electrical design work to accommodate non-standard configurations is excluded and will be charged as additional as required, with agreement of Site Host.
- b) Electrical permit, plan check fees, and utility charges are excluded and must be paid by Site Host where required.
- c) Pricing is based on existing electrical system having adequate physical space and amperage available.
- d) Excludes any underground work such as excavating, concrete or asphalt cutting and patching.
- e) Excludes cellular signal booster for equipment without adequate cellular connection.
- f) Excludes concrete coring of walls, floor, ceiling of building or parking structures
- g) Excludes x-ray or radar detection of concealed obstacles within a concrete slab in either a post tension slab or rebar supported slab.
- h) Excludes protective barriers i.e. post barriers (bollards) or wheel stops.

- i) Excludes pull boxes or intermediate junction boxes for primary electrical feeds to electric vehicle chargers or any low voltage or signal wiring.
- j) Excludes landscape repair or restoration.
- k) Excludes any cosmetic enhancements such as paint or parking lot striping.
- l) Excludes any parking lot, access ramp or access path re-configuration or leveling that may be required to create Americans with Disabilities Act accessible spaces.

VI. ABM Warranty, Installation Services, and Limitations

- **Warranty:** ABM labor and construction material are under warranty for one year after installation; all new work is done to local national electrical code requirements. ABM is not responsible for the condition or capacity of the existing electrical systems. ABM is not responsible for any vandalism that occurs during or after the installation of materials. The cost of City permits and electrical engineering and engineered drawings (if applicable) are not included as part of the CEC-funded installation, although regular construction drawings are included. The CEC prohibits use of its funds for permitting. Local site hosts must cover permit costs.
- **Signal Boosting Equipment:** At times, signal boosting antennae may be required for the wireless features of ChargePoint electric vehicle charging stations to function properly. Due to the nature of wireless signals, possible interference, line of sight obstructions, etc., one or more antennae could be needed. During the original site visit, ABM will make efforts to determine the need for signal boosting equipment and will provide such equipment to the extent feasible within the overall project cost framework. However, it is possible that supplementary signal boosting equipment may be needed in the future. If the need should arise, or if the cost exceeds what is feasible within the CEC grant cost parameters, a proposal can be provided for signal boosting equipment.
- **Americans with Disabilities Act and Accessibility Requirements:** All Americans with Disabilities Act requirements determined by municipal or state agencies are the responsibility of the Site Host. ABM is responsible for the installation of the electrical system(s) necessary to the specific scope outlined for the electric vehicle chargers specified. It does not include surface modifications, striping removal, re-striping, etc. that may be necessary to comply with Americans with Disabilities Act or Accessibility Requirements. Also, any material changes to the electrical scope caused by Americans with Disabilities Act or Accessibility requirements are considered as additional to ABM services provided through CEC funding. The guidelines to be followed are the draft "Plug-In Electric Vehicles: Universal Charging Access Guidelines and Best Practices" published by the State of California, Governor's Office of Planning and Research. In the event that the state issues new guidelines prior to installation, the new guidelines will be used to define Americans with Disabilities Act requirements.
- **Wheel Stops and Bollards:** Reasonable measures will be taken to install stations in a safe location set back to avoid contact from vehicles. As noted above, protective bollards and wheel stops are not included in the standard ABM work scope. If additional protection is desired or required by the City, bollards or wheel stops can be procured and installed with the city's own resources or a proposal can be provided by ABM.

VII. ABM Terms and Conditions

- A. **Indemnification:** ABM will defend, indemnify and save harmless the Site Host, its officers, agents and employees from any and all claims, demands, damages, costs, expenses (including attorney's fees), judgments or liabilities arising out of this Agreement or occasioned by the performance or attempted performance of the provisions hereof; including, but not limited to, any act or omission to act on ABM's part, or that of ABM's agents or employees or other independent contractors directly responsible to ABM, but only to the extent same are caused by the negligence, misconduct, or fault of ABM, ABM's agents or employees or other independent contractors directly responsible to ABM. ABM shall notify both the Site Host's Designee and Purchasing immediately in the event of any accident or injury arising out of or in connection with this Contract.
- B. **Contractor Access to Site:** The Site Host shall permit ABM ("Contractor"), free and timely access to areas and equipment, and allow Contractor to start and stop the equipment as necessary to perform required services. All planned work under this Agreement will be performed during Contractor's normal working hours.
- C. **Workmanship & Warranty:** Contractor warrants that the workmanship hereunder shall be free from defects for one year from date of installation. If any replacement part or item of equipment proves defective, Contractor will extend to Customer the benefits of any warranty Contractor has received from the manufacturer. Removal and reinstallation of any equipment or materials repaired or replaced not under a manufacturer's warranty will be at Customer's expense and at the rates then in effect.
- D. **Alteration to Scope of Work:** Any alteration to, or deviation from, the scope of work in this Agreement involving extra work, cost of material or labor will become an extra charge (fixed-price amount or on a time-and-material basis at Contractor's rates then in effect) over the sum stated in this Agreement.
- E. **Liability for Delay:** Contractor shall not be liable for any delay, loss, damage, or detention caused by unavailability of machinery, equipment or materials, delay of carriers, strikes, including those by Contractor's employees, lockouts, civil or military authority, priority regulations, insurrection or riot, action of the elements, forces of nature, or by any cause beyond its control.
- F. **Occupational Safety and Health Administration Provisions:** Site Host shall make available to Contractor's personnel all pertinent Material Safety Data Sheets pursuant to Occupational Safety and Health Administration's Hazard Communication Standard Regulations.
- G. **Toxic and Hazardous Substances:** Site Host's obligation under this proposal; and any subsequent contract does not include the identification, abatement or removal of asbestos or any other toxic or hazardous substances, hazardous wastes or hazardous materials. In the event such substances, wastes, or materials are encountered, Contractor's sole obligation will be to notify the Site Host of their existence. Contractor shall have the right thereafter to suspend its work until such substances, wastes, or materials and the resultant hazards are removed. The time for completion of the work

shall be extended to the extent caused by the suspension and the contract price equitably adjusted.

- H. **Damage Limitation:** UNDER NO CIRCUMSTANCES, WHETHER ARISING IN CONTRACT, TORT (INCLUDING NEGLIGENCE), EQUITY OR OTHERWISE, WILL CONTRACTOR BE RESPONSIBLE FOR LOSS OF USE, LOSS OF PROFIT, INCREASED OPERATING OR MAINTENANCE EXPENSES, CLAIMS OF SITE HOST'S TENANTS OR CLIENTS, OR ANY SPECIAL, INDIRECT OR CONSEQUENTIAL DAMAGES.

VIII. ABM Preventive Maintenance Program and Funding

The California Energy Commission requires that applications for funding under PON-13-606 "must include a maintenance plan for continued reliable operation and unforeseen breakdowns of the electric vehicle supply equipment" (Application Guidelines, p. 9). To fulfill this requirement, the California Electric Vehicle Alliance has negotiated a maintenance plan with ABM to cover Site Host charging stations for a two-year period following their installation. (Note that the formal term of the CEC project is anticipated to be from the date of execution of the CEC contract with the California Electric Vehicle Alliance through June 30, 2016.) To cover Year 1 of the project period, ABM will donate (as local match) the entire value of the maintenance plan based on its Manufacturers' Suggested Retail Price, which is \$200 per charge port for the year. In Year 2, ABM will discount the Plan by 50 percent, providing \$100 per charge port as match, while CEC funds will provide the balance of \$100 per port to ensure continuity of maintenance across all charging stations in the Project. Table 6 outlines the funding commitments of ABM and the CEC.

Table 6: The Second BayCAP Maintenance Plan Discount Pricing Years 1 - 2

Program Year	Annual MSRP Maintenance Plan (per Charge Port for quarterly inspection)	ABM Local Match (50% discount for BayCAP Quarterly Plan)	Site Host Contribution	CEC Funding	% Discount to Site Host
Year 1	\$200	\$200	\$0	\$0	100%
Year 2	\$200	\$100	\$0	\$100	100%

Source: ChargePoint Network.

ABM Maintenance Scope of Work

- **Software Monitoring:** ABM will monitor on a daily basis the ChargePoint network software to detect failure modes and promptly address the problem, either through software adjustments or dispatch of a technician to the site, if authorized by the site host.
- **Software Upgrades:** ABM will work with ChargePoint to ensure rapid and seamless deployment of software upgrades.

- **Monitoring and re-programming of pricing:** ABM will assist Site Hosts in monitoring (and re-programming as necessary) their pricing approach to electric vehicle parking and charging services.
- **Monitor and report key electric vehicle supply equipment data:** ABM will monitor and report key electric vehicle supply equipment utilization data, including charge session frequency, length, energy utilization, and payment history.
- **Quarterly On-site Maintenance Scope of Work:** An ABM technician will visit Site Host locations in person on a quarterly basis to undertake the following maintenance activities:
 - **Maintain equipment finishes:** ABM will clean the display, head and pedestal/base unit with ABM Green Care cleanser and microfiber cloth; inspect and clean cord and J-1772 receptacle, apply cable protective Green Care coating, and clean aluminum and plastic parts with microfiber cloths and Green Care cleansers. (Note that ABM Green Care products are Leadership in Energy and Environmental Design certified for green maintenance processes.)
 - **Activate "ChargePoint" session** and perform visual inspection of electrical components and initiate the charging station self-test processes. Minor repairs and recalibration can often be done on site while technician is performing service to eliminate return trips and minimize down time of the equipment.
- **ChargePoint warranty repair work:** Charging station warranty related repair work will be processed through ChargePoint if such repairs are the responsibility of the manufacturer.
- **Non-Warranty work – option of pre-authorized work:** All non-warranty work such as vandalism repair or damage to electric vehicle supply equipment shall be estimated prior to repairs. At the option of the Site Host, this work could be immediately addressed under a "Not to Exceed" threshold of \$750.00 (or another amount) pre-approved by the site host. If authorized, ABM will perform work on a time and materials basis. Any agreement for pre-authorized repairs (if so desired) will be executed by ABM and the Site Host independently of this Authorization to Proceed.

IX. Network Services Fees

The ChargePoint network services fee is \$230 per year per port, and covers software upgrades, station programming, cellular connections, and 24 / 7 driver support. THE TWO-YEAR NETWORK SERVICES FEE MUST BE PAID IN FULL PRIOR TO THE COMMISSIONING OF CHARGING STATIONS. ABM will invoice the Site Host on behalf of ChargePoint and shall provide proof of Site Host payment within 30 days to the California Electric Vehicle Alliance in fulfillment of CEC project reporting requirements.

X. ChargePoint One Year Warranty and Optional Extended Warranty

The first year ChargePoint warranty is included free with all charging stations included in the Project. An optional extended warranty covers one or two additional years (parts only) for \$660 per Charging Station per year. ChargePoint equipment warranty details are provided in Exhibit D of this document. If a Site Host wishes to extend the ChargePoint warranty, it must be specified at the time of equipment order and paid within 30 days.

XI. Site Host Pricing Policy Requirements

The California Energy Commission requires Site Hosts to implement a plan to optimize the use of the charging site to allow multiple electric vehicles to use the charging equipment during a typical day, and to prohibit utilization of a charging station “beyond a reasonable period of time.” In alignment with this goal, the Site Host shall implement the Pricing Plan identified in their Letter of Participation included in response to the CEC solicitation PON-13-606. The standard (default) Plan developed for all BayCAP project participants calls for the following elements to be administered by the Site Host. (Note that variations from this Plan may be acceptable but must be approved by the California Electric Vehicle Alliance and included as part of this Notice to Proceed.)

A. Fee-Based Charging: Site hosts shall set charging rates between \$1.00 and \$1.50 per hour for use of the charger. This may or may not include separate charges for parking per the jurisdiction’s usual parking policies. Fees may be calculated based on duration of stay, energy consumed (kilowatt-hours), or a combination of the two.

B. Graduated Pricing Based on Duration of Stay: Site hosts shall raise the fee for occupying the electric vehicle supply equipment-equipped space by a sufficient increment to encourage turnover of the space and thus greater availability and utilization (in charging mode) for electric vehicle drivers. It is recommended that this approach be implemented after approximately four hours of charging at the lower cost rate – particularly in cases where utilization rates are observed to be very high (70 percent or more) and available alternative charging facilities are limited. Site hosts may also consider a lower evening or weekend rate for electric vehicles (similar to most existing parking policies) to encourage responsible off-peak use. (In particular, lots proximate to multi-unit residential buildings could provide a lower-cost overnight rate with a higher daytime rate that incentivizes overnight electric vehicle supply equipment users to make way for daytime visitors and commuters.)

C. Electric Vehicle Supply Equipment Revenue and Cost Monitoring: Pricing strategies should be reviewed on a semi-annual basis to ensure that expenses for sustaining charger operations are covered to the maximum extent feasible and appropriate. In most cases, fees for charger operations set in the \$1 / hour range (or equivalent kilowatt) should be adequate to cover energy costs, transaction fees, the ChargePoint network services fee, and (beginning with Year 3 of the Project) the (optional) continuation of the ABM Maintenance Plan. In rare cases where the charger is not yet being well-utilized, there may be a modest operating subsidy required.

XII. Disposition of Equipment: Charging stations and related equipment installed by ABM at Host Sites are considered to be the property of the Site Host upon delivery at the Site. Per CEC Terms and Conditions, the Site Host shall use the equipment in the project for which it was acquired as long as needed, and the Site Host shall not encumber the property without CEC approval. When no longer needed for the original project or program, the Site Host shall contact the California Energy Commission for disposition instructions.

Exhibit A: Summary of Equipment and Services Provided Under This Agreement

CITY OF _____	
Summary of Charging Station Installation Agreements for ChargePoint Charging Stations and ChargePoint Network Services and ABM Maintenance Services	
Description	Cost
<u>A. Total Quantity and Type of Charging Stations</u> ____ ChargePoint CT 4021-GW1 "Gateway" dual port Level 2 Charging Station(s) (wall-mounted) ____ ChargePoint CT 4023-GW1 "Gateway" dual port Level 2 Charging Station(s) (pedestal mounted) ____ ChargePoint CT 4021 "drone" dual port Level 2 Charging Station(s) (wall-mounted) ____ ChargePoint CT 4023 "drone" dual port Level 2 Charging Station(s) (pedestal-mounted) TOTAL: ____ ChargePoint CT 4000 Charging <u>Stations</u> providing a total of ____ Charging <u>Ports</u> See http://www.chargepoint.com/files/CT4000-Data-Sheet.pdf for complete product specs and details.	Paid by CEC with ChargePoint discount as local match

B. Location of Charging Stations (Please summarize Site and Charger information below -- adding space if needed)

Site Host Address #1: (include facility name/ if any, street address, city, and zip code):

Station Location Description #1 (location on lot where electric vehicle supply equipment is to be installed):

ChargePoint Units to be Installed at this Site (number of units and model number, see following page for model info):

Other Site Information (provided by ABM and Site Host following Site Inspection):

Site Host Address #2: (include facility name/ if any, street address, city, and zip code):

Station Location Description #2:

ChargePoint Units to be Installed at this Site (Number and model):

Other Site Information:

C. Required Two-Year ChargePoint Network Services Agreement:

(\$230 per port x 2 years x total number of ports = total price)

- Payment for the ChargePoint agreement must be made direct to ABM via the process described below.
- Following receipt of payment by ABM, a ChargePoint user ID, temporary password, and URL for the user log-in page will be sent via e-mail to the designated Administrator at the Host Site.
- To complete the ChargePoint network services activation, the Site Host Administrator must log-in at the designated URL, provide the registration information requested, and acknowledge and accept the ChargePoint Master Software Services Agreement. This process must be completed before stations can be utilized. *Exhibit E of this document includes a sample ChargePoint MSSA.*

\$

▪ If the Site Host is unable to enter into the Master Software Services Agreement via the ChargePoint website, please request a hard copy contract from Ken Sapp at ABM ken.sapp@abm.com or (949) 330-1542.	
D. <u>Included</u> Two-Year ABM Cleaning and Maintenance Service (\$200 per year per charge port – included as local match)	Paid by ABM
E. Optional: 2nd or 2nd/3rd Year ChargePoint Extended Warranty (parts only): (# of Charging Stations x \$660 per year x # of years = total price.) Note that the warranty is priced on the basis of charging stations rather than charging ports, i.e., a dual port charging station is \$660/year.	\$
F. Additional (optional) installation or equipment upgrades specified in Exhibit B below (including parts and services):	\$
Total Costs Paid by Site Host (sum of Sections C, E, and F above):	\$

Billing Information

Billing Contact Name: _____ Phone: _____

E-mail: _____

Authorization: We instruct **ABM Electrical Power Solutions, LLC** or subsidiaries to proceed with scheduling and performing the work described in the attached proposal.

Proposed date to begin work: _____

Host Entity Name (for billing and payment purposes): _____

Amount: (Insert "total costs paid by site host" itemized above): _____

Payment will be made to ABM by: (check one option below)

_____ **Company check** before project start date: Check number: _____

_____ **Purchase or Service order:** P.O. Number: _____

____ Credit or Debit card: ____ Visa ____ Master Other: _____

Card Number: _____

Billing Address: _____

Exhibit B: Optional Additional Infrastructure Services Provided by ABM

Sample Additional Electrical Upgrade & Installation Infrastructure Services (to be customized by ABM and Site Host)

▪ Install _____ Wheel Stop(s) ▪ Install _____ Protective Bollard(s) ▪ Transformer _____ KVA ▪ Wall Core Qty _____ ▪ Floor Core Qty _____	▪ J - Box Qty _____ ▪ Trenching _____ ft ▪ Concrete Cut/Patch _____ ft ▪ Asphalt Cut/Patch _____ ft ▪ Landscape Repair _____ ft
--	---

Description of Work to be Performed: _____

Materials List: _____

Materials \$: _____

Labor \$: _____

Tax \$: _____

Total \$: _____

Note: All work performed to local and NEC requirements by California State Certified Electricians.

ABM Electrical Power Services, LLC Terms and Conditions

The following items are in addition to Section VII – ABM Terms and Conditions within this BayCAP Approval to Proceed document. Authorization to proceed with the work outlined in this quotation shall constitute Site Host ("Buyer's") acceptance of these terms and conditions in full. Oral authorizations to proceed must be confirmed to ABM Electrical Power Services in writing (Fax or e-mail) within 24 hours. If there is a conflict or discrepancy between terms and conditions in the Buyer's purchase authorization and this quotation, this quotation shall prevail unless specifically authorized, in writing, by ABM Electrical Power Services, LLC.

Terms of Payment: **1.** Terms are net thirty (30) days. Any invoice not paid within thirty (30) days from the date of invoice will be subject to a service charge equal to the lesser of One and One-half percent (1.5 percent) per month on account balances or the maximum percentage permitted by law. **2.** At ABMEPS's option, customers may be invoiced on a monthly basis for services provided over more than one month. **3.** All pricing and payment terms contained herein are contingent upon a favorable Credit Report for the customer/client to whom this quotation is provided. Upon receipt of a less than favorable credit report ABM Electrical Power Services reserves the right to withdraw this proposal, modify the pricing, or require payment when services are rendered, or advance payment of the total job quotation before providing services. **4.** For material purchases in excess of \$50,000, ABM Electrical Power Services reserves the option to invoice 50 percent of the total at the time of material order and the remaining 50 percent at the time of material delivery. **5.** Customer agrees to pay ABM Electrical Power Services, to the extent permitted by applicable law, all costs and expenses, including but not limited to reasonable attorney's fees, incurred by ABM Electrical Power Services in connection with any collection activities or actions to collect unpaid invoices under this quotation.

Delays: ABM Electrical Power Services shall not be liable for delays or performance resulting from causes beyond its reasonable control, acts of God, acts or omissions of Buyer, fire, strike or other labor difficulty. Should there be a delay, the date of delivery or performance shall be extended.

Cancellation: Notice of cancellation of services to be performed must be received thirty-six (36) hours prior to the agreed upon date and time. Unless such notification is provided, charges will be incurred. These charges will be ABM Electrical Power Service's costs plus ten percent (10 percent) and will include any rental equipment for the Project.

Disclaimer: ABM Electrical Power Services assumes no responsibility for any damage or injury to any property caused directly or indirectly as a result of ABM Electrical Power Services

performing its duties under this agreement except such damage or injury that may be held to result solely and directly from or out of: Any grossly negligent performance by ABM Electrical Power Services in its obligations under this Agreement or any willful misconduct on the part of ABM Electrical Power Services, its agents or employees.

Responsibility: All services are performed in accordance with industry standards, project specifications and/or NETA specifications. Where remediation is beyond the scope of normal reliability testing, and where corrective action is required, such services will be quoted separately.

Assignment: ABMEPS reserves the right to assign this project in part or in total to an affiliated entity.

Termination: An order may be terminated only by mutual written agreement between Buyer and ABMEPS and only upon payment of costs and expenses already incurred by ABMEPS.

Safety: ABMEPS agrees to comply with all applicable federal, state, local, National Electric Codes and project safety rules and regulations. ABMEPS reserves the right not to perform work that in its opinion violates OSHA Electrical Safety-Related Work Practices; Final Rule or other safety rules and regulations.

Standby Time: When ABMEPS service personnel are on the job site but unable to perform services requested because of circumstances beyond ABMEPS control, the customer may be charged standby time at the applicable rate for each such ABMEPS service person (up to a maximum of eight (8) hours per day per person).

Liability: ABM Electrical Power Services, LLC. and its contractors and suppliers of any tier, shall not be liable in contract, in tort or otherwise for damage or loss of property or equipment, loss of profits or revenue, loss of use of equipment or power system, cost of capital, cost of purchased or replacement power or temporary equipment (including additional expenses incurred in using existing facilities), claims of customers of Buyer, or for any special, indirect, incidental, or consequential damages of any kind, whether arising in or based on contract, tort, statute, strict liability, warranty or otherwise.

Warranties: All material and equipment delivered and/or installed will be the products of reputable manufacturers. ABM Electrical Power Services makes no warranty, express or implied, including warranties and merchantability and fitness for a particular purpose which are hereby expressly excluded, concerning material and equipment manufactured by others. ABM Electrical Power Services sells and delivers all materials and equipment not manufactured by it "AS IS," but ABM Electrical Power Services will use its best reasonable efforts to obtain from the manufacturer, in accordance with the manufacturer's customary practices, the repair or replacement of any material or equipment which may prove defective in workmanship or material. The foregoing shall be the exclusive remedy of Buyer and the sole obligation of ABM Electrical Power Services with respect to material and equipment manufactured by others. Further, ABM Electrical Power Services warrants its labor for one (1) year.

Exhibit C: Site Host Commitment to Perform Site Preparation Services

NOTE: This Exhibit is needed ONLY if the Site Host and ABM mutually determine that additional services must be performed by the Site Host to enable successful installation of electric vehicle supply equipment.

Project(s): _____

Site Addresses: _____

Site Addresses: _____

Site Addresses: _____

Site Host Contact Name & Title: _____

Site Host Phone: _____ **Site Host E-mail:** _____

Acknowledgement: We hereby acknowledge that the following additional work is required to meet the terms and conditions of the CEC-funded charging station installation project described herein, and that this work shall be conducted by the Site Host, at the Host's own expense, using the Host's own resources, contractors (if applicable), and personnel.

Scope of Work: _____

Proposed date to begin work: _____

Proposed date to complete work: _____

Authorized Signature: _____

Printed Name: _____

Title (Please Print): _____

Date: _____

Exhibit D: ChargePoint Warranty Information

Exhibit E: ChargePoint Master Software Services Agreement

APPROVAL TO PROCEED

(inclusive of Exhibits A, B, C, D, and E above – as applicable)

The signatures below indicate agreement by all named parties with this Approval to Proceed (including Exhibits A, B, C, D, and E above – as applicable) with the installation of charging equipment and related services under the terms and conditions outlined in this document and in the Bay Area Charge Ahead Project grant application and award from the California Energy Commission.

Please note that this agreement is contingent upon and only goes into force after execution of all necessary agreements between the CEC and the California Electric Vehicle Alliance, and the subsequent execution of valid agreements between the California Electric Vehicle Alliance and ABM. If in the event that these superior agreements are not completed successfully with mutual consent between the parties, then ABM is not obligated to provide the equipment nor services identified in this agreement.

Site Host Authorized Signature

Printed Name & Title

Date

ABM Authorized Signature

Printed Name & Title

Date