

Bay Area and Monterey Bay Regions Local Best Practices Document

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**METROPOLITAN
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Introduction

The purpose of this document is to provide a local resource for Bay Area and Monterey Bay region (“the Region”) cities, counties, and local governments who are interested in making their communities “ready” for the deployment of plug-in electric vehicles (PEV). The Region includes the following 12 counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, Sonoma, Monterey, Santa Cruz, and San Benito.

This document is intended to be used as a companion to:

- The California Plug-In Electric Vehicle Collaborative’s Community Toolkit for Plug-In Electric Vehicle Readiness—a Resource for Local Officials; and
- The Association of Bay Area Governments’ “Ready, Set, Charge” guidelines

This document provides listings of resources that are available to communities within the Region that can:

- Serve as models or examples of “best practices” for implementing PEV readiness;
- Provide additional training or education on PEVs, infrastructure, inspection, zoning, permitting and signage; and
- Provide models for outreach and incentives related to PEVs.

This document also provides a list of locally available incentives and information on a number of ongoing efforts to support PEV deployment. Users are encouraged to make contact with the organizations and individuals listed in each of the categories below to leverage their experience in getting “PEV ready.” By using the companion documents above and the lessons learned from the contacts in this document, it is hoped that the Region’s communities can become PEV ready and that these resources will assist in speeding the deployment of PEV.

How to Use This Document

Local planners and policymakers in the Bay Area and Monterey Bay region should use this document as an overview of relevant issues associated with PEV readiness, and refer to the resources discussed in this document and to the accompanying Planning Concepts document for more in-depth information. The actions discussed in this document are aligned with the actions in the California Plug-In Electric Vehicle Collaborative’s *Community Toolkit for PEV Readiness*, a state-level guidance document that users can refer to for additional guidance.

There are a number of actions that local governments can take to create PEV ready communities. This document discusses 12 of these actions, which are listed below—five core actions to get PEV ready and seven additional actions for expanded readiness—and devotes a section to discussing each one:

Five Core Actions to Get PEV Ready

1. Update Zoning and Parking Policies

2. Update Building Codes
3. Streamline Permitting and Inspection Processes
4. Participate in Local Official Training and Education Programs
5. Reach Out to Local Residents and Businesses

Additional Actions for Expanded Readiness

6. Develop a Regional Public Charging Station Site Selection Plan
7. Encourage Workplace Charging with Local Employers
8. Support Local Electric Utility Efforts to Minimize Grid Impacts
9. Implement Solutions for Multi-unit Dwelling Properties
10. Incorporate PEVs and Charging into Local Vehicle Fleets
11. Create Local Incentives to Encourage PEV Usage and Sales
12. Encourage Renewable Energy

Each section individually discusses the key issues that local governments should consider with respect to a given action, and summarizes guidance or examples of best practices in addressing these issues. Each concludes with a list of resources for local governments, including links to documents and contact information for agency staff. The final section of the document describes additional resources for local governments, including information on the many PEV-related organizations in the Region.

Overview of PEV Vehicles and Charging Technologies

There are three types of vehicles that use electricity as transportation fuel:

- Hybrid electric vehicles (HEV), which are powered by both an internal combustion engine (ICE) and an electric motor,
- Plug-in hybrid electric vehicles (PHEV), which have larger battery packs than HEVs and are designed to plug into the electrical grid to charge the vehicle, and
- Battery electric vehicles (BEV), which are powered solely by energy from the battery.

This document refers to all vehicles that use electricity from the grid—in other words, PHEVs and BEVs—as plug-in electric vehicles (PEV).

Since the range that a PEV can travel on a single battery charge is limited, the type of electric vehicle supply equipment (EVSE) that is available to charge vehicles is a key consideration for PEV drivers. Engineering standards are in place for two primary types of EVSE, and standards for new charging equipment are under development:

- **Level 1 AC**—These chargers use standard household electrical outlets, and require no new electrical service for a building operating on an existing circuit. The main drawback of Level

1 charging is the time required to recharge vehicles; a full charge typically takes between three and 30 hours depending upon the vehicle type and battery capacity.

- **Level 2 AC**—These chargers are used specifically for PEV charging and operate at higher voltages than conventional household outlets, and often require upgraded electrical infrastructure at EVSE sites, but deliver power to vehicles much more quickly. A Level 2 AC charger takes between 80 minutes and six hours to fully charge a vehicle.
- **Level 1 & 2 DC**—Level 1 & 2 DC chargers, also known as DC fast chargers, provide power much faster than the AC counterparts. However, DC fast chargers are more expensive to build and operate due to the equipment and electrical upgrades necessary to operate them; in addition, engineering standards have not yet been adopted for these chargers. As a result, few of the PEVs available in today's market are equipped with compatible hardware for DC charging. However, tests have shown that Level 1 DC EVSE takes between five minutes and two hours to fully charge a vehicle, while Level 2 DC EVSE takes between a few minutes and an hour and a half.
- **Battery Switching**—Another charging, and potentially time-saving, strategy that warrants consideration is battery switching, where drivers would swap out depleted batteries for fully-charged ones. The main barrier to battery switching is vehicle design: in order for battery switching to be successful, there must be some level of standardization regarding the type and placement of batteries used by different vehicles. Better Place, a Palo Alto-based company, is currently involved in a demonstration project for battery switch capable PEVs in Bay Area taxi fleets.

Five Core Actions to Get PEV Ready

1. Update Zoning and Parking Policies

Local governments need to implement ordinances or policies to facilitate the access and use of publicly available charging infrastructure. Such policies generally address signage (surface street directional signs and parking facility signs), charging infrastructure installation that incorporates accessibility guidelines, and parking facility policies.

The following are important considerations in developing these policies:

- **Compliance with American Disabilities Act (ADA).** The installation of charging stations cannot violate any ADA standards for sidewalk, parking spaces, or other accessibility. As a result, careful attention should be given to implementing charging installations that meet the federal and state ADA requirements.

California developed Interim Disabled Access Guidelines for Electrical Vehicle Charging Stations in 1997.¹ These guidelines are for state-funded projects, however, they provide some initial guidance for local governments. They require that one of every 25 PEV charging sites be accessible, which means that the associated parking space is 9 to 18 feet deep and includes a 5 foot aisle on the passenger side of the vehicle.

- **Signage policies and designs.** Surface street directional signage serves two important functions. It directs PEV users to the nearest public charging infrastructure locations, and educates non-PEV drivers about the availability of charging infrastructure in their community, potentially allowing them to consider how a PEV might work for them. This important outreach element also enables the community to show its support for PEVs.

Caltrans has authority over directional and information signage from the major highway systems in California. Local jurisdictions have authority over surface street signage. Signage in parking facilities has multiple purposes. Generally, these needs include information about which parking spaces are designated for PEVs or about electricity rates and parking fees. Separate signs are required to communicate restrictions, such as time limits on parking and charging.

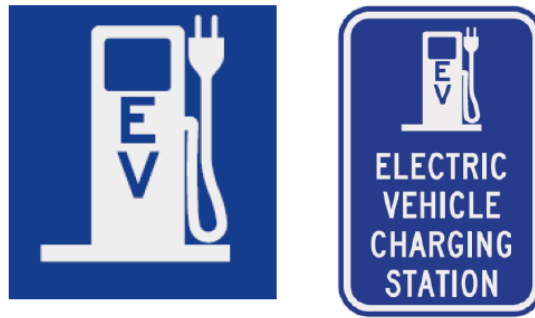
The California PEV Collaborative has issued the following statement, which should serve as guidance for local jurisdictions in the Region:

The PEV Collaborative supports the use of standardized signs to minimize confusion and provide the greatest ease of use for EV drivers. To this end, the Collaborative recommends that Cal Trans adopt the use of the candidate signs currently being tested in Oregon and Washington, and that local jurisdictions request the use of those signs during the test period with the expectation that they will ultimately be approved at the federal level and become the uniform standard nationally.

¹ California Department of General Services (2011). "Interim Disabled Access Guidelines for Electrical Vehicle Charging Stations, 97-03." Retrieved from: http://www.documents.dgs.ca.gov/dsa/pubs/policies_rev_01-01-11.pdf

The recommended signs are shown here for reference:

Figure 1. FHWA Interim Approved Symbols for EV Charging Stations



Source: ECoTality, *Lessons Learned—EVSE Signage*

The issues related to accessibility and parking enforcement discussed elsewhere in this section may require additional signage at parking spaces. However, it is important to keep this signage simple and clear in order to provide clear signals to drivers.

- **Parking Enforcement.** Local governments may also face the question of how to prohibit non-PEVs from parking in spaces designated for PEVs. In other words, if a conventional vehicle parks in a designated parking spot for a PEV, or if a PEV parks in a space intended to provide access to EVSE, but does not utilize the charging equipment, the local jurisdiction should consider the corrective action that should be applied. In a recent report for the DOE,² ECoTality noted that some jurisdictions were reluctant to introduce dedicated EV parking without first establishing enforcement policies. Therefore, clearly defined enforcement policies should be seen as an important catalyst to support PEV readiness in local jurisdictions.

For example, Marin County recently adopted a series of amendments to its county code focused on electric vehicle parking that address several of the issues discussed above. The code now includes an electric vehicle charging station parking stall designation and states, “It shall be unlawful to park in a designated electric vehicle charging station parking stall unless the vehicle is a charging electric vehicle.” The amendments also allow the Board of Supervisors to levy fees for parking and electricity use³ on PEV owners who use public charging stations.

- **Parking facility restrictions and incentives.** Once public charging infrastructure is installed, public and private parking facility owners will need to consider parking policies specific to the individual site, owner, and local budgets. Considerations include: a) whether to grant reduced or free parking for PEVs while charging; b) whether to provide free electricity from the charging infrastructure or establish a usage charge system; and c) whether to establish time limits on parking in spaces with charging infrastructure, either because all parking has time limits or because the preference is to allow many PEVs to charge in one day (e.g., limited charge time).

² ECoTality (2012). “Lessons Learned—EVSE Signage.” Retrieved from: <http://www.theevproject.com/downloads/documents/Signage%20Initial%20Issue%204-20-2012.pdf>

³ The ordinance does not specify that fees will go toward covering parking and electricity costs, but these are among the costs associated with EV parking that could be covered by fees.

- **Parking requirements.** Local governments routinely specify the amount of parking required for different land uses, often in the form of minimum number of parking spaces per dwelling unit or per employee. Communities seeking to accelerate PEV deployment may wish to consider implementing minimum requirements for PEV parking and charging stations. Local governments with minimum parking requirements in place may also wish to consider whether PEV parking should count toward overall parking requirements. Allowing PEV parking to count toward parking requirements is recommended, which would incentivize developers to provide PEV parking without increasing the total number of spaces required.

When developing parking policies, it is important to consider both how PEV parking will be used over time and the importance of charging station availability at the outset of PEV deployment. PEV-only parking stalls may remain vacant for significant periods of time over the next several years due to limited deployment. However, signage indicating the location of these spots and for associated parking infrastructure is important to boost range confidence among PEV drivers and to send the appropriate signal to the general public that EVSE is available. Local governments should adopt policies that maximize use of existing parking space while sending positive signals to PEV owners and prospective PEV buyers.

- **Zoning incentives.** Local governments routinely offer developers the opportunity to develop more intensively than zoning codes typically allow if developers contribute to environmental mitigation or public facilities. Instead of requiring dedicated PEV parking, local governments can use this tactic to create incentives for developers to provide PEV parking by allowing more intensive development in exchange for providing PEV spaces.

For example, the City of San Carlos has amended its zoning code in order to create incentives for developers to provide charging stations in mixed use areas. Section 18.05.030.A of the San Carlos Municipal Code allows developers to exceed the maximum allowable floor area ratio by 10% if they provide additional environmental design features on-site or contribute to off-site improvements at open spaces or public facilities. The code lists “electric car facilities” as one of the on-site features that developers can include in order to qualify for this exemption.

Bay Area and Monterey Bay Region Resources

- County of Marin (2012). “Ordinance No. 3572.” <http://www.co.marin.ca.us/depts/BS/Main/BOSagmn/ordinances/ord-3572.doc>
- City of San Carlos (2012). “Municipal Code: Development Standards for Mixed-Use Districts, Section 18.05.030.A.” <http://www.codepublishing.com/CA/sancarlos/>
- County of Sonoma (July 2011). “Electric Vehicle Charging Station Program and Installation Guidelines.” http://www.sonoma-county.org/prmd/docs/misc/ev_prog_guidelines.pdf
- ECOtality (2012). “Lessons Learned—EVSE Signage.” <http://www.theevproject.com/downloads/documents/Signage%20Initial%20Issue%204-20-2012.pdf>
- Bay Area Climate Change Collaborative (2011). “Ready, Set, Charge, California! A Guide to EV-Ready Communities.” <http://www.baclimate.org/impact/evguidelines.html>

2. Update Building Codes

Local building codes and practices should be updated to include specifications for PEV charging infrastructure types, electric service requirements, and installation recommendations for various building types. The California Green Building Standards Code (CalGREEN) provides useful guidance for local jurisdictions related to PEV charging, identifying voluntary measures for single-family and multi-family dwellings. At a more local level, the Tri-Chapter Uniform Code Council (TUCC) has provided EVSE guidance to its member jurisdictions for single-family residences and for commercial installations.

Specific areas to consider in local building codes include:

- **Charging infrastructure types and service ratings.** PEV charging can occur at varying service ratings, and commonly include Level 1 (120 volt service), Level 2 (240 volt service), and DC fast charging (400 volt+ service requirements). PEV owners will decide which service best meets their driving needs, but their charging infrastructure choice may impact their building's electrical load and the local electrical distribution system. Please refer to the "Overview of PEV Vehicles and Charging Technologies" section above.
- **Charging infrastructure circuit specifications.** To support new charging infrastructure, building codes need to be updated to specify electric circuit requirements. This includes, but is not limited to, service panel loads, wiring and raceway specifications, and receptacle design.
- **Installation recommendations for varying building types.** Many PEV drivers will live and charge in single family, detached homes, where PEV circuit specifications are straightforward. However, some PEV owners will reside in multi-unit dwellings where charging infrastructure can be more complicated. Building codes can provide guidance on the number of circuits necessary for varying building types, and also can specify the panel service requirements for these larger buildings. Commercial buildings also will have unique electrical and installation requirements.
- **Building load management.** Codes and local guidance materials can identify means to estimate the effects of PEV charging infrastructure on building loads. These recommendations and codes can involve more than estimated PEV circuit loads; they can include full building load impacts and make recommendations for energy efficiency upgrades to offset the new PEV circuit loads.

For example, several Bay Area and Monterey Bay region cities have adopted changes to their building codes that require new construction to accommodate EVSE and/or create standards for EVSE. The City of Sunnyvale now requires that garages and carports in all new single-family buildings, as well as at least 12.5% of shared parking spaces in multifamily buildings, be pre-wired for Level 2 charging stations. These stations must be designed to meet the specifications for EVSE in the 2010 California Electrical Code. The City of Milpitas has also adopted detailed requirements for residential and non-residential EVSE into its building code based on the CEC and on Underwriters Laboratory guidelines for charging stations.

Bay Area and Monterey Bay Region Resources

- City of Sunnyvale (2012). “Electric Vehicle Chargers: Building Division Requirements.” Retrieved from: <http://sunnyvale.ca.gov/Portals/0/Sunnyvale/CDD/Residential/Electrical%20Car%20Chargers.pdf>
- City of Milpitas (2011). “Electric Vehicle Charging System in Single Family Residence Plan Review and Permitting Requirements.” http://www.ci.milpitas.ca.gov/pdfs/bld_electric_vehicle_charging_system.pdf
- City of Milpitas Building Safety Department (2011). “Commercial or Multi-Family Electric Vehicle (EV) Charging Station.” http://www.ci.milpitas.ca.gov/pdfs/bld_policy_construction_BLG17.pdf
- International Code Council—East Bay Chapter (2012). “Tri-Chapter Uniform Code Committee (TUCC).” <http://www.eastbayicc.org/pages/TUCC.php>

3. Streamline Permitting and Inspection Processes

When individuals or businesses purchase PEVs and seek to install approved charging equipment to support their cars, they rely on their local government to serve them. It is essential that local governments take the necessary steps to develop and streamline the permitting and inspection procedures for EVSE. A streamlined process would be efficient, rapid, and consistent while ensuring safe installations and the least possible cost for property owners. A pre- and post-installation checklist for EVSE is included as an Appendix for reference. The general issues that local jurisdictions in the Region should consider are described below.

- **Implement an efficient permit application process.** A protracted permit application process could add time and dampen consumer enthusiasm for PEVs—this is particularly important for residential permitting. Expedited solutions, such as creating an online application to substitute for an initial office visit, or same-day “over-the-counter” approvals to move projects forward, can save time, alleviate PEV owner frustration, and bring goodwill toward the local government’s efforts. Solutions will vary by community depending on resources and existing approaches for other permits.

Each local jurisdiction will have to consider the tradeoff between the permit application process and the inspection process. Some communities require a number of documents and references from residents/contractors when applying for a permit to install PEV infrastructure. This adds time up-front, but can reduce the time for the inspection process after installation, and reduces the risk of a failed inspection that would require re-work and a second inspector visit.

Apart from the installation of residential EVSE, communities will need to consider ways to permit and inspect nonresidential EVSE e.g., for publicly available chargers. Anecdotal evidence to date suggests that there is generally confusion regarding the permits required for EVSE at parking garages for instance. In some cases, it is not clear to stakeholders (e.g., parking management companies) if a permit is even required to install EVSE. Although it is appropriate to focus on developing and streamlining a permitting and inspection process for residential installations, the deployment of publicly accessible EVSE will likely increase in the near future.

- **Minimize permit fees for charging equipment installation.** Permit fees will vary by jurisdiction, and likely vary by project type and scope. Some communities are implementing a flat fee for charging station installations; initial survey results indicate that about 45% of cities are charging between \$100-250 for the installation of charging equipment installed at residential, commercial or multi-unit dwellings, open parking lots, or on-street parking. About 25% of cities are charging either less than \$100 or between \$250-500, and the remaining 10% are charging more than \$500.⁴ Fixed, low fees can be implemented if the installation follows an approach that is consistent with or common to other community upgrades, or if the municipality wants to incentivize charging infrastructure. For standard installations, a permit fee of between \$100 to \$250 which can be issued within 24 to 48 hours is considered to be a best practice.
- **Secondary approach—use existing 240V permit.** Many communities are implementing a unique permit application for PEV charging equipment installations. However, some communities are using existing permits for 240-volt electrical service upgrades. Although existing permits may not capture as much unique information, it allows a community to move forward without implementing new permit types (or until new types are implemented).
- **Reduce the number of on-site inspections.** Each time an inspection is required, it adds scheduling delays to the project. Where appropriate, consider only requiring a final inspection and avoiding project progress inspections. Additionally, establishing a common inspection checklist for charging station installations helps communities establish common approaches, and lets property owners know what to expect.
 - Many communities that have adopted requirements for EVSE into their building codes have also taken steps to streamline the permitting process for charging stations in single-family residences. For example, Milpitas does not require that single-family homeowners looking to install EVSE submit site plans for review prior to a building inspection. Instead, these homeowners simply schedule an inspection, during which they provide the following information to the inspector: the type and UL (or other approved testing laboratory) listing of the EV charging system.
 - The panel rating of the existing electrical service and charging system load and circuit size.
 - Whether a second electric meter installation is required due to special electric utility rates available for EV charging.
 - The proposed location of the EV charging system.

Milpitas has also issued guidance to prepare homeowners for an inspection. This guidance includes diagrams illustrating typical configurations of EVSE in different garage types in order to assist homeowners with determining the proposed location of the charging system.

Similarly, Sunnyvale allows homeowners in single-family residential districts to obtain permits for charging stations online provided that the station will be located within a garage and can be connected to existing electrical panels. Sunnyvale has also issued guidance for EV charging stations, including a permitting checklist. The cities of Gonzales and Morgan

⁴ These data are based on 50 cities out of a possible 118 reporting.

Hill also offer express or over-the-counter permits for EVSE; and Berkeley, Los Altos, and Sebastopol have issued guidance on installing EV charging stations to help guide property owners through the permitting process.

Bay Area and Monterey Bay Region Resources

- City of Milpitas (2011). “Electric Vehicle Charging System in Single Family Residence Plan Review and Permitting Requirements.”
http://www.ci.milpitas.ca.gov/pdfs/bld_electric_vehicle_charging_system.pdf
- City of Sunnyvale (2012). “Electric Vehicle Chargers: Building Division Requirements.”
<http://sunnyvale.ca.gov/Portals/0/Sunnyvale/CDD/Residential/Electrical%20Car%20Chargers.pdf>
- City of Berkeley (2012). “Plug-In Electric Vehicle (PEV) Residential Charging Systems Guide.” http://www.cityofberkeley.info/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/PEV%20guide.pdf
- City of Sebastopol (2012). “Electric Vehicle (EV) Charging System in Single Family Residence (SFR).”
http://ci.sebastopol.ca.us/sites/default/files/sbd/electric_vehicle_charging_system_in_single_family_residence_0.pdf
- City of Sebastopol (2012). “Commercial or Multi-family Electric Vehicle Charging Station.”
http://ci.sebastopol.ca.us/sites/default/files/sbd/commercial_or_multi-family_electric_vehicle_ev_charging_station_0.pdf
- City of Los Altos (2010). “Electric Vehicle (EV) Charging System for Single Family Residence.” <http://www.ci.los-altos.ca.us/commdev/building/documents/ELECTRICVEHICLECHARGER.pdf>
- International Code Council—East Bay Chapter (2012). “Tri-Chapter Uniform Code Committee (TUCC).” <http://www.eastbayicc.org/pages/TUCC.php>

4. Participate in Local Official Training and Education Programs

The issues outlined in this guidance document regarding PEV deployment are new to many stakeholders, including local government officials. As a result, local officials and first responders are encouraged to seek out training and educational resources that will help their respective communities become PEV ready. In addition to providing technical training on PEV maintenance and EVSE installation for staff, these resources enable local officials to become familiar with electric charging infrastructure and to understand the safety implications of vehicles and chargers. There are a number of educational resources available to local governments and agencies in the Bay Area and Monterey Bay region, including:

- **Clean Cities Coalitions:** The Clean Cities program has developed a 30-minute online presentation for electrical contractors and inspectors regarding EVSE residential charging installation. In the Bay Area, the San Francisco Clean Cities Coalition, East Bay Clean Cities

Coalition, and the Silicon Valley Clean Cities Coalition have provided leadership on training and education programs to date.

- **Electric Vehicle Infrastructure Training Program (EVITP):** The EVITP is a 24-hour course set up to train and certify electricians throughout California to install residential and commercial scale EVSE. The training program addresses the technical requirements to ensure that the equipment is properly installed and maintained, and also instructs stakeholders on issues related to EVSE deployment. EVITP has sponsored events in the Bay Area and will be expanding its role after recently receiving a grant from the California Employment Training Panel, funded by the California Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program.
- **The Green Team:** The Silicon Valley Clean Cities Coalition, Breathe California, and the Electronic Transportation Development Center offer a series of clean transportation technical classes, which include 50-hour courses on electric vehicles, hybrid electric vehicles, and EVSE.
- **California Plug-in Electric Vehicle (PEV) Collaborative:** The PEV Collaborative is launching a PEV Resource Center that will provide answers to key issues regarding EVSE to the following audiences:
 - Vehicle Consumers and Homeowners
 - Local Government Officials
 - Fleet Managers
 - Infrastructure and Electrical Contractors
 - Emergency First Responders
 - Educators and Instructors
- **Advanced Transportation Technology and Energy (ATTE) Initiative:** The ATTE Initiative offers training courses at several community colleges throughout California, including the City College of San Francisco. Training includes an 8-hour to 16-hour course on PEVs and EVSE.

The programs listed above are examples of the opportunities that local agencies have to educate themselves about EVSE issues such as permitting, installation, and zoning. Generally, these programs are provided at no cost to participants. In cases where programs require course fees, adjacent municipalities can coordinate and share curricula and lessons learned to reduce costs. By coordinating, financial resources can be identified to allow a few local officials to complete formal training and certificate programs.

Bay Area and Monterey Bay Region Resources

- East Bay Clean Cities Coalition, admin@cleancitieseastbay.org. For information on upcoming classes and events: <http://www.cleancitieseastbay.org/events.html>
- San Francisco Clean Cities Coalition, Bill Zeller, (415) 355-3728, william.zeller@sfgov.org.

- Silicon Valley Clean Cities Coalition (with Green Team information), (408) 998-5865. For information: <http://www.svcleancities.org/index.php/future-events.html>
- Electric Vehicle Infrastructure Training Program, Bernie Kotlier, (408) 242-4000, bkevitp@gmail.com, or Jennifer Mefford, (248) 318-7885
- California Plug-in Electric Vehicle Collaborative, info@pevcollaborative.org. For information: <http://www.pevcollaborative.org/news-events>
- Advanced Transportation Technologies and Energy Center at the City College of San Francisco, Peter Davis, (619) 473-0090, outrchpd@me.com. For information: <http://www.ccsf.edu/Resources/ATT/>

5. Reach Out to Local Residents and Businesses

Local government should reach out to residents and businesses about PEVs, charging infrastructure and the actions it is taking to get the community PEV Ready. The Metropolitan Transportation Commission (MTC) and the Bay Area Air Quality Management District (BAAQMD) are collaborating to develop a *Go EV Campaign*, which will be implemented in coordination with a consultant (or consultant team) starting in the 3rd Quarter of 2012. The effort will be a promotional campaign aimed at building awareness, action and demand for PEVs (including both BEVs and PHEVs) in the San Francisco Bay Area. One of the primary objectives of the campaign is to communicate the potential of PEVs to displace gasoline vehicles and save consumers money, stimulate the local economy, create jobs, reduce GHG emissions, and improve public health. The specific goals of the Campaign include:

- Education of San Francisco Bay Area residents about electric vehicles, including vehicle operation, differentiation between vehicle types and vehicle charging (e.g., charging station locations, charge times, miles per charge, etc.);
- Behavior change of San Francisco Bay Area drivers to purchase PEVs when offered the choice;
- Development and implementation of core messages that create awareness of PEV benefits (e.g., cost savings, convenience, regional economic and job benefits, environmental and health benefits, “fun to drive” and “cool factor”);
- Continuation of the promotion of the Bay Area identity as a center for high tech and green culture;
- Identification of prominent individuals/organizations to deliver campaign messages, including civic and business leaders, PEV-related companies, auto companies, cities (e.g., San Francisco and San Jose), regional public agencies, environmental groups and prominent EV drivers (e.g., George Schultz, Gavin Newsom, etc.); and
- Motivation of individuals to reduce their contribution to San Francisco Bay Area GHG emissions.

Key, high-level messages can highlight PEV availability and benefits, including total cost of ownership, environmental, health, and community benefits, and point to state and national

outreach campaigns (see resources below). The primary focus, however, should emphasize the community-specific PEV activities and information such as local PEV policies.

A good practice and relatively simple first step can be to create a “one-stop shop” online tool, possibly through a city website, with links to state and national campaigns as well as unique local content. Information also can be distributed via other websites, local print and electronic media, social networks, over-the-counter handouts at city hall and at local restaurants, retail establishments and auto dealers, public signage and other local distribution resources. Key audiences and topics include the following:

- **Local residents.** Community residents will need information on how to have charging equipment installed in their homes, local contractors who are trained and certified to install charging infrastructure, and local electric utility contacts available to address PEV issues. Homeowners will also want information on where the regional public charging infrastructure is located, and whether there are local incentives for vehicles or charging equipment.
- **Local businesses.** Employers and retail outlets in the community will need information on what to consider when deciding whether to install charging infrastructure. Local government outreach can include references to other employers and employer associations that are working to become PEV ready, such as the Business Council on Climate Change (<http://www.bc3sfbay.org>). Additionally, information will be needed on the business proposition and green marketing opportunities for businesses and fleet owners around the use of PEVs.

Bay Area and Monterey Bay Region Resources

- BAAQMD (2012). “Bay Area PEV Ready.” <http://www.bayareapevready.org/>
- Go EV Campaign, Ursula Vogler (MTC), uvogler@mtc.ca.gov, (510) 817-5785
- Electric Power Research Institute (2011). “Plugging In: A Consumer’s Guide to the Electric Vehicle.” Retrieved from: http://my.epri.com/portal/server.pt?Abstract_id=000000000001023161

Additional Actions for Expanded Readiness

6. Develop a Regional Public Charging Station Site Selection Plan

To date, regional agencies have used an array of parameters to develop a strategy for siting publicly available EVSE. The first movers in these exercises have been aided by ECOtality as part of The EV Project. The parameters considered generally include land use, origin-destination modeling (e.g., using travel models), corridor planning, links to transit trips, off-street parking availability and accessibility, car sharing potential, and surveys of PEV drivers.

ECOtality is under contract with BAAQMD to perform an analysis regarding EVSE site selection in the Region. In coordination with ICF and BAAQMD, identifying charging station site selection will consider the following steps:

- **Estimate demand for PEVs in the Region**

Using a combination of demand forecasting and inputs from the Bay Area regional travel demand model (developed by MTC), a forecasted demand for PEVs in the Bay Area will be estimated out to 2020. The demand forecasting will be based on factors such as hybrid ownership, regulatory drivers (e.g., the Low Carbon Fuel Standard and the Zero Emission Vehicle Program), and the travel needs that can be met by PEVs (including a consideration of the potential split between PHEV and BEV technologies). ICF has developed forecasts for PEVs in the Bay Area which can be used as inputs into this task.

- **Refine estimates of PEV demand in the Region based on projected ownership characteristics**

The initial projections for PEV demand will be refined by taking spatially-explicit demographic data into account. This subtask will also draw from the PEV characteristics of near- and mid-term vehicle deployments and data available regarding PEV owner characteristics. Several basic household demographic profiles for the Region will be considered, including parameters such as household income, education, and family size. These will be informed by findings from initial PEV consumer market research to describe early adopters, likely adopters, possible adopters, unlikely adopters, or any other designations useful for describing the target market segments. Once these basic demographic profiles are established, the next step is to identify the location of these households vis-à-vis the locations of the travel profiles generated previously.

- **Estimate parking type availability for PEV purchasers**

This step in the analysis will characterize the parking types in the study area based on general descriptive factors such as garage parking, surface lots, or underground parking, and ownership parameters e.g., shared parking or dedicated parking. This step will also require an assessment of off-street parking lots in key areas throughout the Region, distinguished between privately owned (and in some cases, managed separately by a parking management company) and municipally owned lots.

■ **Identify most suitable location for publicly accessible EVSE**

The location of publicly-available EVSE is a complicated issue that planning agencies are struggling with across the nation. In a time of fiscal austerity and limited resources, public funding is being scrutinized in extraordinary detail. Some of the key parameters that we will include in our analysis are highlighted, with a brief description, in Table 1.

Analyze potential impacts on utility generation capacity

Over the long term, increased deployment of PEVs will lead to greater levels of energy consumption. It is therefore important to consider whether local utilities have the generation capacity to accommodate anticipated growth in PEVs, and if not, what opportunities exist to increase capacity. This is a particularly important issue for the many municipal utility districts that are responsible for delivering electricity to individual communities within the Region since they are more susceptible to peak load impacts and have less resources in which to amplify distribution capabilities.

Table 1. Parameters to Consider in the Identification of Suitable Locations for EVSE

Category	Parameter	Brief Explanation
Vehicle Characteristics	Vehicle range	Informs trip distance and vehicle type; as well as level of charging that is appropriate
	Charging time	Together with trip characteristics, will help characterize potential for opportunity charging; and provide estimate of level of charging needed (e.g., long charging times are not practical in some cases; fast charging is impractical in others)
PEV Demand	Vehicle type	Distinguishing between demand for PHEVs and BEVs is difficult; however, it would prove useful in the estimate of types of charging required, the associated cost, and the increased electricity demand due to EV deployment.
	Trip characteristics	Understanding where people are going and how far; a common output of travel demand models
	Home charging capability	Accessibility to a garage will help indicate the likelihood of a driver charging at home, where the vehicle spends a considerable amount of time. Increased home charging puts downward pressure on the need for public charging
Parking Characteristics	Lot types	The type of lot availability will help us understand, at a first pass at least, the range of costs for deploying EVSE.
	Ownership status	Will enable us to identify barriers associated with gaining access to some lots, targeting incentives, etc.
	Accessibility for installation	Improves cost estimate of EVSE installation; proximity to appropriate wiring/circuitry is useful, otherwise installation can be expensive
Electricity supply	Local utility service area	Enables us to determine how increased electricity demand will impact the individual utilities that serve Bay Area communities.

Using the parameters and information in Table 1, the siting analysis will subsequently identify the potential charging opportunities, characterized by the options outlined in Table 2.

Table 2. Types of Charging and Potential Locations

Type of Charging	Location
Workplace charging	Commuter lots
	Commercial lots (e.g., retail)
Opportunity charging	Retail centers
	Cinemas/movies
	Airports
	Cultural venues (e.g., stadiums)
Emergency charging	Mobile chargers
	Safety grid
Battery Swap Stations	Fleet maintenance yards
	Retail and commercial centers
	Fueling stations

As noted in Table 2, aside from what has been termed workplace charging (discussed in more detail below) and opportunity charging (charging characterized as an opportunity to charge when parked for more than two hours), the analysis will also consider the potential for emergency charging and battery swap stations. One of the most straightforward ways to determine emergency charging locations is to identify a suitably sized grid so that a driver is never more than a defined distance (e.g., three miles) from a charger. An overlay of the proposed or existing stations and the security grid would help a planning agency identify potential areas for emergency charging. Subsequently, the planning agency could evaluate the value of various types of charging. Battery swap stations are also an important charging technology to consider, particularly for fleets of standardized vehicles that can be charged at central locations. Potential sites for battery swap station locations for consumer vehicles include fueling stations, retail centers, and other sites with easy automobile access in high-traffic locations.

7. Encourage Workplace Charging With Local Employers

Identifying opportunities for workplace charging has been recognized as a gap or deficiency in the Bay Area and Monterey Bay region. With an initial focus on deploying residential chargers for early adopters, this is unsurprising. In recognition of this existing gap in the PEV ecosystem, the Air District and SCAQMD are sponsoring a project through CALSTART to conduct outreach to targeted companies, create a Workplace Charging Forum, and develop a Workplace Charging Toolkit. That work will also include the identification of issues and barriers that have prevented or are preventing the deployment of workplace charging statewide.

Bay Area and Monterey Bay Region Resources

- Business Council on Climate Change and Bay Area Council (2011). “Electrify Your Business: Moving Forward with Electric Vehicles, A Bay Area Business Guide.” http://www.bc3sfbay.org/uploads/5/3/3/9/5339154/electrify_your_business.pdf
- CALSTART (2012). “EV Employer Initiative.” <http://www.evworkplace.org> (resources on workplace charging will be available beginning in September 2012)

8. Support Local Electric Utility Efforts to Minimize Grid Impacts

As the largest utility in the Bay Area and Monterey Bay region, Pacific Gas & Electric (PG&E) has taken a leading role in PEV readiness. PG&E has worked closely with local and regional stakeholders to communicate the importance of utility notification protocols for new EVSE installations, particularly in residential applications. PG&E also offers a special EV rate, listed as an experimental residential time-of-use (TOU) rate for customers (E-9). For this rate, off-peak recharging for PEVs is offered at a drastically reduced rate to the consumer. For instance, for baseline usage in the summer, the peak rate is about \$0.30/kWh, which drops to about \$0.10/kWh or what is termed part-peak, and is just under \$0.04/kWh for off-peak charging.

Despite PG&E’s leadership in this area, there are other utilities serving Bay Area and Monterey Bay region communities that will need support from local communities regarding issues, such as notification protocols and understanding potential demand for PEVs so that they can understand the impacts on local distribution infrastructure. Another key issue that will be important is the development of TOU rates to encourage off-peak charging, comparable to those outlined previously from PG&E.

Historically, TOU rates have been used among commercial and industrial customers with complex energy management systems capable of ramping down energy use or increasing on-site electricity production to adapt to changes in energy prices. If TOU rates are offered, early adopters must be outfitted with the tools to understand when peak rates would be triggered to prevent excessive demand charges and a potentially negative perception of PEVs. This may be addressed in part with the integration of smart chargers, though they are often significantly more expensive than a basic charging unit. Incentives to help reduce the initial expense of a smart charger would greatly benefit the consumer by keeping costs low and utility costs low by encouraging the use of off-peak energy.

Bay Area and Monterey Bay Region Resources

- Pacific Gas & Electric (2011). “PG&E Standards and Requirements for Plug-In Electric Vehicle Interconnections.” http://www.pge.com/includes/docs/pdfs/mybusiness/customerservice/otherrequests/newconstruction/servicerequirements/electric_vehicle_bulletin.pdf
- Pacific Gas & Electric (2012). “Plug-In Electric Vehicles: Notification Process.” <http://www.pge.com/mybusiness/environment/whatyoucando/electricdrivevehicles/contactpge/>

9. Implement Solutions for Multi-Unit Dwelling Properties

The population density in the Bay Area and Monterey Bay region requires the consideration of deploying EVSE multi-unit dwellings (MUDs). The Department of Environment in San Francisco recently initiated MultiCharge SF in partnership with Coulomb Technologies to bring charging infrastructure to multi-family buildings in San Francisco, where two thirds of residences reside in MUDs (see Table 3 below). The project will help develop a knowledge base and best practices for EVSE deployment in MUDs by covering the costs of charging equipment and subsidizing the costs of installation significantly.

Table 3. Population and MUD Residents in Bay Area Counties

County	Population	% Population in MUDs
Alameda	1,500,000	38%
Contra Costa	1,100,000	24%
Santa Clara	1,800,000	32%
San Francisco	900,000	67%
San Mateo	750,000	33%

The MultiCharge SF project will help address some of the issues associated with deploying EVSE at MUDs. However, other jurisdictions outside of San Francisco will likely have to deal with the challenges of deploying EVSE at MUDs (see Table 4 below for a list of common challenges). The deployment of PEVs today will require many jurisdictions in the Region to grapple with these challenges before the lessons learned from the MultiCharge SF project are fully understood. The important factor here is that the entire Region cannot rely solely on the singular project in San Francisco County to develop a uniform knowledge base to deploy EVSE in MUDs. Other jurisdictions will have to engage home owner associations (HOAs), developers, and property owners to develop solutions for their community.

In addition to the City of San Francisco’s efforts, BAAQMD is collaborating with MTC to develop elements of a regional strategy regarding the installation of EVSE in MUDs through the *Go EV!* Campaign, an outreach and PEV readiness initiative. While it is unlikely this strategy will resolve all the issues associated with this complex topic, this strategy should make information more readily available to MUD owners and local jurisdictions. Information will be available beginning in September 2012 through the District’s Bay Area PEV Ready website.

Though much of the work to develop PEV charging options in MUDs will need to be developed locally, state-level agencies and organizations are also working to identify solutions to deploying EVSE in MUDs. It will therefore be necessary for jurisdictions to engage with the information resources listed below to keep current on the guidance available.

Table 4. Common Factors that Impact EVSE Installation at MUDs

Physical Challenges	<ul style="list-style-type: none"> • Availability of capacity in the electrical panel • Availability of space for additional meters in the meter rooms • Distances between utility meters, parking spaces, and unit electrical panels
Cost of Installation and Operation	<ul style="list-style-type: none"> • Restrictive facility configurations (master meter, remote parking, etc.) • Cost allocation to residents (based on usage, equipment, parking, shared service areas) • Inability to take advantage of off-peaking charging rates • HOA fee structures
Codes, Covenants, and Legalities	<ul style="list-style-type: none"> • Differences in ownership • Differences between actors who make the investment versus those that reap benefit • Agreements between property owners and residents / renters • Deeded parking spaces assigned to individual residents

Bay Area and Monterey Bay Region Resources

- San Francisco Department of Environment—MultiCharge SF, Bob Hayden, Bob.Hayden@sfgov.org, (415) 355-3740
- San Francisco Department of the Environment (2012). “Multi-Family Building Initiative.” <http://sfenvironment.org/transportation/clean-fuels-vehicles/electric-vehicles-sf-electric-drive/charging-and-infrastructure/residential/multifamily-building-initiative>
- BAAQMD (2012). “Bay Area PEV Ready.” <http://www.bayareapevready.org/> (resources on PEVs in MUD will be available beginning in September 2012)

10. Incorporate PEVs and Charging into Local Vehicle Fleets

The deployment of PEVs in government fleets is important because it identifies governments as leaders in the deployment of advanced technologies. In the case of electric vehicles, there is also the opportunity, for instance, to co-locate fleet charging with public access charging stations. This is often identified as an opportunity for demonstrative and effective outreach to the public.

There are approximately 50,000 government fleet vehicles in the Bay Area, with about 1,500 hybrids in service. Of the 50,000 vehicles, about 44% of these vehicles are light-duty cars and the other 56% were light-duty trucks. Of these vehicles, about 6% and 1% are hybrid electric vehicles (HEVs). For the sake of comparison, light-duty trucks make up about 40% of the personal light-duty vehicle fleet. This matters because it limits the potential for electrification in the near-term future. Most vehicle forecasts for the next several years indicate that the overwhelming majority of PHEV and BEV offerings will be light-duty cars as opposed to trucks.

Government fleet purchases are generally different than personal vehicle purchases—fleet managers generally procure a vehicle for specific purposes with a narrower focus on vehicle attributes. To demonstrate the challenges associated with PEV deployment in fleets, it is useful to understand some of the general characteristics of government fleets e.g., vehicle turnover or vehicle fleet expansion.

According to statistics published by the Federal Highway Administration, California public fleets increased by an average of about 1.6% for automobiles and 2.5% for trucks from 2000-2009. Based on these increases and the model year population counts as of 2008, Bay Area and Monterey Bay region government fleets are likely retiring about half as many vehicles as they are purchasing annually. In other words, we estimate that for every 100 new vehicles added to the fleet, approximately 50 vehicles are retired.

MTC is currently funding an important project via its Climate Initiatives Program to deploy PEVs in government fleets. That project is led by Alameda County, but involves Sonoma County, Transportation Authority of Marin, City of San Francisco, City of San Jose, City of Oakland, City of Fremont, City of Concord, and the Bay Area Climate Collaborative. The project will ultimately deploy 90 vehicles—78 sedans and 12 vans—and 90 chargers in these fleets.

Bay Area and Monterey Bay Region Resources

- MTC Climate Initiatives Program, Brenda Dix, bdix@mtc.ca.gov, 510-817-5927
- Alameda County—Motor Vehicle Division, Doug Bond, douglas.bond@acgov.org, (510) 272-6401
- East Bay Clean Cities Coalition (2012). <http://www.cleancitieseastbay.org/>
- San Francisco Clean Cities Coalition, Bill Zeller, 415-355-3728, william.zeller@sfgov.org
- Silicon Valley Clean Cities Coalition (2012). <http://www.svcleancities.org/>
- Hybrid Truck and Bus Voucher Incentive Project (administered by CALSTART for ARB) (2012). <http://www.californiahvip.org/>

11. Create Local Incentives to Encourage PEV Usage and Sales

Many communities and local governments in the Bay Area and Monterey Bay region have already started to deploy incentives to encourage the deployment of PEVs and EVSE. These measures are generally complementary to incentives provided at the federal level (e.g., the tax incentive for vehicle and charger purchase), the state level (e.g., the Clean Vehicle Rebate Project), and the regional level (e.g., BAAQMD's deployment of residential and nonresidential EVSE as part of the EV Project and regional match funding). Depending on resource constraints, these incentives can make a significant contribution to the value proposition for PEV owners.

Regional agencies in the Bay Area have also demonstrated their long-term commitment to supporting the electrification of the transportation sector as a critical strategy to meet the region's climate change goals. Most notably, on May 18, MTC and ABAG approved the Plan Bay Area Preferred Land Use and Transportation Investment Strategy⁵, which outlines the Bay Area's strategy to meet the per capita GHG reduction targets of SB 375, with spending upwards of \$275 billion out to 2035. While most of these investments are transit-oriented or for the expansion of roads and bridges; however, there are two key aspects of the Plan Bay Area that will promote the deployment of PEVs and EVSE out to 2035:

⁵ Preferred Land Use and Transportation Investment Strategy for Plan Bay Area, May 2012, available online at: www.onebayarea.org

- **Regional Public Charger Network:** With PHEVs likely to be deployed in significant numbers in the Bay Area, this strategy makes targeted investments to help increase the opportunity to increase the number of so-called electric miles for PHEVs. The initial plan is to dedicate approximately \$240 million over the span of 15 years to support this program.
- **Vehicle Buyback & PEV Incentives Program:** This program couples fleet turnover with the deployment of PEVs. The vehicle buyback program is designed as a trade-in for older vehicles that are below a certain fuel economy threshold, with the eligibility restricted to consumers purchasing a PHEV or BEV. The incentive amount varies with the fuel economy of the vehicle being traded in (measured in mpg) as well as the vehicle type being purchased (i.e., PHEV or BEV). The initial plan allocates \$180 million for this strategy over the span of 15 years.

Bay Area and Monterey Bay Region Resources

- Metropolitan Transportation Coalition (2012). "Plan Bay Area: Technical Summary of Proposed Climate Policy Initiatives." http://www.onebayarea.org/pdf/Appendices_5-4-12/Appendix_E_TechReport_CPI_050412.pdf (See section 3.1 for information on the regional public charger network and section 3.2 on the vehicle buyback and PEV incentives program.)
- BAAQMD (2012). "Bay Area PEV Ready: PEV Public Charger Deployment." <http://www.bayareapevready.org/funding/pev-public-charger-deployment/>

Residential EVSE Deployment

- **The EV Project and BAAQMD:** Through the EV Project, ECOtality has teamed with BAAQMD to provide EVSE at no cost to homeowners.
- **ChargePoint America and BAAQMD:** Through the ChargePoint America program, Coulomb technologies will also provide rebates to homeowners in the Bay Area who install EVSE.

Bay Area and Monterey Bay Region Resources

- BAAQMD (2012). "Bay Area PEV Ready: PEV Public Charger Deployment." <http://www.bayareapevready.org/funding/homechargers/> (Contains information both on ECOtality and Coulomb residential charging programs.)

Nonresidential EVSE Deployment

- **BAAQMD Public Charger Deployment:** BAAQMD is gathering feedback from local stakeholders to determine the type and location EVSE to be installed in public places.
- **BAAQMD PEV Fast Charger Deployment:** In addition to home and public chargers, BAAQMD is also working to create a network of 50 high-voltage DC fast chargers in the Bay Area. This effort will include opportunities for public input on EVSE locations.

Bay Area and Monterey Bay Region Resources

- BAAQMD (2012). “Bay Area PEV Ready: PEV Public Charger Deployment.” <http://www.bayareapevready.org/funding/pev-public-charger-deployment/>
- BAAQMD (2012). “Bay Area PEV Ready: PEV Fast Charger Deployment.” <http://www.bayareapevready.org/funding/fastchargers/>

Other Incentives

- **High Occupancy Vehicle (HOV) Lane Exemption:** The lifetime and availability of the stickers for HOV lane exemptions from the State of California depend on the vehicle architecture (i.e., PHEV vs BEV).
- **City of San Jose, Clean Air Vehicle Parking Program:** A temporary incentive that provides free parking for qualifying vehicles in city-owned garages, parks, and downtown.
- **Farmers Insurance:** Provides a discount of up to 10% for hybrid electric vehicle and alternative fuel vehicle (AFV) owners
- **Preferred Parking at San Francisco International Airport (SFO):** SFO offers preferred parking for PEVs. The charging is currently free for users. The facility has both Level 1 and Level 2 chargers, installed as part of the ChargePoint America program.

Bay Area and Monterey Bay Region Resources

- California Air Resources Board (2012). “Eligible vehicle list: Single occupant carpool lane stickers.” <http://www.arb.ca.gov/msprog/carpool/carpool.htm>
- Farmers Insurance Group (2012). “California Insurance Discounts for Your Car and Home.” http://www.farmers.com/california_insurance_discounts.html
- San Jose Department of Transportation (2012). “San Jose Clean Air Vehicle Parking Program.” (408) 535-3850. More information: http://www.sjdowntownparking.com/clean_air.html
- San Francisco International Airport (2012). “Plug-in Electric Vehicle Parking.” http://www.flysfo.com/web/page/orphan/plug-in_electric_car_parking/

12. Encourage Renewable Energy

Investor owned utilities (IOUs) in California are at various stages of preparedness regarding the deployment of PEVs. Based on ICF research, the IOUs in California—SCE, SDG&E, and PG&E—have not prioritized providing opportunities for PEV drivers to purchase greener electricity for charging i.e., green charging. The IOUs are currently focused on issues including, but not limited to, interconnection, ensuring distribution infrastructure is sufficient for residential EVSE (especially in areas where PEV purchasers may be clustered), and interfacing with EVSE providers to facilitate PEV deployment.

The two most viable pathways for consumers to pursue renewable energy as part of the deployment for PEVs are likely:

- Green Pricing Programs
- Community Choice Aggregators (CCAs)

The existing green pricing programs and CCAs are listed below with a brief description of each program.

Green Pricing Programs

The most common pathway for consumers to send a market signal indicating a demand for renewable energy today is via voluntary green pricing programs provided by the local utility. These programs are more common for MOUs; of the 3 major IOUS, PG&E used to offer a green pricing program called ClimateSmart™. That program was recently terminated, but PG&E is working to create a new Green Option Tariff that will enable consumers to purchase green energy. The programs are voluntary and provide customers the opportunity to commit to paying a premium for electricity with the understanding that this contribution will go towards purchasing renewable energy in the utility’s district. MOUs throughout California have been particularly successful in getting consumers to sign up for green pricing programs, most notably Sacramento Municipal Utility District (SMUD), the City of Palo Alto Utilities, and Silicon Valley Power (see Table 5 below).

Table 5. Green Pricing Programs in the Region

Utility Provider	Program Name	Brief Description
City of Palo Alto Utilities	PaloAltoGreen	1.5 ¢/kWh
Silicon Valley Power	Santa Clara Green Power	1.5 ¢/kWh, 100% renewable

The provision of renewable energy to interested consumers is a high priority for some utilities; however, in the context of PEV deployment and vehicle charging, it is not a high priority at this time. It will be important to work with utilities that have deployed successful green pricing programs to incorporate renewable electricity purchasing for PEV charging. It is likely that there is significant overlap between customers interested in the opportunity to purchase green electricity and interested PEV purchasers. The potential overlap in customer interest in green pricing and green charging for EVs should help conserve marketing and advertising resources for utilities.

Although premiums for green pricing are generally around \$5-10 per month for customers, this cost could increase significantly with the additional usage due to PEV charging. It will be important for customers to be aware of the potential costs associated with PEV charging and how this impacts green pricing programs. The operational savings of electricity usage for PEVs compared to gasoline in conventional vehicles is a major incentive for consumers; if these savings are inflated due to a lack of understanding by the consumer, then this may have a small but negative impact on PEV deployment. Furthermore, consumers should be aware that even

using the average mix of generation sources in California yields significant GHG reductions compared to gasoline use.

Bay Area and Monterey Bay Region Resources

- City of Palo Alto—PaloAltoGreen, (650) 329-2161, paloaltogreen@cityofpaloalto.org. More information: <http://www.cityofpaloalto.org/forms/pagreen/index.html>
- Silicon Valley Power—Santa Clara Green Power, (408) 244-7283, green@siliconvalleypower.com. More information: <https://siliconvalleypower.com/index.aspx?page=1950>

Community Choice Aggregation

Another viable pathway for coupling the deployment of PEVs with renewable energy is via Community Choice Aggregators (CCAs). Community Choice Aggregation was established in California by the Legislature via AB 117 (Statutes of 2002) to give cities and/or counties the authority to procure electricity on behalf of consumers in their jurisdiction. Under a CCA, the IOU is still responsible for delivery of power, metering, and billing; the local CCA authority is responsible for the source of electricity supply. There are only 3 confirmed and registered CCAs currently in California: 1) San Joaquin Valley Power Authority (approved in 2007), 2) Marin Energy Authority (approved in April 2010), and 3) CleanPower SF (approved May 2010).

The process of establishing a confirmed CCA can be a protracted process. For instance, it took Marin Energy Authority (MAE) 7 years to complete the process. Although the timeframe is likely to decrease as there is an opportunity for the first mover CCAs to share lessons learned with other areas interested in developing CCAs, the process is still likely to be lengthy and contentious. The MAE includes the City of Belvedere, Town of Fairfax, County of Marin, City of Mill Valley, Town of San Anselmo, City of San Rafael, City of Sausalito and Town of Tiburon, and the MAE board recently approved a request from the City of Richmond in Contra Costa County. It may be easier for communities wishing to pursue CCA to follow Richmond's example and join an existing CCA partnership rather than establishing their own CCA.

MAE's immediate plans regarding renewable electricity offerings to consumers include two levels:

- Light Green—a 25% renewable electricity provision (compared to 13% in PG&E's existing generation mix) at what MAE reports as the same or lower costs as PG&E rates; and
- Deep Green—a 100% renewable electricity provision at rates estimated to be 7% higher than PG&E.

MAE is currently in the implementation phase of the program and is phasing in these options by first offering the program to a smaller sample of consumers—about 9,200. At full subscription, MAE estimates 72,000 customers.

It is beyond the scope of this work to consider the potential benefits and drawbacks of CCAs. Similarly, because CCAs are relatively new and there are so few of them in California, it is

impossible to conclude one way or another that CCAs are more or less capable of providing green charging options to consumers. At this point, regional and state agencies should continue to coordinate and observe CCA developments in the context of PEV deployment. With both MEA and CleanPower SF operating in the Bay Area, this will be an interesting development to monitor.

Bay Area and Monterey Bay Region Resources

- San Francisco Public Utilities Commission—CleanPowerSF, (415) 554-3289, CleanPowerSF@sfwater.org. More information: <http://cleanpowersf.org/about/>
- Marin Energy Authority, (888) 632-3674, info@marinenergy.com. More information: <https://marincleanenergy.info/>

Additional Local Resources

Several organizations in the Bay Area and Monterey Bay region are dedicated to supporting PEV deployment through education, advocacy, and coordination among government agencies, researchers, utilities, and members of the PEV industry.

The Bay Area EV Strategic Council

Bay Area stakeholders have responded to the challenge of coordinating action to support the deployment of PEVs and the charging infrastructure via the formation of the Bay Area EV Strategic Council. The mission of the EV Strategic Council is to establish the greater San Francisco Bay Area as the “EV Capital of the United States”, as measured by the proportion of plug-in electric vehicles (PEVs) in the region. Founded in April 2011, the Council was conceived as a three year project to set the conditions for accelerated PEV adoption in the region. The Council is comprised of individuals from state, regional and local public agencies, PEV-related businesses, utility and major energy service companies, non-governmental organizations (NGOs), universities and research facilities, and the Clean Cities Coalitions.

Monterey Bay Electric Vehicle Alliance (MBEVA)

The Monterey Bay Electric Vehicle Alliance (MBEVA) is a public-private partnership comprised of diverse stakeholders from Monterey, San Benito and Santa Cruz counties whose overall goal is to assure the region is PEV ready. MBEVA’s primary goals are to increase funding for and installation of publicly-available PEV charging stations, to ensure that local governments adopt PEV-supportive policies, to increase public awareness about PEVs, to increase training for the local workforce in PEV-related jobs, and to attract electric vehicle businesses to the region.

San Francisco Clean Cities Coalition

The San Francisco Clean Cities Coalition works with vehicle fleet owners, fuel providers, community leaders, and other stakeholders to reduce petroleum use in transportation. SFCCC offers a wide variety of conferences, workshops, and meetings on a wide range of topics, such as fuels, advanced vehicles, and the alternative transportation sector. It hosts workshops and produces guides on the different options for alternative-fuel vehicles, including PEVs, and also on funding opportunities related to PEV deployment.

Silicon Valley Clean Cities

The Silicon Valley Clean Cities Coalition (SV Clean Cities) is a partnership of public, private agencies, businesses, and interested citizens dedicated to the advancement of alternative fuels in order to improve the air quality of the Silicon Valley. One of SV Clean Cities’ goals is to increase the number of PEVs and charging stations through technical training, informational workshops, grant-writing assistance, outreach on legislation and funding opportunities, and

policy advocacy. PEV-related events organized by SV Clean Cities help homeowners and fleet managers understand options for selecting, purchasing, and deploying PEVs and EVSE.

East Bay Clean Cities Coalition

The East Bay Clean Cities Coalition works to promote PEVs and other alternative-fueled vehicles by providing information on vehicles, charging and fueling infrastructure, events, and funding opportunities. The Coalition has over 60 stakeholders representing Alameda County, Contra Costa County, and parts of Solano County, and is in the process of expanding to include Sonoma County and Napa County.

PEV Advocacy Groups

In addition to the groups mentioned above, several advocacy groups whose members are primarily PEV drivers and enthusiasts are also working to promote PEVs, both nationally and in the Bay Area and Monterey Bay Region. These organizations work to influence policymakers to support PEVs, maintain websites with information about PEVs and PEV-related advocacy opportunities, and organize meetings and events for current and potential PEV drivers. They include Plug in America, a national organization based in California, as well as several local chapters of the Electric Auto Association, such as the Golden Gate Electric Vehicle Association. Owners of EVs have also organized through Facebook and other social media outlets to create enthusiasts' groups for specific PEV models, such as the San Francisco Bay Area Nissan LEAF Owners Association (SF BayLEAFs).

Bay Area and Monterey Bay Region Resources

- Bay Area EV Strategic Council, Rafael Reyes, Executive Director, (408) 409-5534, rrayes@baclimate.org. More information: <http://baclimate.org/impact/ev-strategic-council.html>
- Monterey Bay EV Alliance, Sharon Sarris, Outreach Team Leader, (831) 688-7900, slsarris@greenfuseenergy.com. More information: <http://www.mbeva.org>
- San Francisco Clean Cities Coalition, Bill Zeller, Manager, Clean Vehicle Program, San Francisco Department of the Environment, (415) 355-3728, william.zeller@sfgov.org. More information: <http://sfenvironment.org/transportation/clean-fuels-vehicles/san-francisco-clean-cities-coalition-sfccc>
- Silicon Valley Clean Cities Coalition, Margo Sidener and Patricia Tind, Co-Coordiators, (408) 998-5865. margo@lungsrus.org and patricia@lungsrus.org. More information: <http://www.svcleancities.org>
- East Bay Clean Cities Coalition, Richard Battersby and Chris Ferrara, Co-Coordiators, (530) 752-9666, rebattersby@ucdavis.edu and caf3@pge.com. More information: <http://www.cleancitieseastbay.org>
- Plug In America, (415) 323-3329, info@pluginamerica.org. More information: www.pluginamerica.org

- San Francisco Bay Area Nissan LEAF Owners Association, Howard Clearfield, President, hclearfield@sfbayleafs.org. More information: <http://www.sfbayleafs.org>
- Local chapters of the Electric Auto Association (EAA):
 - Golden Gate Electric Vehicle Association, info@ggeva.org, <http://www.ggeva.org>
 - East Bay Chapter, <http://www.ebeaa.org/>
 - North Bay Chapter: Alan Soule, info@nbeaa.org, <http://www.nbeaa.org/>
 - San Jose Chapter: Terry Wilson, Secretary, (408) 446-9357, sjeaacontact@yahoo.com, <http://rotordesign.com/sjeaa/>
 - Silicon Valley Chapter: <http://eaasv.org/>
 - Central Coast Chapter: <http://www.becketts.ws/ea/default.htm>

Appendix: EVSE Installation Checklist

	Residential	Non-Residential
Phase 1: Pre-Work Contractor	<ul style="list-style-type: none"> Understand intended use of the EVSE (i.e. personal) 	<ul style="list-style-type: none"> Obtain an address for the location Determine ownership of the site and/or authorization to install equipment at site Understand intended use of the EVSE (i.e. fleet, employee, customer, visitor, etc.) Determine number of vehicles charging and connectors per charging station Determine source of power and authorization to use source
	<ul style="list-style-type: none"> Determine type of vehicle(s) to be charged at EVSE Evaluate mounting type options (i.e. bollard, pole-mount, wall-mount, ceiling-mount) Clarify communication requirements (i.e. ethernet, cellular, wi-fi, none, or other) Determine the NEMA Enclosure type Determine the physical dimensions of the space(s) Inspect the type of circuit breaker panel board intended for the installation 	
Phase 2: Pre-Work Customer	<ul style="list-style-type: none"> Identify incentives or rate structures through the utility Determine size of electrical service at the site Identify and contact applicable local permit office(s) to identify specific requirements, including local fire, environmental, construction, building, concealment and engineering requirements Identify incentives available through local, state, or federal programs Contact insurance company to acquire additional insurance or separate coverage as needed Hire the contractor and verify credentials with all subcontractors. Ensure electrical contractor's license for electrical work is current 	
Phase 3: On-Site Evaluation	<ul style="list-style-type: none"> Verify EVSE meets UL requirements and is listed by UL or another nationally recognized testing laboratory Verify EVSE has an appropriate NEMA rated enclosure (NEC 110.28) based on environment and customer needs, such as weatherization or greater levels of resistance to water and corrosive agents Determine the level of charger meets customer's PEV requirements (most vehicles require the maximum of a 240V / 32A circuit (40A breaker) Based on proposed EVSE location, determine if cord length will reach a vehicle's charging inlet without excessive slack and does not need to be more than 25' in length (NEC 625.17) Cord management methodologies have been considered to reduce the risk of tripping hazards and accidental damage to the connector Mounting type selection based on requirements to meet site guidelines Determine whether EVSE communication options are beneficial to customer and/or local utility 	

	Residential	Non-Residential
<p>Phase 4: On-Site Survey</p>	<ul style="list-style-type: none"> • Ensure overhead doors and vehicle parking spot do not conflict with EVSE location • Place EVSE in a location convenient to charging port on vehicle and typical orientation of the vehicle when in garage (i.e. backed in or head-first) • Ensure functionality of lighting in the garage to meet NEC code 210.70 	<ul style="list-style-type: none"> • Space(s) should be visible to drivers and pedestrians • Determine proximity to building entrance (could be considered an incentive for PEV use) • Select spaces proximate to existing transformer or panel with sufficient electrical capacity • EVSE installation should maintain a minimum parking space length to comply with local zoning requirements • If available, use wider parking spaces to reduce the risk of cord set damage and minimize the intersection of cords with walking paths • Ensure sufficient lighting at proposed space(s) to reduce risk of tripping and damage to charging station from vehicle impact or vandalism. Light levels above two foot candles are recommended • For lots with accessible parking, the first charging station should be prioritized for an ADA accessible parking space and for every 25th additional station another accessible space is installed • Determine availability of space for informative signage • EVSE with multiple cords should be placed to avoid crossing other parking spaces • All available charging station mounting options should be considered and optimized for the space • Determine if hazardous materials were located at the site • PARKING DECKS • Place EVSE towards the interior of a parking deck to avoid weather-related impacts on equipment • PARKING LOTS • Avoid existing infrastructure and landscaping to mitigate costs, potential hazards and other negative impacts • ON-STREET • Install on streets with high foot and vehicle traffic to mitigate vandalism • Avoid existing infrastructure and landscaping to mitigate costs, potential hazards and other negative impacts • Installations at ADA accessible spaces should be considered in public streets where accessible parking exists • For pull-in spaces, EVSE should be placed in front of the spaced and either centered on the space or placed between two spaces (if two connectors are available). EVSE with more than two connectors should not be used in on-street applications • For parallel parking locations, the charging station should be installed at the front third of the parked vehicle and based on the direction of traffic flow. EVSE with a single connector is recommended to reduce potential trip hazards

	Residential	Non-Residential
Phase 4: On-Site Survey <i>(continued)</i>	<ul style="list-style-type: none"> • Mount the connector at a height between 36" and 48" from the ground (NEC 625.29) unless otherwise indicated by the manufacturer • Install wall or pole-mount stations and enclosures at a height between 36" and 48" • Ensure sufficient space exists around electrical equipment for safe operation and maintenance (NEC 110.26). Recommended space is 30" wide, 3' deep, and 6'6" high • Minimize tripping hazards and utilize cord management technologies when possible • Equipment operating above 50 volts must be protected against physical damage (NEC 110.27). Ensure the vehicle is out of the line of vehicle travel and use wheel stops or other protective measures • EVSE must be located such that ADA routes maintain a pathway of 36" at all times 	
Phase 5: Contractor Installation Preparation	<ul style="list-style-type: none"> • Price quote submitted to customer and approved including utility upgrades • Order equipment • Provide stamped engineering calculations as needed • Provide site plan modification with diagrams as necessary • Complete all necessary service upgrades and/or new service assessments • Complete permit applications as required by local permitting department • Ensure permit is approved and collected • Schedule all necessary contract work (i.e. boring, concrete, and/or paving restoration) and utility work (i.e. utility marking, service upgrade, new service and/or meter pull) • Ensure utility marking of existing power lines, gas lines or other infrastructure is completed and utilize "Call Before You Dig" services 	
Phase 6: Installation	<ul style="list-style-type: none"> • Residential garages may permit the use of nonmetallic-sheathed cable in lieu of conduit 	<ul style="list-style-type: none"> • Run conduit from power source to station location • For EVSE great than 60 amperes, a separate disconnect is required (NEC 625.23) and should be installed concurrently with conduit and visible from the EVSE
	<ul style="list-style-type: none"> • Post permit at site in visible location • Remove material to run conduit and/or wiring (i.e. drywall, insulation, pavers, concrete, pavement, earth, etc.) • Contractors are encouraged to examine requirement for installation sites and types of wiring in Chapter 3 of the NEC • Pull wiring. Charging stations require a neutral line and a ground line and equipment is considered to be a continuous load • Conductors should be sized to support 125% of the rated equipment load (NEC 625.21) • Prepare mounting surface and install per equipment manufacturer instructions • Floor-mount: typically requires a concrete foundation with J-bolts on station base plate with space to allow conductors to enter through the base • Wall/Pole/Ceiling-mount: install brackets for mounting of the equipment • Install bollard(s) and/or wheel stop(s) as needed • Install informative signage to identify the EVSE and potential trip hazards • Install additional electrical panels or sub-panels as needed • Install service upgrades, new service and/or new meter as needed. Utility may also pull a meter to allow for charging station wires to be connected to a panel • Make electrical connection • Perform finish work to repair existing infrastructure, surfaces, and landscaping 	

	Residential	Non-Residential
Phase 7: Inspection	<ul style="list-style-type: none"> • An initial electrical inspection by applicable building, fire, environmental and electrical authorities should occur after conduit has been run and prior to connecting equipment and running wires. If necessary, contractor should correct any issues and schedule a second rough inspection • If required, the inspector will perform a final inspection to ensure compliance with NEC and other codes adopted within the jurisdiction by inspecting wiring, connections, mounting and finish work • Contractor should verify EVSE functionality 	
Additional Resources	<ul style="list-style-type: none"> • National Codes and Standards • American National Standards Institute (ANSI) • National Fire Protection Association (NFPA) • Underwriters Laboratories, Inc. (UL) • International Association of Electrical Inspectors (IAEI) • International Code Council (ICC) • NECA-NEIS Standards • NECA and NFPA Webinars • Electric Vehicle Infrastructure Training Program (EVITP) Installer Training Course/Certification 	

References for Appendix

- Advanced Energy (2011). “Charging Station Installation Handbook for Electrical Contractors and Inspectors: Version 1.0.” <http://www.advancedenergy.org/transportation/evse/Charging%20Handbook.pdf>
- Pacific Gas & Electric (1999). “Electric Vehicle Infrastructure Installation Guide.” <http://ncrportal.mwcog.org/sites/surveys/EVP/General%20EV%20Reports/evmanual.pdf>
- National Electrical Contractors Association. “Managing Electric Vehicle Supply Equipment (EVSE) Installations.” <http://iaei-western.org/Files/2011/Programs/NECA%20EVSE%20Presentation%20NECA%20SD%202011%20Western%20IAEI%20Section.pdf>

**If AC Level 1 EVSE is utilized, NECA recommends connection to NEMA 5-15R or 5-20R receptacles and an individual branch circuit (National Electrical Contractors Association. “Managing Electric Vehicle Supply Equipment (EVSE) Installations.” <http://iaei-western.org/Files/2011/Programs/NECA%20EVSE%20Presentation%20NECA%20SD%202011%20Western%20IAEI%20Section.pdf>).