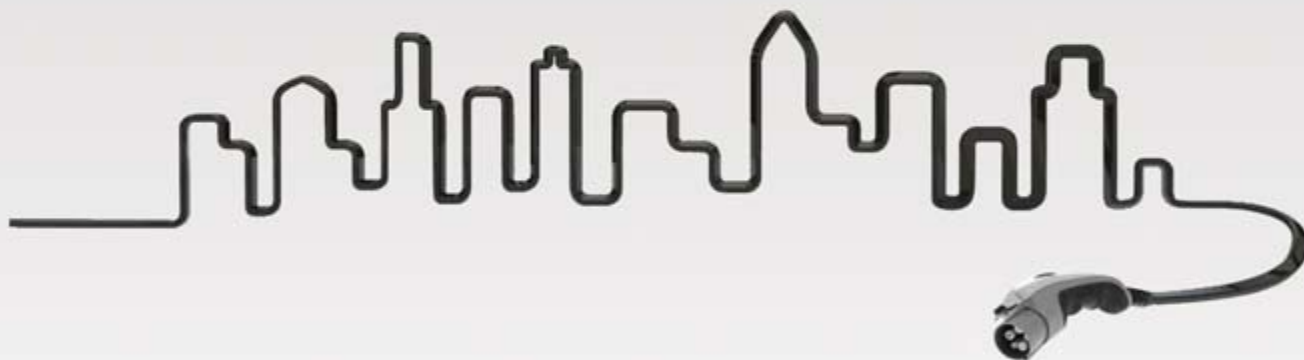


A Toolkit for Community Plug-In Electric Vehicle Readiness



A Resource for Local Officials, Version 2
August 2012

This toolkit was developed by the California Plug-In Electric Vehicle Collaborative, a multi-stakeholder partnership working to ensure a strong and enduring transition to a plug-in electric vehicle marketplace. Members played a guiding and consulting role in developing the toolkit, although individual organizations may not formally endorse every recommendation.

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The PEV Collaborative is a partner with SCAQMD, Bay Area Air Quality Management District (BAAQMD), California Center for Sustainable Energy (CCSE), Central Coast Clean Cities Coalition, Sacramento Area Council of Governments and San Joaquin Valley Air Pollution Control District in implementing statewide community readiness efforts.

This document is also a product of a partnership with Ready, Set, Charge, California (RSC), a program of the Bay Area Climate Collaborative. It builds upon the broad guidelines for PEV community readiness developed by RSC, and it references RSC and other information sources for specific readiness actions.

Finally, this document was developed with support from the Governor's Office of Planning and Research and in coordination with the California Energy Commission (CEC) and its community PEV readiness grant program. The PEV Collaborative is working to ensure communities can leverage both programs for local action. The CEC also is a member of the PEV Collaborative.

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Preface: How to Use this Toolkit

This toolkit highlights actions your community can take to get ready for the plug-in electric vehicles (PEVs) that are arriving in your community. It is intended to enhance local planning efforts while recognizing that each community will be starting from a different level of readiness. It offers tangible best practices examples and case studies from communities and stakeholders throughout California and abroad. It conveys the varying approaches communities can pursue to become PEV ready, depending on their local needs and priorities.

Each easy-to-reference section includes a description of the needed action, its purpose, and examples from California communities and stakeholders. The sections are designed to stand alone, so you can refer only to those sections needed. References to online resources or appendices provide additional sources of information (for example, Appendix A lists existing community-readiness guidelines, and Appendix B summarizes current PEV activities throughout California and beyond).

Each section highlights information from these primary sources that should be used in tandem with this toolkit:

- Plug-In Electric Vehicle Collaborative (PEV Collaborative) reports and guidelines, developed by PEV Collaborative members (www.pevcollaborative.org).
- Ready, Set, Charge, California (RSC) A Guide to EV-Ready Communities, coordinated by the Bay Area Climate Collaborative (California) (www.readysetcharge.org).
- Community Planning Guide for Plug-in Electric Vehicles, by Advanced Energy Corporation, focusing on stakeholder partnerships and collaboration approaches (North Carolina) (www.advancedenergy.org/transportation/resources/Community%20Planning%20Guide.pdf).

Communities also can benefit from and leverage the California Energy Commission's (CEC) community PEV readiness program. The CEC program encompasses a longer timeframe than the U.S. DOE readiness program, and can therefore be used for more comprehensive and broader readiness actions (notably actions #6 through #12 mentioned later in this toolkit).

Why Take Action? And Why Now?

Plug-in electric vehicles (PEVs) are here – and more are on their way! Now is the time for local governments to get ready by developing the policies and programs you need to support those PEVs already in your communities and the thousands more expected soon on California’s roadways. Now is the time to ask yourself, “Is our community PEV ready?”

Benefits of Becoming PEV Ready

By becoming PEV ready, your community can benefit in the following ways:

Attracting people with PEVs to live and shop in your community, bringing customers to local businesses and stimulating the local economy. When public chargers are installed at shopping centers, they become magnets for new business; the growing market of PEV drivers – from out of town and local – will stop to shop in your community while waiting for their car to charge.

Proactively serving your constituents, both homeowners and businesses. Your community will benefit from being proactive and ready when homeowners and local businesses begin installing residential, workplace, and commercial charging, and as PEV drivers seek to access an increasingly expanding PEV charging network at workplaces, retail locations, and in public spaces.

Taking advantage of the incentives available today for PEV charging infrastructure, gaining access to capital and integrated resource management solutions through grants and partnerships. By acting now, your municipality can be the first in line to take advantage of state and federal incentives, grants and loans, which will be exhausted quickly as other communities throughout the state get PEV ready.

Enhancing energy security and independence. By becoming PEV ready you are positioning your community to engage in opportunities to link with future alternative energy sources such as “vehicle-to-grid” and other distributed energy resources.

Integrating alternative and multimodal corridor transportation plans. Becoming PEV ready is consistent with Sustainable Community Strategies being developed pursuant to Senate Bill 375, which encourages local and regional municipalities to pursue integrated land use and transportation planning that supports the state’s air quality and public health goals.

Reducing greenhouse gases (GHG). Becoming PEV ready will reduce local GHGs, consistent with local emissions reduction targets and with Assembly Bill 32, under which the state’s GHG emissions must be reduced to 1990 levels by 2020.

Providing access to convenient, clean transportation fuel. Becoming PEV ready offers new, clean fuel choices to local residents and businesses and helps promote a clean and green community image.

Becoming a model for other communities statewide. California is taking a leadership role in preparing for this market and ensuring that challenges are addressed and consumers are supported. Your community has the opportunity to lead the “charge” and become a model for others across the state.

In these times of shrinking local government budgets, taking action to become PEV ready may seem like a lower priority when there is so much competition for other community and constituent services. However, for all the reasons stated above, you can’t afford not to invest. You don’t want to be left playing catch-up as consumer interest grows and the PEV market expands throughout California.

California Leads the PEV Charge

California is at the forefront of this emerging PEV market with the largest early PEV sales numbers compared to any other state. California is a leader in part because it has implemented groundbreaking policies to help shape the market. For example, in March 2012, Governor Jerry Brown issued Executive Order B-16-2012 that lays the foundation for the state’s continued leadership in this area by setting targets for zero-emission vehicles. Among other things, the order states that by 2015 all major cities will have adequate infrastructure and be PEV ready and that by 2025 there will be 1.5 million zero-emission vehicles on the road.

PEV Community Readiness Benefits

By becoming PEV ready, your community can benefit by:

- Attracting people with PEVs to live and shop in your community, bringing customers to your businesses and stimulating the local economy
- Proactively serving your constituents, both homeowners and businesses
- Taking advantage of the incentives available today for PEV charging infrastructure, gaining access to capital and integrated resource management solutions through grants and partnerships
- Enhancing energy security and independence, and preparing for opportunities to link with future alternative energy sources such as “vehicle-to-grid” and other distributed energy resources
- Integrating alternative and multimodal corridor transportation plans, consistent with Sustainable Community Strategies developed pursuant to SB 375
- Reducing greenhouse gases, consistent with AB 32 and local emissions reduction targets
- Providing access to convenient, clean transportation fuel
- Becoming a model for other communities statewide

Five Core Actions to Get PEV Ready

This toolkit emphasizes five core readiness actions that are necessary for a community to become PEV ready: updating zoning and parking policies, updating local building codes, streamlining permitting and inspection processes, participating in training and education programs for local officials, and reaching out to local residents and businesses. It also outlines seven additional actions that communities can take to expand their readiness and encourage faster growth in the PEV market.

Since cities and counties have primary jurisdiction over their own land-use planning decisions and regulations, these actions are not mandates; however, they are recommended steps you can take to ensure your community has the infrastructure, policies, and programs in place to support the influx of these PEVs.

California communities have the opportunity to learn from each other as cities and counties experiment with PEV readiness and learn which approaches work best. In cases where new codes need to be implemented, communities can approach the process as a pilot planning practice that can be revisited over time.

Five Core Actions to Get PEV Ready

- Action # **1** Update zoning and parking policies
- Action # **2** Update local building codes
- Action # **3** Streamline permitting and inspection processes
- Action # **4** Participate in training and education programs for local officials
- Action # **5** Reach out to local businesses and residents

Getting Started: Forming a Local Multi-Stakeholder Coalition

The first two steps to PEV readiness are determining your community's priorities and identifying local leaders to promote action through a local multi-stakeholder coalition. Taking these first two steps will position your community to implement the five readiness actions outlined in this toolkit.

In addition to the economic, community service, and environmental benefits of becoming PEV ready listed in the previous chapter, a community's environmental goals can become strong drivers for taking action. Each community should consider the role PEVs play in their alternative fuel and environmental improvement goals.

To maximize a community's ability to meet its local planning needs while supporting residents and the PEV market, a task force comprised of multiple government departments and relevant stakeholders could be formed. This multi-stakeholder coalition would coordinate new policies and ensure ongoing communication and information-sharing occurs to improve the chances of successful implementation.

Recognizing that continued coordination is critical to PEV infrastructure deployment, the California Energy Commission has funded ten multi-stakeholder coalitions in regions across the state. These coalitions convene key actors throughout each region to share best practices, improve coordination and find solutions to the barriers facing PEV infrastructure deployment. See the list of multi-stakeholder coalitions established as of this Toolkit's publication, date and their contact person, on page 11. See also, Additional Resources, at the end of this chapter for information on how to form effective local partnerships.

Partnerships and relevant stakeholders should include:

- Regional and local government planning officials
- Department officials from public works and buildings
- Local public and private fleets
- U.S. Department of Energy Clean Cities Coalitions
- The California Energy Commission community PEV readiness program
- Generators and distributors of electricity and utility regulatory authorities
- Owners and operators of property that will be essential to the deployment of publicly available charging infrastructure
- PEV manufacturers or retailers
- Charging equipment or service providers
- Training and curriculum development providers
- Regional and local non-profit organizations

Regional Multi-Stakeholder Coalitions in California

(As of August 2012)

Bay Area

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Central Coast

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Monterey Bay

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North Coast Region (Humboldt, Del Norte, Trinity)

Matthew Marshall
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Upstate Region (Shasta, Siskiyou, Tehama)

Jason Darrow
Jason@siskiyoucounty.org

Additional Resources

Resource/Source	Chapter Name/Page Number	Website
<p><i>Communication Guide: How do communities become PEV ready?</i></p> <p>PEV Collaborative</p>		<p>www.pevcollaborative.org/sites/all/themes/pev/files/CommunicationGuide5.pdf</p>
<p><i>Ready, Set, Charge, California</i></p> <p>Bay Area Climate Collaborative</p>	<p>Introduction to PEVs (PEV ecosystem, local benefits, market), 1.2</p> <p>PEV Policy (stakeholder roles), 1.3</p> <p>EV-Ready Community Policies, Actions, and Incentives, 2</p>	<p>www.readysetcharge.org</p>
<p><i>Community Planning Guide for Plug-in Electric Vehicles</i></p> <p>Advanced Energy</p>	<p>Planning 101 Steps for Success</p>	<p>www.advancedenergy.org/transportation/resources/Community%20Planning%20Guide.pdf</p>

Five Core Actions to Get PEV Ready

- Action # **1** **Update zoning and parking policies**
- Action # **2** **Update local building codes**
- Action # **3** **Streamline permitting and inspection processes**
- Action # **4** **Participate in training and education programs for local officials**
- Action # **5** **Reach out to local businesses and residents**



Action #1

Update Zoning and Parking Policies

Key Recommendations:

- 1 Update local building codes that address parking and fueling infrastructure and ensure that PEV charging infrastructure policies are implemented in compliance with the Americans with Disabilities Act (ADA). Refer to the Additional Resources section at the end of this chapter to locate sample code language.
- 2 Adopt PEV signage policies and designs that meet the California Manual on Uniform Traffic Control Devices. Refer to the Additional Resources section at the end of this chapter to locate the reference source.

Action #1: Update Zoning and Parking Policies

Local governments need to implement ordinances or policies to facilitate the access to 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 the Americans with Disabilities Act (ADA).

Careful attention should be given to installing charging infrastructure that meets the federal and state ADA requirements. Resources listed below provide detailed installation recommendations to address these rules.

Signage policies and designs.

Surface street directional signs serve two important functions. They direct PEV drivers to the nearest public charging infrastructure locations and educate 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 signs for the state's major highway systems. Local jurisdictions have authority over surface street signs. Signs in parking facilities have multiple purposes. Refer to the references below for a detailed description of the types and purposes for signs. Generally, these purposes 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.

Parking facility restrictions and incentives.

Once public charging infrastructure is installed, public and private parking facility owners will need to consider parking policies that are specific to the individual site, owner, and local budgets. Considerations include: a) whether to provide 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).

Additional Resources

Resource/Source	Chapter Name/Section or Page Number	Website
<p><i>Accessibility and Signage for Plug-in Electric Vehicle Charging Infrastructure</i></p> <p>PEV Collaborative</p>	<p>Example code language, pages 12-29</p> <p>Example signage, pages 30-33</p>	<p>http://www.pevcollaborative.org/sites/all/themes/pev/files/AccessibilityReport-4%2726%20final.pdf</p>
<p><i>Maps and Apps – Today’s Mapping and Location-Based Services for Plug-in Electric Vehicle Charging Infrastructure</i></p> <p>PEV Collaborative</p>		<p>http://www.pevcollaborative.org/sites/all/themes/pev/files/Maps%20%26%20Apps%20report%20final%205%273%2712.pdf</p>
<p><i>Ready, Set, Charge, California</i></p> <p>Bay Area Climate Collaborative</p>	<p>Sample zoning code provisions, ordinance amendments, 3.2</p> <p>Guidance for evaluating parking facilities for EVSE installations, 3.5.1</p> <p>ADA and reasonable accommodations, 3.5.2</p> <p>Signage, 3.6</p>	<p>http://baclimate.org/images/stories/actionareas/ev/readysetcharge_evguidelines.pdf</p>
<p>Advanced Energy Charging Station Installation Handbook</p>	<p>Americans with Disabilities Act Standards, page 10</p>	<p>http://www.advancedenergy.org/transportation/evse/charging_station_installation_handbook.php</p>
<p>CAL. VEH. CODE § 22511 (2012) [codified SB 475 (Butler)]</p>	<p>PEV parking restrictions</p>	<p>http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AB475&search_keywords._</p>
<p>California laws and regulations on accessibility</p>		<p>http://www.disabilityaccessinfo.ca.gov/lawsregs.htm. California Manual on Uniform</p>
<p>Traffic Control Devices (CA-MUTCD)</p> <p>Caltrans</p>		<p>http://www.dot.ca.gov/hq/traffops/signtech/mutcdsupp/.</p>
<p>Federal Highway Administration</p> <p>Manual on Uniform Traffic Control Devices (MUTCD)</p> <p>Federal signage rules handbook</p>		<p>http://mutcd.fhwa.dot.gov/</p>

Region-Specific Resources

Resource/Source	Chapter Name/Page Number	Website
<p>Electric Vehicle Charging Stations Program and Installation Guidelines (2011)</p> <p>County of Sonoma</p>		<p>www.sonomacounty.org/prmd/docs/misc/ev_prog_guidelines.pdf.</p>
<p>Electric Vehicle Charging Infrastructure Guidelines for the Greater San Diego Area (2010)</p> <p>ECotality</p>		<p>http://www.theevproject.com/documents.php.</p>
<p>Technical Policy 11B-1 Accessibility to Electric Vehicle Charging Stations</p> <p>City of San Diego</p>		<p>http://www.sandiego.gov/development-services/industry/pdf/tpolicy11b1.pdf</p>



Action #2 Update Local Building Codes

Key Recommendation:

- 1 Update local building codes and practices to include specifications for PEV charging infrastructure types, electric service requirements, and installation recommendations for various building types.

Action #2: Update Local 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. Specific local building code considerations include:

Charging infrastructure types and service ratings.

PEV charging can occur at varying service ratings, which commonly include Level 1 (120-volt service), Level 2 (240-volt service), and DC fast charging (400-volt+ service requirements). PEV drivers will decide which service best meets their driving needs, but their charging infrastructure choice may impact the building's electrical load and the local electrical distribution system. Several references listed below provide comprehensive descriptions of the varying infrastructure levels.

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. Although not a formal recommendation of this toolkit, several California communities require that new construction projects include electric circuits for PEV charging.

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 drivers will reside in multi-unit dwellings where installing charging infrastructure can be more complicated. Building codes can provide guidance on the number of circuits necessary for different building types and 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 the means to estimate the effects of PEV charging infrastructure on building loads. These recommendations and codes can involve more than the estimated PEV circuit loads; they can include full building load impacts and they can make recommendations for energy efficiency upgrades to offset the new PEV circuit loads.

Additional Resources

Resource/Source	Chapter Name/Section or Page Number	Website
<p><i>Ready, Set, Charge, California</i></p> <p>Bay Area Climate Collaborative</p>	<p>Building and electrical code guidance, 3.5</p> <p>Equipment (charging infrastructure), 5.1</p> <p>Electrical requirements, 5.3</p> <p>Design and installation, Infrastructure design criteria 5.4, 5.5</p> <p>ICC Tri-Chapter Uniform Code Committee (TUCC) charging station guidance for single family residence installations, 8.8</p> <p>TUCC charging station guidance for commercial installations, 8.9</p>	<p>www.readysetcharge.org</p>
<p><i>California Green Building Standards Code ("CALGreen," Title 24 Part II)</i></p>	<p>Electric Vehicle Charging, Section A5.106.5.3 Voluntary non-residential measures (provides wiring specifications and parking space requirements), page 90, (Table A5.106.5.3.1)</p> <p>Electric Vehicle Charging, Section A4.106.6 Voluntary residential measures, which include a) electrical ratings for dedicated circuits, conduit/raceway specifications, and service panel specifications; and b) parking designations for multi-family dwellings</p>	<p>www.bsc.ca.gov/Home/CAL-Green.aspx</p>
<p>National Electric Code (NEC) Article 625</p> <p>National Fire Protection Association (NFPA)</p>	<p>Guidance for charging infrastructure installations</p>	<p>www.nfpa.org/catalog/product.asp?pid=70HB11&order_src=A882</p>

Resource/Source	Chapter Name/Page Number	Website
<i>Charging Station Installation Handbook</i> Advanced Energy	Applicable codes and standards, page 8 On-site evaluation checklist, page 20 Installation guidelines (for varying building types), page 21	www.advancedenergy.org/transportation/evse/ChargingStation-InstallationHandbook.pdf
<i>Developing Infrastructure to Charge Plug-In Electric Vehicles</i> U.S. DOE Clean Cities	Fact sheets and downloadable documents	www.afdc.energy.gov/afdc/vehicles/electric_charging_equipment.html


Region-Specific Resources

Resource/Source	Chapter Name/Page Number	Website
<i>Electrician's Guide for Installing Electric Vehicle Charging Stations at Single-Family Homes</i> Southern California Edison		www.sce.com/info/electric-car/installers/installers.htm
Building Division Requirements, EV Chargers City of Sunnyvale		http://sunnyvale.ca.gov/Portals/0/Sunnyvale/CDD/Residential/Electrical%20Car%20Chargers.pdf

A few of the sample references listed above are reprinted on the following pages

3.5.3 SAMPLE BUILDING CODE AMENDMENTS FOR PEV AND ON-SITE ENERGY SYSTEM READINESS

The following section of the guidelines offers examples of building code amendments pertaining to EV charging station installations and energy/storage management systems. The two are grouped so that local agencies can consider aligning the goals of sustainable transportation, energy efficient buildings, and reduced emissions. Building ordinance amendments can be utilized as an effective mechanism to require the installation of EV charging stations. In examples that follow, deployment recommendations are followed by actual language cited from existing codes and amendments in the U.S. and Canada.


Recommendation #11 – Require sufficient area and electrical infrastructure for charging PEVs. 

Properly size all electric vehicle supply equipment, the electrical room wall, and floor area to accommodate the charging of PEVs.

In new multi-unit, commercial or industrial developments, local agencies may choose to require all conduits leading to the electrical room including electrical service conduits, and the electrical room to be appropriately sized to accommodate future electrical equipment necessary for electric vehicle charging stations, and the voltage and amperage capability of other anticipated infrastructure.

Adopted Code Language: *Vancouver, B.C. Building By-law*
Electric Vehicle Charging: Electrical Room:

The electrical room in a multi-family building, or in the multi-family component of a mixed use building that in either case includes three or more dwelling units, must include sufficient space for the future installation of electrical equipment necessary to provide a receptacle to accommodate use by electric charging equipment for 100% of the parking stalls that are for use by owners or occupiers of the building or of the residential component of the building.⁴⁶

Recommendation #12 – Encourage single-family residential chargers and PEV “pre-wiring” readiness. 

Local agencies may wish to include basic infrastructure, such as conduits, junction boxes, wall space, electrical panel and circuitry capacity to accommodate future upgrades for solar systems and PEV charging.

Most PEV charging will occur at night at homes when vehicles are parked for long periods of time and when electric utility rates are often the lowest. Some local agencies have already adopted requirements that new residential developments contain basic infrastructure to capture roof top solar power. Producing renewable energy during peak use periods and charging during off-peak periods is an ideal way to power PEVs. Buyers of new homes may seek those where low cost solar readiness improvements have been put in place.

Adopted Code Language: *City of Chula Vista, California. Planning Ordinance*

Photovoltaic pre-wiring:

All new residential units shall include electrical conduit specifically designed to allow the later installation of a photovoltaic (PV) system which utilizes solar energy as a means to provide electricity. No building permit shall be issued unless the requirements of this section and the jurisdiction’s Pre-Wiring Installation Requirements are incorporated into the approved building plans. The provisions of this chapter can be modified or waived when it can be satisfactorily demonstrated to the Building Official that the requirements of this section are impractical due to shading, building orientation, construction constraints or configuration of the parcel.⁴⁷

Adopted Code Language: *CALGreen, Tier 1 (Voluntary)*

Electric vehicle (EV) Charging: One-and two-family dwellings.

Install a listed raceway to accommodate a dedicated branch circuit. The raceway shall not be less than trade size 1. The raceway shall be securely fastened at the main service or subpanel and shall terminate in close proximity to the proposed location of the charging system into a listed cabinet, box or enclosure. Raceways are required to be continuous at enclosed or concealed areas and spaces. A raceway may terminate in an attic or other approved location when it can be demonstrated that the area is accessible and no removal of materials is necessary to complete the final installation.⁴⁸

TABLE A5.106.5.1.1
TIER 1
10 PERCENT OF TOTAL SPACES [DSA-SS]

TOTAL NUMBER OF PARKING SPACES	NUMBER OF REQUIRED SPACES
0–9	0
10–25	2
26–50	4
51–75	6
76–100	9
101–150	11
151–200	18
201 and over	At least 10 percent of total

TABLE A5.106.5.1.2
TIER 2
12 PERCENT OF TOTAL SPACES

TOTAL NUMBER OF PARKING SPACES	NUMBER OF REQUIRED SPACES
0–9	1
10–25	2
26–50	5
51–75	7
76–100	9
101–150	13
151–200	19
201 and over	At least 12 percent of total

A5.106.5.1.3 Parking stall marking. Paint, in the paint used for stall striping, the following characters such that the lower edge of the last word aligns with the end of the stall striping and is visible beneath a parked vehicle:

CLEAN AIR
 VEHICLE

A5.106.5.1.4 Vehicle designations. Building managers may consult with local community Transit Management Associations (TMAs) for methods of designating qualifying vehicles, such as issuing parking stickers.

Notes:

1. Information on qualifying vehicles, car labeling regulations and DMV SOV stickers may be obtained from the following sources:
 - a. California DriveClean
 - b. California Air Resources Board
 - c. U.S. EPA fuel efficiency standards
 - d. Janet Okino, DMV Registration Operations, (916) 657 6678 and John Swanton, ARB Public Information, (626) 575-6858
2. Purchasing policy and refueling sites for low emitting vehicles for state employees use can be found at the Department of General Services.

A5.106.5.3 Electric vehicle charging. Provide facilities meeting Section 406.7 (Electric Vehicle) of the *California Building Code* and as follows:

A5.106.5.3.1 Electric vehicle supply wiring. For each space required in Table A5.106.5.3.1, provide one 120 VAC 20 amp and one 208/240 V 40 amp, grounded AC outlets or panel capacity and conduit installed for future outlets.

TABLE A5.106.5.3.1

TOTAL NUMBER OF PARKING SPACES ¹	NUMBER OF REQUIRED SPACES
1–50	1
51–200	2
201 and over	4

1. In a parking garage, the total number of parking spaces is for each individual floor or level.

A5.106.6 Parking capacity. Design parking capacity to meet but not exceed minimum local zoning requirements.

A5.106.6.1 Reduce parking capacity. With the approval of the enforcement authority, employ strategies to reduce on-site parking area by

1. Use of on street parking or compact spaces, illustrated on the site plan or
2. Implementation and documentation of programs that encourage occupants to carpool, ride share or use alternate transportation.

Note: Strategies for programs may be obtained from local TMAs.

A5.106.7 Exterior wall shading. Meet requirements in the current edition of the *California Energy Code* and select one of the following for wall surfaces:

1. Provide vegetative or man-made shading devices for east-, south- and west-facing walls with windows, with 30 percent coverage to a height of 20 feet or top of exterior wall, whichever is less, for east and west walls. Calculate shade coverage on the summer solstice at 10 AM for east-facing walls and at 3 PM for west-facing walls. Plant vegetative shade of species documented to reach desired coverage within 5 years of building occupancy.
2. Use wall surfacing with minimum SRI 25 (aged), for 75 percent of opaque wall areas.

Exception: Use of vegetated shade in Wildland-Urban Interface Areas as defined in Chapter 7A (Materials and Construction Methods for Exterior Wildfire Exposure) of the *California Building Code* shall meet the requirements of that chapter.

Note: If not available from the manufacturer, aged SRI value calculations may be found at the California Energy Commission’s web site at www.energy.ca.gov.

A5.106.9 Building orientation. Locate and orient the building as follows:



ELECTRIC VEHICLE CHARGERS

THESE REQUIREMENTS APPLY TO BUILDING PERMITS SUBMITTED ON OR AFTER JANUARY 1, 2011

BUILDING DIVISION REQUIREMENTS

An electrical permit is required for installation of electric vehicle chargers. Following is a listing of the general requirements for electric vehicle charging equipment based on the 2010 California Electrical Code, California Building Code, and Sunnyvale Municipal Code. This brochure is intended to provide general information, contact the Building Safety Division for any questions or additional information.

General Requirements

- The electric vehicle charging system shall be listed by a nationally recognized testing laboratory (i.e., UL) in compliance with UL 2202 “Standard for Electric Vehicle (EV) Charging System Equipment.” (CEC 90.7)
- Provide size of the existing electrical panel, existing load on the panel, and proposed load/circuits from the electric vehicle charging system in order to determine if there is adequate capacity in the existing panel. (CEC 220)
- The electric vehicle charging system shall be installed in accordance with manufacturer’s guideline and shall be suitable for the environment (indoor/outdoor). If installed indoors, the charging station shall be labeled “Ventilation Not Required” in a location clearly visible after installation. (CEC 625.15)
- If installed indoors, the electric vehicle charging coupling (the nozzle) shall be located between 18” and 48” above the finished floor. If installed outdoors, the electric vehicle charging coupling (the nozzle) shall be located between 24” and 48” above the finished grade. (CEC 625.29, 625.30)
- If the electric vehicle charging equipment is located in an area subject to vehicular damage, an adequate barrier must be installed (e.g. 4” diameter steel pipe filled with concrete, a minimum of 40” above the finished floor/grade, installed in a footing measuring 12” in diameter and 3’ deep). (CEC 110.27)
- If the project site is in an AE or AO flood zone, the charging equipment shall be elevated or designed according to the flood requirement (Sunnyvale Municipal Code 16.62). Flood zone information is available on-line at www.e-onestop.net.

Single Family Residential Requirements

- If the electric vehicle charging system will be located outside of the garage or carport, review and approval by the Planning Division may be required prior to issuance of the building permit.
- If a dedicated electrical meter is to be installed for the electric vehicle charging system, provide an approval letter from PG&E prior to obtaining the building permit. The new meter shall be installed between 48” and 66” above the ground. Additionally, if a single mast will continue to be used to serve the meters, ensure that the service entrance conductors are sized for the sum of the two meters, based on the table below (CEC Table 310.5(b)(6) and Chapter 9 Table 1):

SERVICE ENTRANCE CONDUCTORS SIZE AND RATING			
Service or Feeder Rating	Copper Conductors	Aluminum or Copper-Clad Aluminum	Minimum Conduit Size
100 Amps	#4 AWG	#2 AWG	1 ¼ inch
125 Amps	#2 AWG	#1/0 AWG	1 ¼ inch
150 Amps	#1 AWG	#2/0 AWG	1 ¼ inch
200 Amps	#2/0 AWG	#4/0 AWG	1 ½ inch

Note: PG&E prohibits new meters to be installed on exterior walls adjacent to bedrooms or bedroom closets (due to noise concerns).

Non-Residential and Multi-Family Requirements

- The electric vehicle charging spaces may be counted towards the number of required low-emitting/fuel efficient parking in the CALGreen or LEED, as applicable.
- A sign shall be posted at the electric vehicle charging spaces stating “Electrical Vehicle Charging Only.”

Accessibility Requirements (CBC Chapter 11B)

- A minimum of one accessible electric vehicle charging space shall be provided for each group of charging stations. However, these spaces shall not be counted as required accessible parking spaces, as required by California Building Code, because the charging spaces are not dedicated exclusively for disabled accessible use.
- The size of the accessible electric vehicle charging space shall be a minimum of 9’ wide and 18’ in length and the loading area shall be a minimum of 8’ wide and 18’ in length. The loading area shall be located on the passenger side of the parking space and be striped (not using blue paint). These spaces do not need to include signage dedicating them for disabled access use.
- Operational controls for the charging station controls (i.e. on/off buttons, payment readers, etc.) shall meet all applicable reach range provisions as noted below:
 - If the equipment is accessed only from a forward approach, the operating buttons shall be located between 15” and 48” from the finished floor/grade.
 - If the equipment is available from a parallel approach, the operating buttons shall be located between 9” and 54” from the finished floor/grade.
 - Any receptacles that may be provided shall be located a minimum of 15” above the finished floor/grade.

PERMIT PROCESS

1. Prior to submittal for a building permit, contact the Planning Division to determine if a separate permit is required.

Building Permit Review

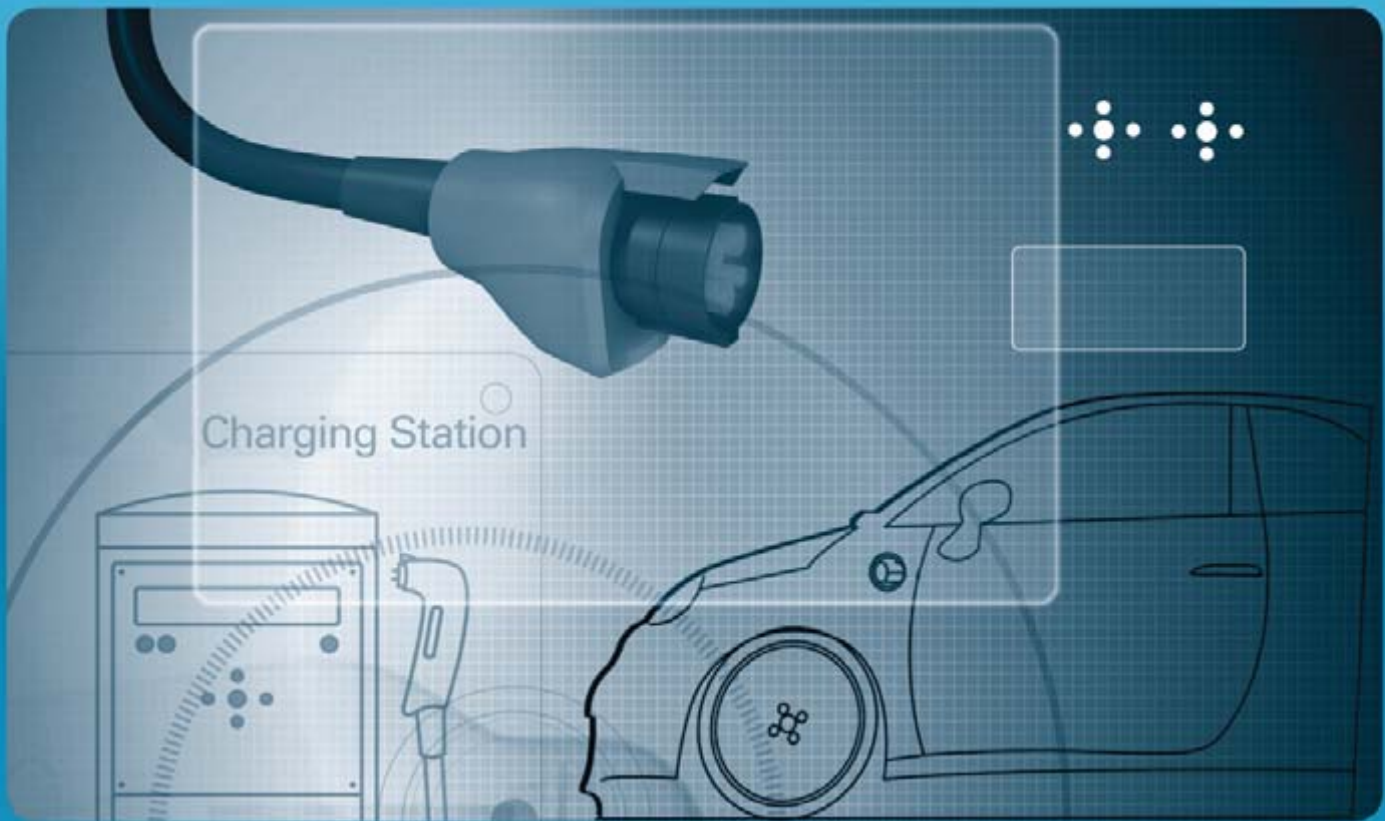
2. Building permits for electrical vehicle chargers in single-family detached residential buildings are available on-line at www.e-OneStop.net or at the One-Stop Permit Center. For all other locations, the permit can be obtained at the One-Stop Permit Center, which is open between the hours of 8:00 a.m. and 5:00 p.m., Monday through Friday.

Inspections

3. A minimum of one final inspection is required after the electric vehicle charger is installed. However, additional inspections may be required depending on the scope of work (i.e. underground conduit installation, footing for pedestals).
4. The manufacturer’s installation guidelines shall be available for the building inspector at the job site during the inspection.

Building Permit Application Requirements

- A completed Building Permit Worksheet application.
- An approval letter from the Homeowner’s Association (if applicable).
- Provide the type of electric vehicle charging system: Level 1 (120 VAC, 15/20 A), Level 2 (240 VAC, 40 A), or Level 3 (208-240 VAC, 40 A)
- For non-residential and multi-family locations, provide a site plan showing the following:
 - site plan showing the location of the electric vehicle chargers and accessibility requirements
 - electrical plan showing how the new charging units will be powered
- If the main electrical panel is to be relocated, provide a letter of approval from PG&E for the new location.



Electrician's Guide for Installing Electric Vehicle* Charging Stations at Single-Family Homes

* Light duty passenger electric vehicles

Preparing a home for electric vehicle charging and metering requires the collaboration of several parties to help customers make the right decisions for their individual situations. Southern California Edison (SCE), electricians, customers, and cities each play important roles in this process.

This guide provides useful information on the process for preparing a single family residence for safe and reliable electric vehicle charging.

The process *may* include installing an electric vehicle charging station, second electrical panel, meter socket box, and/or two-socket panel to accommodate separate electric vehicle metering. Installing this equipment is *optional* and depends on the **SCE rate plan** the customer enrolls in and the **level at which the customer chooses to charge the vehicle** (120 volts or 240 volts). Each customer should select their rate plan and charging level before the electrician begins any electrical work on the house. Otherwise, customers and electricians alike run the risk of costly delays.

Before you assess your customers' home panel and wiring needs, please ensure that customers who live in SCE's service territory contact SCE to learn about their rate plan options and how each rate plan may affect their home panel, wiring, and electric vehicle charging options.

Direct customers to call:

1-800-4EV-INFO (800-438-4636)

(Press "0" to be transferred to a customer service specialist)

Or visit:

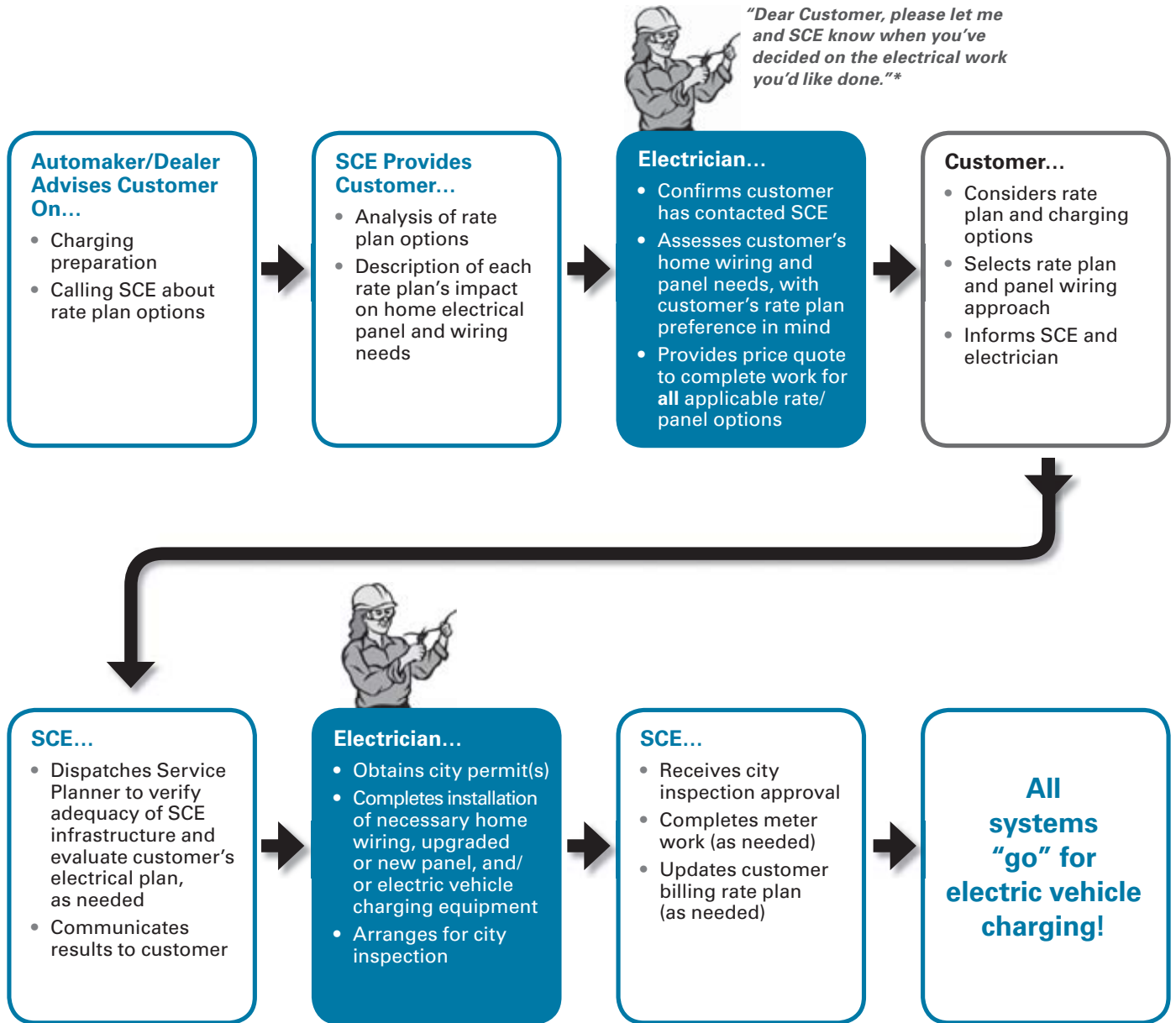
www.sce.com/PEV



Electrician Guide for Installing Electric Vehicle
Charging Stations at Single-Family Homes
Last Updated: 12/3/2010

Installation Process

This flowchart illustrates the basic processes used by SCE to get customers in **single-family homes** “plug-in ready.” Also shown are the points at which electricians play an especially important role in moving the installation process forward.









*It is important to remind your customers to call both you **and** SCE after deciding on the electrical work, so SCE can send a Service Planner to your customer’s home so you can finish your work as quickly as possible. Knowing each customer’s rate plan selection, electrical vehicle charging level, and planned panel configuration will allow SCE’s Service Planners to properly inspect the local transformer and service drops and evaluate the customer’s electrical plan.

Important Steps for Electricians

1. Confirm that your customer has contacted SCE about rate plan options and implications **before** you conduct a home assessment of electrical panel and wiring needs. If not, direct the customer to call 1-800-4EV-INFO (1-800-438-4636) M-F, 8:00 am - 5:00 pm.
2. Evaluate residential electrical panel and wiring for **capacity** to charge the electric vehicle.
3. Provide price quote to complete electrical work for **all** applicable rate/panel options.
4. Once SCE has approved the proposed electrical plan, upgrade the existing panel or add a second panel or meter socket box, as necessary, with customer's rate plan choice in mind.
5. For Electric Vehicle Plan: install the appropriate panel option and remember that this power is for **electric vehicle charging only**. *Note: SCE will install the second meter after the panel is installed and the city approves the installation.*
6. Refer to **SCE's Electric Service Requirements (ESR)** for complete panel configuration details (www.SCE.com/AboutSCE/Regulatory/DistributionManuals/ESR.htm).

Rate/Panel Options

The combination of SCE electric vehicle rate plans and panel configurations yields 6 Rate/Panel options:

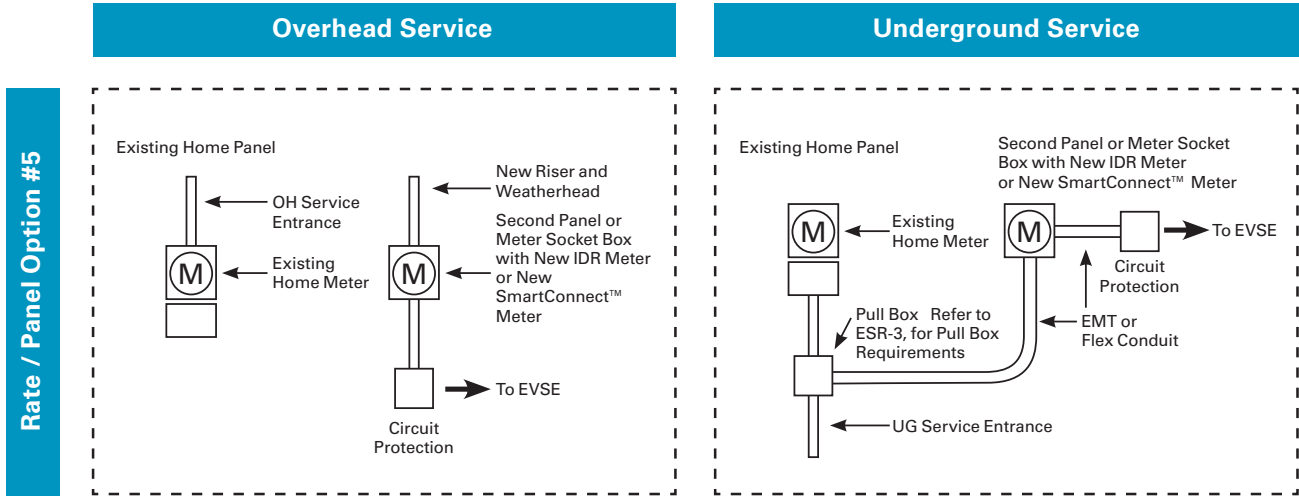
Rate Plans	Rate Description	Panel Choices		
		Use Existing Panel	Add 2nd Panel or Meter Socket Box	Upgrade Existing Panel
Residential Plan (D) <i>Single Meter</i>	Tiered Rate* Home and electric vehicle loads measured together	 Option #1 (likely no meter change)	N/A	 Option #2 (likely no meter change)
Home & Electric Vehicle Plan (TOU-D-TEV) <i>Single Meter</i>	Time of Use Tiered Rate* Home and electric vehicle loads measured together; rates higher during the day and lower at night	 Option #3 (meter may need to be replaced)	N/A	 Option #4 (meter may need to be replaced)
Electric Vehicle Plan (TOU-EV-1) <i>Two Meters</i>	Time of Use Rate Electric vehicle load metered separately from home load; home remains on current rate and meter; electric vehicle rate is higher during the day and lower at night	N/A	 Option #5 (panel upgrade or addition must be complete before second meter is installed) See page 4 for detailed panel configurations.	 Option #6

*With tiered rates, cost per kWh increases with the amount of electricity used.

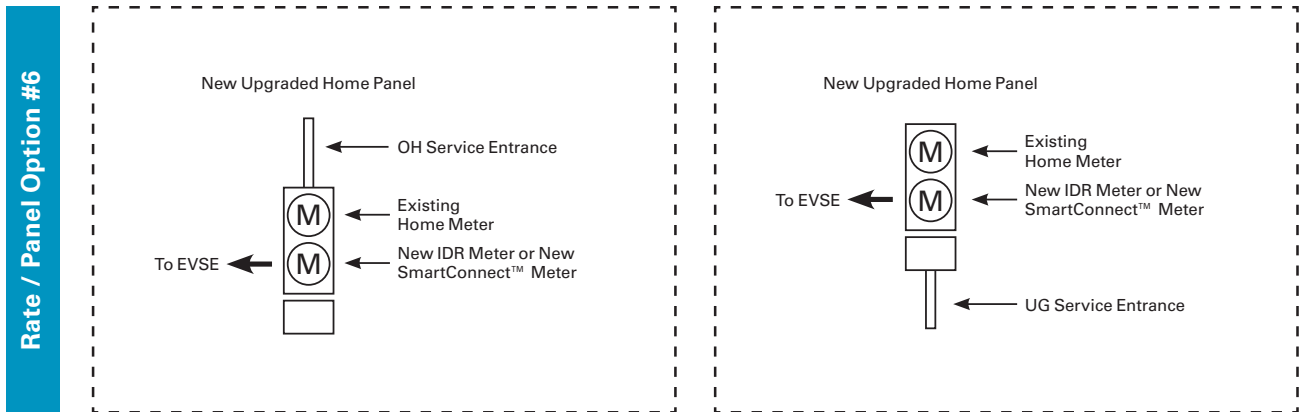
Electrician Guide for Installing Electric Vehicle Charging Stations at Single-Family Homes
 Last Updated: 12/3/2010

Panel Configurations

Rate/Panel Options 5 and 6 require two meters and either a separate panel, a meter socket box, or a two-socket panel to accommodate both meters. Several panel configurations are shown below:



Note: Where at all possible, the second panel or meter socket box shall be at the same location and directly adjacent to the existing metering.



Note: SCE provides *only a single service line* for all panel configurations, regardless of whether one or two panels are installed.

For additional information about panel configurations, please refer to SCE's *Electric Service Requirements (ESR)* available at www.sce.com/AboutSCE/Regulatory/DistributionManuals/ESR.htm

Key	
UG:	Underground
OH:	Overhead
IDR:	Interval Data Read
EMT:	Electrical Metallic Tubing
EVSE:	Electric Vehicle Service Equipment





Action #3

Streamline Permitting and Inspection Processes

Key Recommendations:

- 1 Develop a permit application specifically designed for PEV infrastructure installations. Refer to the notes below for alternative approaches and additional information. See Additional Resources at the end of this chapter for a U.S. Department of Energy template that is designed for local communities to easily adopt.
- 2 Implement a complete permit and inspection procedure for PEV charging infrastructure, taking into consideration existing codes and practices. Given the variability between communities, streamlined PEV solutions are expected to vary as well. Communities launching new processes should consider planned re-evaluation periods, (i.e., “pilot programs”) which remain flexible to accommodate the learning process. Refer to the PEV Collaborative report, *Streamlining the Permitting and Inspection Process for Plug-in Electric Vehicle Home Charger Installations*, listed under Additional Resources at the end of this chapter.

Action #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. Local governments should streamline their permitting and inspection procedures to ensure a positive experience for all. A streamlined process would be efficient, rapid, and consistent while ensuring safe installations and the least possible cost for property owners. Furthermore, streamlined processes reduce complexity for all participants: installers can clearly set expectations of PEV owners, procedures and requirements are obvious for electrical contractors, and city officials have well-defined, repeatable actions.

General considerations include:

Implement an efficient permit application process.

The process of installing charging equipment involves several steps, some of which add time and could potentially dampen consumer enthusiasm for PEVs. One such step is the permit application. Expedited solutions to move projects forward can save time and cost, alleviate PEV owner frustration, and bring goodwill toward the local government's efforts. Examples of expedited solutions include creating an online application in place of an initial office visit, or same-day "over-the-counter" approvals. Solutions will vary by community depending on resources and existing approaches for other permits. As an example of the various steps involved, a fact sheet describing the Los Angeles Department of Water and Power's (LADWP) installation process is referenced at the end of this chapter.

A key conclusion emphasized in the PEV Collaborative report, *Streamlining the Permitting and Inspection Process for Plug-in Electric Vehicle Home Charger Installations*, is the tradeoff between the permit application process and the inspection process. Some communities require a number of documents and references from residents and contractors when they are applying for a permit to install PEV infrastructure. This adds time up front and delays the installation, but may reduce the time for the inspection process after installation. On the other hand, clearly defined installation requirements enable electricians to be prepared and serve to streamline permitting procedures by avoiding unnecessary up-front paperwork and review, while ensuring inspectors have all the proper information necessary to approve the installation.

Minimize permit fees for charging equipment installation.

Permit fees will vary by jurisdiction, and may vary by project type and scope. Some communities are implementing a flat fee for charging station installations. 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. However, some communities need to recoup all costs including inspector and other staff time directly from each permit fee, a requirement which dictates higher rates. Communities could consider establishing preliminary rates with the intent to review them annually.

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 this 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.

In most cases, the installation of a charging station will only require one inspection. However, each time an additional inspection is required adds scheduling delays to the project. Where appropriate, consider requiring only 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.

Additional Resources

Resource/Source	Chapter Name/Section or Page Number	Website
<i>Streamlining the Permitting and Inspection Process for Plug-in Electric Home Charger Installations</i> PEV Collaborative		www.pevcollaborative.org/sites/all/themes/pev/files/PEV_Permitting_InspectionReport.pdf
<i>Ready, Set, Charge, California</i> Bay Area Climate Collaborative	Installation streamlining for residential PEV chargers, 4 Checklist for building inspectors for residential charging station installations, 8.7 National Renewable Energy Laboratory charging station permitting template, 8.10	www.readysetcharge.org
<i>Charging Station Installation Handbook</i> Advanced Energy	Installation guidelines for inspectors, page 16 Inspection checklist, page 35	www.advancedenergy.org/transportation/evse/ChargingStation-InstallationHandbook.pdf

Additional Resources (continued)

Resource/Source	Chapter Name/Page Number	Website
City permit template U.S. Department of Energy Clean Cities		www.afdc.energy.gov/afdc/pdfs/EV_charging_template.pdf
Case studies of select large cities U.S. Department of Energy Clean Cities		www.afdc.energy.gov/afdc/vehicles/electric_deployment_case_studies.html
Installation of charging equipment video U.S. Department of Energy Clean Cities		www.cleancities.tv/FeaturedContent/Training/EVSEResidentialChargingInstallation.aspx

Region-Specific Resources

Resource/Source	Chapter Name/Page Number	Website
Los Angeles County template for permit and inspector Los Angeles Department of Water and Power	Rate options, online permit instructions and fees, incentives for residential EVSE, installation flow charts	https://www.ladwp.com/ladwp/faces/ladwp/commercial/c-gogreen/c-gg-driveelectric?_adf.ctrl-state=185fbaf3b_4&_af-Loop=78152472646000&_af-WindowMode=0&_afWindowId=ala7jufih_1#%40%3F_af-WindowId%3Dala7jufih_1%26_af-Loop%3D78152472646000%26_af-WindowMode%3D0%26_adf.ctrl-state%3Dala7jufih_37 https://www.permitla.org/
Electrical load calculations and wiring instructions – for property owners City of Riverside		www.riversideca.gov/utilities/pdf/2011/EV%20Charger%20Guidelines.pdf
<i>EV Permit and Charger Installation Guidelines</i> City of Riverside		www.riversideca.gov/building/pdf/handouts/EV-Charger-Guidelines.pdf

Region-Specific Resources (continued)

Resource/Source	Chapter Name/Page Number	Website
City of Beverly Hills		www.beverlyhills.org/services/building/electric_vehicles.asp#ChargingStation
City of Sacramento		www.cityofsacramento.org/dsd/customer-service/documents/CityofSac_ElectricVehiclePermitGuide-Packet_Oct_20_11.pdf
City of San Francisco		www.sfenvironment.org/downloads/library/home_evse_permit_summary_sheet_v12.pdf
City of San Diego		www.sandiego.gov/development-services/industry/pdf/infobulletin/ib187.pdf
City of Berkeley		www.ci.berkeley.ca.us/uploadedFiles/Planning_and_Development/Level_3_-_Energy_and_Sustainable_Development/PEV%20guide.pdf
Electric utility outreach material PG&E (an example)		www.pge.com/myhome/environment/pge/cleanair/electric-drivevehicles/pluginready/

A few of the sample references listed above are reprinted on the following pages

Permit for Charging Equipment Installation Electric Vehicle Supply Equipment (EVSE)

Jurisdiction: **City, State**

Compliance with the following permit will allow the installation and operation of electric vehicle charging equipment at a residence in the **City, State** jurisdiction. This permit addresses one of the following situations:

- Only an additional branch circuit would be added at the residence
- A hard-wired charging station would be installed at the residence. The attached requirements for wiring the charging station are taken directly out of the 2011 edition of the National Electrical Code® (NEC) NFPA 70, Article 625 Electric Vehicle Charging System. This article does not provide all of the information necessary for the installation of electric vehicle charging equipment. Please refer to the current edition of the electrical code adopted by the local jurisdiction for additional installation requirements. Reference to the 2011 NEC may be made at www.nfpa.org/70.

This permit contains a general reference to the NEC or electrical code used in the jurisdiction. All work and installed equipment will comply with the requirements of the NEC or the electrical code used in the jurisdiction. The jurisdiction maintains the authority/responsibility to conduct any inspections deemed necessary to protect public safety; however, due to the projected plug-in hybrid electric vehicle (PHEV) volume, it is suggested for consideration that a qualified electrician be approved to self-inspect the system enabling system operation in advance of jurisdiction inspection. The charging station installer shall also be responsible for notifying or coordinating any work with the utility company where needed.

Section 1 of the permit application requires basic identifying information be submitted. Note that there is a separate portion of the form requesting information on the property owner who may not be the individual requesting the installation.

Section 2 of the permit application identifies which code needs to be complied with depending on whether a branch circuit and meter or a hard-wired charging station is being installed.

The technical installation requirements address the following specific elements of electric vehicle charging station safety:

- Listing and labeling requirements
- Wiring methods
- Breakaway requirements
- Overcurrent protection
- Indoor siting
- Outdoor siting

Section 3 consists of standard certification statement that could be modified as needed by the jurisdiction. By signing the certification statement, the applicant agrees to comply with the standard permit conditions and other applicable requirements. This consent would give the jurisdiction the option of allowing the applicant to proceed with installation and operation of the charging equipment.

Section 4 of the document gives an example of a checklist the jurisdiction could develop to track key information on the application. The example under section 4 contains only a few items of the many that the jurisdiction might wish to track.

This permit package also includes a schematic drawing depicting a typical indoor installation. In this installation the wiring path follows the exterior of the structure, and the charging station is located indoors. The NEC® allows for interior wiring and outdoor installations. The purpose of the schematic is only to show how the charging station equipment could be arranged and is not intended to convey any permit requirements.

Application for Installation of Electric Vehicle Charging Equipment

NOTICE: The system must be installed in compliance with the National Electric Code® NFPA 70, Article 625 Electric Vehicle Charging System or applicable electrical code currently adopted and enforced within the jurisdiction of installation. All associated work with circuits, electrical service and meters shall be completed in compliance with NFPA 70, national electric code, or applicable electrical code currently adopted and enforced within the jurisdiction of installation.

Section 1: Permit Applicant Information

Name:			
Installation Street Address (P.O. box not acceptable):	Contact Person:	Phone Number: () -	
City:	County:	State:	ZIP Code:
Owner Name:	Street Address:	Phone Number: () -	
City:	State:	ZIP Code:	
Submitter's Name/Company	Street Address:	Phone Number: () -	
City:	State:	ZIP Code:	
General description of equipment to be installed:			

Section 2: Permit Code Information

Requirements for wiring a charging station are taken directly out of the 2011 edition of the National Electrical Code® (NEC) NFPA 70, Article 625 Electric Vehicle Charging System. This article does not provide all of the information necessary for the installation of electric vehicle charging equipment. Please refer to the current edition of the electrical code adopted by the local jurisdiction for additional installation requirements. Reference to the 2011 NEC may be made at www.nfpa.org/70.

NEC® Chapte r or Article	DESCRIPTION
Chapter 2 and 3	Branch Circuit A new electrical box added on a branch circuit shall comply with NFPA 70 National Electrical Code® Chapter 2 Wiring and Protection and Chapter 3 Wiring Methods and Materials and all administrative requirements of the NEC or the electrical code in effect in the jurisdiction
625.4	VOLTAGES Unless other Voltages are specified, the nominal ac system voltages of 120, 120/240, 208Y/120, 240, 480Y/277, 480, 600Y/347, and 600 Volts shall be used to supply equipment
625.5	LISTED OR LABELED All electrical materials, devices, fittings, and associated equipment shall be listed or labeled.

625.9	<p>WIRING METHODS The electric vehicle coupler shall comply with 625.9(A) through (F).</p> <p>(A) Polarization. The electric vehicle coupler shall be polarized unless part of a system identified and listed as suitable for the purpose.</p> <p>(B) Noninterchangeability. The electric vehicle coupler shall have a configuration that is noninterchangeable with wiring devices in other electrical systems. Nongrounding-type electric vehicle couplers shall not be interchangeable with grounding-type electric vehicle couplers.</p> <p>(C) Construction and Installation. The electric vehicle coupler shall be constructed and installed so as to guard against inadvertent contact by persons with parts made live from the electric vehicle supply equipment or the electric vehicle battery.</p> <p>(D) Unintentional Disconnection. The electric vehicle coupler shall be provided with a positive means to prevent unintentional disconnection.</p> <p>(E) Grounding Pole. The electric vehicle coupler shall be provided with a grounding pole, unless part of a system identified and listed as suitable for the purpose in accordance with Article 250.</p> <p>(F) Grounding Pole Requirements. If a grounding pole is provided, the electric vehicle coupler shall be so designed that the grounding pole connection is the first to make and the last to break contact.</p>
625.13	<p>ELECTRIC VEHICLE SUPPLY EQUIPMENT Electric vehicle supply equipment rated at 125 volts, single phase, 15 or 20 amperes or part of a system identified and listed as suitable for the purpose and meeting the requirements of 625.18, 625.19, and 625.29 shall be permitted to be cord-and-plug-connected. All other electric vehicle supply equipment shall be permanently connected and fastened in place. This equipment shall have no exposed live parts.</p>
625.14	<p>Rating Electric vehicle supply equipment shall have sufficient rating to supply the load served. For the purposes of this article, electric vehicle charging loads shall be considered to be continuous loads.</p>
625.15	<p>Markings The electric vehicle supply equipment shall comply with 625.15(A) through (C).</p> <p>(A) General. All electric vehicle supply equipment shall be marked by the manufacturer as follows: FOR USE WITH ELECTRIC VEHICLES</p> <p>(B) Ventilation Not Required. Where marking is required by 625.29(C), the electric vehicle supply equipment shall be clearly marked by the manufacturer as follows: VENTILATION NOT REQUIRED The marking shall be located so as to be clearly visible after installation.</p> <p>(C) Ventilation Required. Where marking is required by 625.29(D), the electric vehicle supply equipment shall be clearly marked by the manufacturer, "Ventilation Required." The marking shall be located so as to be clearly visible after installation.</p>
625.16	<p>Means of Coupling The means of coupling to the electric vehicle shall be either conductive or inductive. Attachment plugs, electric vehicle connectors, and electric vehicle inlets shall be listed or labeled for the purpose.</p>
625.17	<p>Cable The electric vehicle supply equipment cable shall be Type EV, EVJ, EVE, EVJE, EVT, or EVJT flexible cable as specified in Article 400 and Table 400.4. Ampacities shall be as specified in Table 400.5(A)(1) for 10 AWG and smaller, and in Table 400.5(A)(2) for 8 AWG and larger. The overall length of the cable shall not exceed 7.5 m (25 ft) unless equipped with a cable management system that is listed as suitable for the purpose. Other cable types and assemblies listed as being suitable for the purpose, including optional hybrid communications, signal, and composite optical fiber cables, shall be permitted.</p>
625.18	<p>Interlock Electric vehicle supply equipment shall be provided with an interlock that de-energizes the electric vehicle connector and its cable whenever the electrical connector is uncoupled from the electric vehicle. An interlock shall not be required for portable cord-and-plug-connected electric vehicle supply equipment intended for connection to receptacle outlets rated at 125 volts, single phase, 15 and 20 amperes.</p>
625.19	<p>Automatic De-Energization of Cable The electric vehicle supply equipment or the cable-connector combination of the equipment shall be provided with an automatic means to de-energize the cable conductors and electric vehicle connector upon exposure to strain that could result in either cable rupture or separation of the cable from the electric connector and exposure of live parts. Automatic means to de-energize the cable conductors and electric vehicle connector shall not be required for portable cord-and-plug-connected electric vehicle supply equipment intended for connection to receptacle outlets rated at 125 volts, single phase, 15 and 20 amperes.</p>
625.21	<p>Overcurrent Protection Overcurrent protection for feeders and branch circuits supplying electric vehicle supply equipment shall be sized for continuous duty and shall have a rating of not less than 125 percent of the maximum load of the electric vehicle supply</p>

	equipment. Where noncontinuous loads are supplied from the same feeder or branch circuit, the overcurrent device shall have a rating of not less than the sum of the noncontinuous loads plus 125 percent of the continuous loads.
625.22	<p>Personnel Protection System</p> <p>The electric vehicle supply equipment shall have a listed system of protection against electric shock of personnel. The personnel protection system shall be composed of listed personnel protection devices and constructional features. Where cord-and-plug-connected electric vehicle supply equipment is used, the interrupting device of a listed personnel protection system shall be provided and shall be an integral part of the attachment plug or shall be located in the power supply cable not more than 300 mm (12 in.) from the attachment plug.</p>
625.23	<p>Disconnecting Means</p> <p>For electric vehicle supply equipment rated more than 60 amperes or more than 150 volts to ground, the disconnecting means shall be provided and installed in a readily accessible location. The disconnecting means shall be capable of being locked in the open position. The provision for locking or adding a lock to the disconnecting means shall be installed on or at the switch or circuit breaker used as the disconnecting means and shall remain in place with or without the lock installed. Portable means for adding a lock to the switch or circuit breaker shall not be permitted.</p>
625.25	<p>Loss of Primary Source</p> <p>Means shall be provided such that, upon loss of voltage from the utility or other electrical system(s), energy cannot be back fed through the electric vehicle and the supply equipment to the premises wiring system unless permitted by 625.26.</p>
625.26	<p>Interactive Systems</p> <p>Electric vehicle supply equipment and other parts of a system, either on-board or off-board the vehicle, that are identified for and intended to be interconnected to a vehicle and also serve as an optional standby system or an electric power production source or provide for bi-directional power feed shall be listed as suitable for that purpose. When used as an optional standby system, the requirements of Article 702 shall apply, and when used as an electric power production source, the requirements of Article 705 shall apply.</p>
625.28	<p>Hazardous (Classified) Locations</p> <p>Where electric vehicle supply equipment or wiring is installed in a hazardous (classified) location, the requirements of Articles 500 through 516 shall apply.</p>
625.29	<p>Indoor Sites</p> <p>Indoor sites shall include, but not be limited to, integral, attached, and detached residential garages; enclosed and underground parking structures; repair and nonrepair commercial garages; and agricultural buildings.</p> <p>(A) Location. The electric vehicle supply equipment shall be located to permit direct connection to the electric vehicle.</p> <p>(B) Height. Unless specifically listed for the purpose and location, the coupling means of the electric vehicle supply equipment shall be stored or located at a height of not less than 450 mm (18 in.) and not more than 1.2 m (4 ft) above the floor level.</p> <p>(C) Ventilation Not Required. Where electric vehicle nonvented storage batteries are used or where the electric vehicle supply equipment is listed or labeled as suitable for charging electric vehicles indoors without ventilation and marked in accordance with 625.15(B), mechanical ventilation shall not be required.</p> <p>(D) Ventilation Required. Where the electric vehicle supply equipment is listed or labeled as suitable for charging electric vehicles that require ventilation for indoor charging, and is marked in accordance with 625.15(C), mechanical ventilation, such as a fan, shall be provided. The ventilation shall include both supply and exhaust equipment and shall be permanently installed and located to intake from, and vent directly to, the outdoors. Positive pressure ventilation systems shall be permitted only in buildings or areas that have been specifically designed and approved for that application. Mechanical ventilation requirements shall be determined by one of the methods specified in 625.29(D)(1) through (D)(4).</p> <p>(1) Table Values. For supply voltages and currents specified in Table 625.29(D)(1) or Table 625.29(D)(2), the minimum ventilation requirements shall be as specified in Table 625.29(D)(1) or Table 625.29(D)(2) for each of the total number of electric vehicles that can be charged at one time.</p> <p>(2) Other Values. For supply voltages and currents other than specified in Table 625.29(D)(1) or Table 625.29(D)(2), the minimum ventilation requirements shall be calculated by means of general formulas stated in article 625.39(D)(2).</p> <p>(3) Engineered Systems. For an electric vehicle supply equipment ventilation system designed by a person qualified to perform such calculations as an integral part of a building's total ventilation system, the minimum ventilation requirements shall be permitted to be determined in accordance with calculations specified in the engineering study.</p> <p>(4) Supply Circuits. The supply circuit to the mechanical ventilation equipment shall be electrically interlocked with the electric vehicle supply equipment and shall remain energized during the entire electric vehicle charging cycle. Electric vehicle supply equipment shall be marked in accordance with 625.15. Electric vehicle supply equipment receptacles rated at 125 volts, single phase, 15 and 20 amperes shall be marked in accordance with 625.15(C) and shall be switched, and the mechanical ventilation system shall be electrically interlocked through the switch supply power to the receptacle.</p>
625.30	<p>Outdoor Sites</p> <p>Outdoor sites shall include but not be limited to residential carports and driveways, curbside, open parking structures, parking lots, and commercial charging facilities.</p> <p>(A) Location. The electric vehicle supply equipment shall be located to permit direct connection to the electric vehicle.</p> <p>(B) Height. Unless specifically listed for the purpose and location, the coupling means of electric vehicle supply equipment</p>

	shall be stored or located at a height of not less than 600 mm (24 in.) and not more than 1.2 m (4 ft) above the parking surface.
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Section 3: Certification Statement

I hereby certify that the electrical work described on this permit application shall be/has been installed in compliance with the conditions in this permit, National Electrical Code® (NEC) NFPA 70, Article 625 Electric Vehicle Charging System or applicable electrical code currently adopted and enforced within the jurisdiction of installation. Furthermore, all associated work with circuits, electrical service, and meters shall be/has been completed in compliance with NEC NFPA 70 or applicable electrical code currently adopted and enforced within the jurisdiction of installation. By agreeing to the above requirements, the licensee or owner shall be permitted to install and operate the charging station. The licensee also insures that appropriate load calculations have been done to insure that the residence has adequate electrical capacity to support electric vehicle charging equipment.

Existing circuits provided for garages may supply other loads and may not have sufficient capacity for electric vehicle charging equipment.

In some older installations, the residential electrical service may not have sufficient capacity to supply electric vehicle charging equipment. Capacity problems are likely to be encountered on 60 ampere services or on 100 ampere services with multiple 240 volt loads. In such cases load calculations must be performed to insure adequate capacity.

Signature of Licensee:	Date:
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Signature of Owner:	Date:
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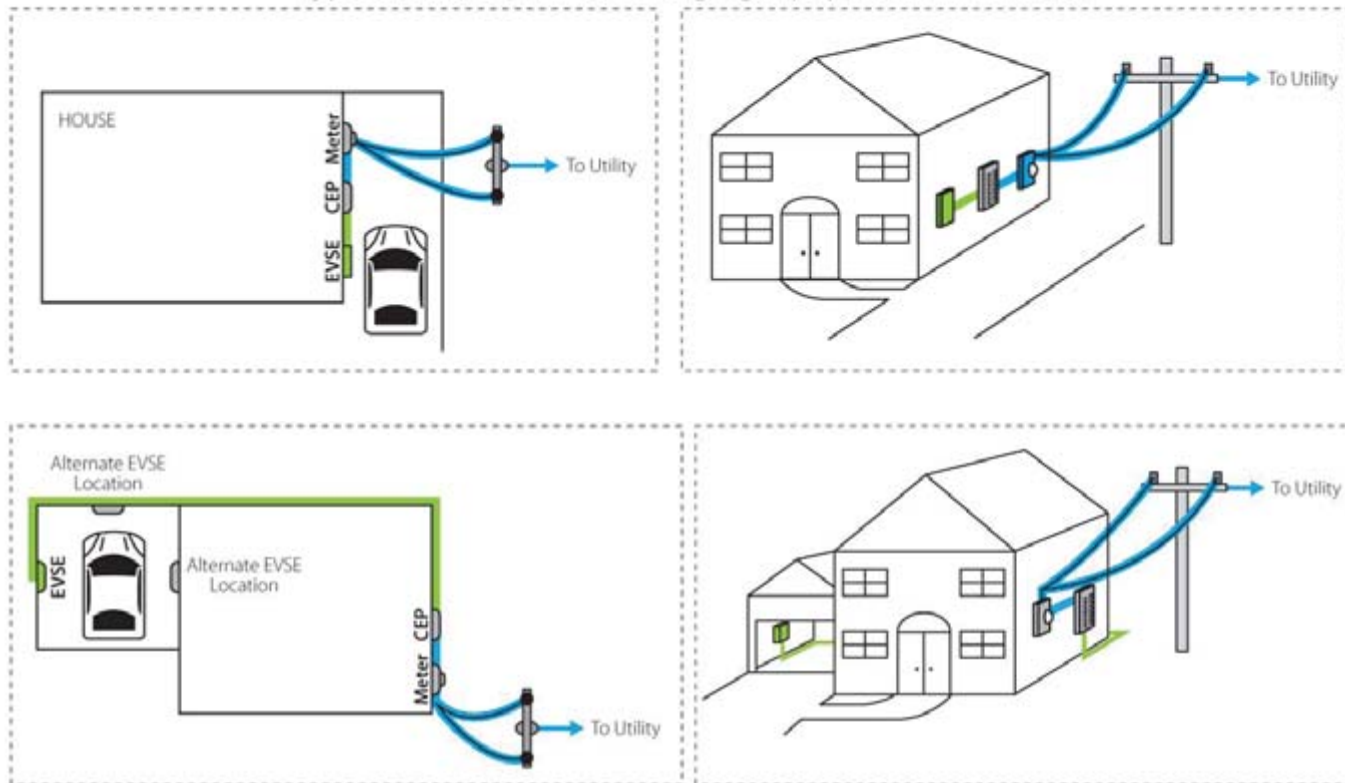
Section 4: Jurisdiction Checklist

Information each jurisdiction would add to permit:

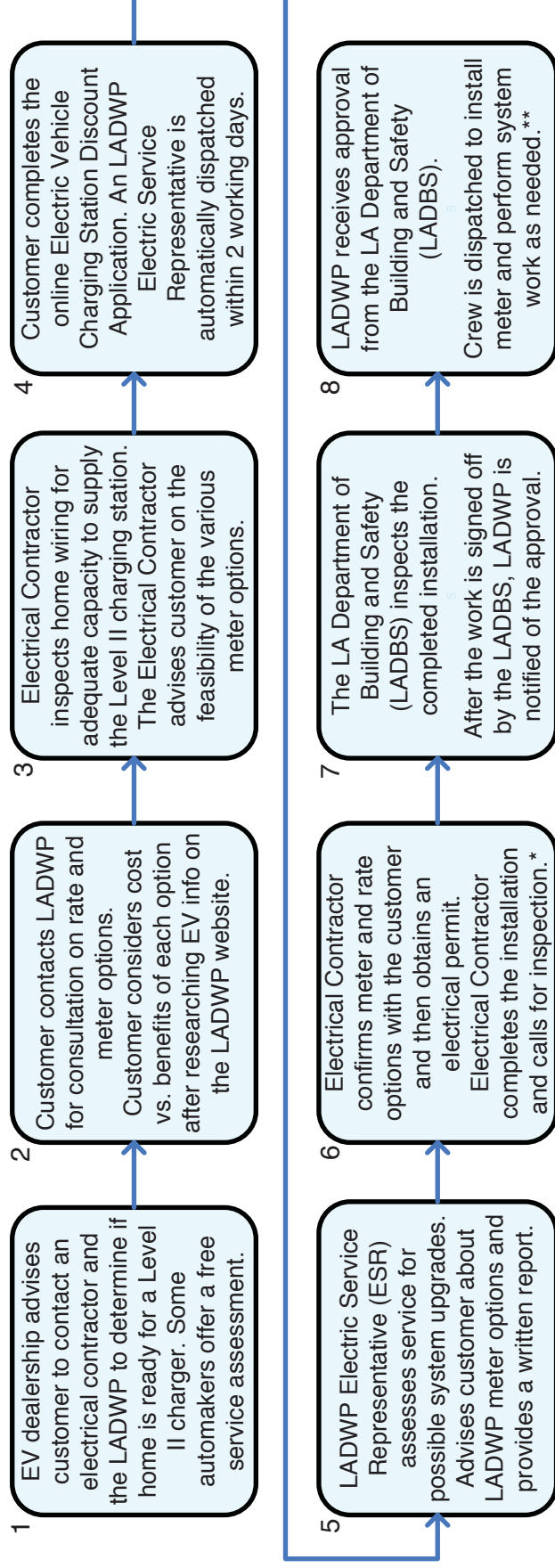
- Date utility notified of work completed
- Information on installation sent to tax assessor
- Indoor/outdoor location
- Modification to existing service required
- Other items as determined by the jurisdiction

Figure 1. Typical Electric Vehicle Charging Equipment Installations

Typical Electric Vehicle Charging Equipment Installation



Residential EV Level II (240 volt) Charger Installation Steps



* For jobs that involve a service panel upgrade or a separate time-of-use TOU meter, the ESR must also be called for inspection.

** A meter change to a Whole house TOU meter takes 7 business days from permit to plug-in if no panel upgrade is needed. Jobs with new service panel work take approximately 5 to 10 business days from LA Building and Safety approval unless underground conduit work is needed.

Important Information

To receive the electric vehicle discount rate, a time of use (TOU) meter is required. Go to <http://www.ladwp.com/ev> and complete the Residential Electric Charging Station Rate Discount Application or call 1 (866) 484-0433 for help and general inquiries. Customers must have their electric service account information and the Vehicle ID number to apply. LADWP also offers a \$2,000 rebate for separately metered EV charging stations. For more information about electric rates and incentive programs, call the LADWP Rates Group at (213) 367-4718 or visit <http://www.ladwp.com/ev>.

The electrical contractor should not install the charging station until after the customer contacts the LADWP regarding meter and rate options. To avoid delays in service, the customer must complete the online Charging Station Rate Discount Application prior to obtaining a LADBS electrical permit.

For a free LADWP service assessment or to inquire about installation issues, contact an Electric Service Representative (ESR) at (213) 367-8036 or email the Service Planning EV Unit at SVC_EVRequests@ladwp.com.

Level II EV charging station installations for apartment and condominium dwellers are usually complex and require more time to assess by the Department of Building and Safety and LADWP Service Planning. In most cases, electrical plans will be needed. For LADBS information, contact the Electrical Code Information Desk at (213) 482-0377.

Level III (480 volt) public charging stations require electrical plans for engineering review. Call the Service Planning EV Unit at (213) 367-8036 to inquire or contact LADWP Service Planning by email at SVC_EVRequests@ladwp.com.



Action #4

Participate in Training and Education Programs for Local Officials

Key Recommendation:

- 1 Identify existing training programs that local officials can complete to increase their understanding of important PEV topics and become familiar with PEV charging infrastructure for inspection and maintenance purposes. Such programs also can help local officials understand the safety implications of vehicles and chargers.

The Electric Vehicle Infrastructure Training Program (EVITP) has developed a training and certification curriculum supported by U.S. DOE. The program can conduct local community workshops for public officials for a nominal instructor fee. Local governments can pool together support for a full-day regional workshop. See the Additional Resources section at the end of this chapter for corresponding reference materials.

Action #4: Participate in Training and Education Programs for Local Officials

This readiness action encourages local officials to take advantage of training and education programs that support their inspection and maintenance needs and enhance their knowledge of safety implications of PEVs and chargers. Other programs train electrical contractors in charging equipment installation.

Numerous regional and state programs are listed under Additional Resources below. Many, including state programs, U.S. Department of Energy Clean Cities programs, and local utility programs are sponsored, and therefore are free to participants. Some programs require course fees. Adjacent municipalities can coordinate, in some cases at a county level, and share curricula and lessons learned. By coordinating, communities may be able to identify financial resources that allow a few local officials to complete training or general workshops. Such training can start with just a few officials in the next year or two and grow to include more people as the PEV market expands and funding is available.

Additional Resources

State and Federal Programs

Program	Sponsor	Description	Website
Electric Vehicle Infrastructure Training Program (EVITP)	IBEW/NECA, in partnership with U.S. DOE	EVITP recently was awarded an additional \$750,000 through the State of California Employment Training Panel (ETP) to train an additional 1,100 electricians (publicly and privately employed) in PEV charging station infrastructure. This augmentation will expand the EVITP program statewide.	www1.eere.energy.gov/cleancities/evitp.html www1.eere.energy.gov/cleancities/toolbox/pdfs/electric_vehicle_infrastructure_training.pdf
Workforce training and development grants (AB 118)	California Energy Commission		www.energy.ca.gov/2011publications/CEC-600-2011-006/CEC-600-2011-006-CMF.pdf

State and Federal Programs (continued)

Program	Sponsor	Description	Website
Employment Training Panel (ETP)		Funding to offset job skill training costs for currently employed and newly employed full-time workers to support the development and deployment of alternative and renewable fuels and vehicle technologies.	www.etp.ca.gov/
State Green Ladders Program			www.careerladdersproject.org/initiatives-programs/green-transportation-collaborative/
Clean Cities TV		Videos for inspector training, installations	www.cleancities.tv/FeaturedContent/Training/EVSEResidentialChargingInstallation.aspx
National Alternative Fuels Training Consortium			www.naftc.wvu.edu/
ETA EV Technician certification program	Ameri-Skills		www.ameriskillstech.com
California Occupational Guides: Alternative Fuel Vehicle Technicians	California EDD		www.calmis.ca.gov/file/occguides/Alternative-Fuel-Vehicle-Tech.pdf

Regional Programs

Area	Description/Sponsor	Website
Bay Area	City staff training for general readiness by Bay Area Clean Cities Coalitions East Bay San Francisco South Bay	 www.cleancitieseastbay.org/ www.sfcleancity.com/ www.svcleancities.org/
South Coast	Outreach to cities by South Coast Clean Cities Coalitions Staff and inspectors training for cities by Los Angeles County First responder training – fire and police; second responder training – tow company and service technicians by Rio Hondo Community College (Green Instructor of the Year Award)	www.scag.ca.gov/cleancities/ http://cte.riohondo.edu/auto/
Sacramento	First responder training by Sacramento Clean Cities Coalition	www.cleancitiessacramento.org/
San Diego	First Responder training by San Diego Clean Cities Coalition EVITP for electrical contractors San Diego Electrical Training Center/NECA and IBEW	www.sdcleanfuels.org/ http://www.sdet.org/course-detail.asp?sClassNumber=2012J26022

A reference listed above is reprinted on the following pages



An Open Letter to the Plug-in Electric Vehicle Industry

The mission of the national Electric Vehicle Infrastructure Training Program (EVITP) is to provide the Electric Vehicle industry and its member organizations with a structured platform to facilitate training and certification for the safe and expert installation of Electric Vehicle Supply Equipment. Attached to this letter are some documents which will provide you with more information about EVITP.

EVITP is an open, industry-wide partnership of the listed EV industry stakeholders. EVITP is not a corporation or business. EVITP is simply a collaboration of member organizations, and does not operate for profit. While the EVITP Statement of Purpose (available upon request) presents a number of sound reasons for E.V. industry stakeholders to work closely with EVITP, **there is one compelling, overriding reason to join the training collaborative: EVITP training will significantly advance and enhance the growth of the Plug-In Electric Vehicle Industry.**

As we know, an EV sale is quite different than a conventional vehicle sale. Prospective EV buyers have a number of concerns including initial cost, battery longevity, range, and the how/when/where of recharging. **EVITP will play a major role in helping customers become more comfortable with the purchase and long term operation of an Electric Vehicle because EVITP is:**

- Aware that insensitive, poorly trained electrical contractors, or electricians, could turn a customer off. EVITP is therefore ...
- Incorporating customer experience and customer relationship training, and
- Training to the highest standards so charging equipment will function properly and be well maintained, keeping customers satisfied, and
- Providing contractors and electricians with industry-wide product knowledge so they can advise customers expertly and professionally, and
- Integrating local utility company guidelines and recommendations into EVITP training to foster a seamless electric service experience for the customer

If you would like additional information, or would just like to talk about EVITP, please feel free to contact either of us at your convenience.

Sincerely,

A handwritten signature in cursive script that reads "Jennifer Mefford".

Jennifer Mefford, Co-Chair EVITP
Mobile: 248-318-7885
jmevitp@gmail.com

A handwritten signature in cursive script that reads "Bernie Kotlier".

Bernie Kotlier, Co-Chair EVITP
Mobile: 408-242-4000
bkevitp@gmail.com



Affirmed EVITP Partners

- General Motors
- BMW
- AeroVironment, Inc.(EVSE Manufacturer; Nissan Partner)
- California Community Colleges,ATTE Campuses
- General Electric (EVSE Manufacturer)
- The National Fire Protection Association (NFPA)
- The International Association of Electrical Inspectors (IAEI)
- Milbank (EVSE Manufacturer)
- Ameren (Missouri Utility)
- Schneider Electric (EVSE Manufacturer)
- DTE Energy (Michigan Utility)
- PEP Stations (EVSE Manufacturer)
- ClipperCreek (EVSE Manufacturer)
- Exergonix (Battery Storage)
- The University of California-Davis, PHEV Research Center
- Orlando Utilities Commission (Municipal Utility)
- Southern California Edison (SCE)
- Smith Electric Vehicles (Vehicle Manufacturer)
- The National Electrical Contractors Association
- Hubbell (EVSE Manufacturer)
- Commonwealth Edison (Illinois Utility)
- Leviton (EVSE Manufacturer)
- National Joint Apprenticeship and Training Committee
- Legrand/Pass & Seymour (EVSE Manufacturer)
- Kansas City Power & Light (Utility)
- Duke Energy (Southeastern & Midwestern U.S. Utility)
- SPX (Program Manager)
- Pacific Gas and Electric (Utility)
- Coulomb Technologies
- ECotality
- Eaton Corporation

National Electric Vehicle Infrastructure Training Program Phase One Training Course

Course Description: This 24 hour class comprehensively addresses the requirements, regulations, products and strategies which will enable electrical contractors and electricians to master successful, expert, and professional customer relations, installation, and maintenance of Electric Vehicle (EV) and Plug-in Hybrid Electric Vehicle (PHEV) infrastructure.

Course Objectives: Graduates will have gained thorough knowledge and practical application of all covered Electric Vehicle infrastructure subjects including the critical areas of customer experience, protection of utility systems, vehicle charging technical applications, and safety.



Training Course Plan: This Phase One class focuses on Level One and Level Two charging systems and related subjects. The Phase Two class, which will cover Level Three systems and related subjects, will be delivered in the summer of 2012.

The EVITP Phase One Class Outline

1. Overview of Electric Vehicles
2. Types of Electric Vehicles – Present and Future
3. Electric Vehicle Manufacturers and Products
4. Electric Vehicle Charging Unit Manufacturers and Products
5. Utility Policy, Notification, and Integration
6. Electric Vehicle Rules and Regulations
7. Electrical Vehicle Charging Site Assessment
8. Electrical Vehicle Charging Stations and Charging Load Requirements
9. Code Officials and Inspection
10. Electrical Codes, Electrical Safety Requirement, Other Regulations and Standards
11. Electric Vehicle Charging Installations
12. Renewable Energy and Electric Vehicles
13. First Responders
14. Customer Relations / Contractor's Role; Electrician's Role
15. Field Installation Practicum (Lab)
16. Electric Vehicle Certification Lab and Written Exams

EVITP News Summary

- Chicago, IL – April 14-16, 2011. The **Electric Vehicle Infrastructure Training Program (EVITP) Trains 54 Master Instructors.** *Industry collaboration leads to quick deployment of comprehensive EVSE installation training.*
- Chicago, IL – April 14-16, 2011. **EVITP Announces the Addition of California Community Colleges, Advanced Transportation Technology and Energy Program network, (ATTE) as an EVITP Partner.**
- Ann Arbor, MI – July 30-August 5, 2011. **28 Instructors from Across the U.S. have been EVITP Trained and Certified on the Campus of the University of Michigan to teach the EVITP curriculum.**
- Long Beach, CA – August 8-12, 2011. **8 EVITP Instructors were trained at Long Beach City College to teach the EVITP curriculum to state certified general electricians enrolled in EVITP classes at California Community College's ATTE Campuses.**

More EVITP News

- Detroit, MI – September 2, 2011. EVITP Master Instructors are currently training additional Instructors and Electricians across the nation. **EVITP Announced Today that More than 140 EVITP Instructors have been Certified to Train Electricians in 27 States.**
- Tampa, FL – March 1, 2012. EVITP announces that EVITP Instructors have trained and certified more than 1,000 EVITP Certified Electricians **in 36 Markets across the U.S.**
- Sacramento, CA – March 23, 2012. The California Employment Training Panel (ETP) announced today that it has **awarded \$750,000 for the training of 1,100 California state certified electricians** in the EVITP curriculum.

The EVITP Web Page

The Electric Vehicle Infrastructure Training Program (EVITP) web page is located on the Department of Energy/Clean Cities website at <http://www1.eere.energy.gov/cleancities/evitp.html>



The screenshot shows the EVITP web page on the EERE website. The header includes the U.S. Department of Energy logo and the text "Energy Efficiency & Renewable Energy". The main navigation bar is green and contains links for HOME, ABOUT, COALITIONS, FINANCIAL OPPORTUNITIES, INFORMATION RESOURCES, COORDINATOR TOOLBOX, NEWS, and EVENTS. A search bar is located in the top right corner. The main content area features a sidebar on the left with a list of links under "Partnerships", including "National Clean Fleets Partnership", "National Parks Initiative", "Electric Vehicle Infrastructure Training Program" (which is highlighted), "Advanced Vehicle Technology Competitions", "Natural Gas Transit & School Bus Users Group", "Natural Gas Vehicle Technology Forum", "Hall of Fame", and "Contacts". The main content area has a heading "Electric Vehicle Infrastructure Training Program" followed by a paragraph describing the program's purpose. Below this is a section titled "Training Opportunities" and another titled "Focused Curriculum". On the right side, there is a logo for "Electric Vehicle EVITP Infrastructure Training Program" and a photograph of a person working on a red electric vehicle.

For more information about EVITP please email your message to info@EVITP.com



Action #5

Reach Out to Local Residents and Businesses

Key Recommendation:

- 1 Implement outreach programs in local communities that include two elements:

Direct references and links to regional, state, and national campaigns that provide general PEV information, including environmental, health, and community benefits. The Additional Resources section below lists many references. One to include is the California PEV Resource Center: www.driveclean.ca.gov/pev/

Community-specific information such as: how to install residential charging equipment (homeowners), how to provide charging for employees and customers (local businesses), and where PEV drivers can find chargers.

Action #5: Reach Out to Local Residents and Businesses

Local government should reach out to residents and businesses to inform the community about PEVs, charging infrastructure, and the actions it is taking to become PEV ready.

Key, high-level messages can highlight PEV availability and benefits such as total cost of ownership, and environmental, health, and community benefits, then point to state and national outreach campaigns (See Additional 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 the 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, how to find local contractors who are trained and certified to install charging infrastructure, and how to contact their local electric utility to address electricity service and rate program upgrades. Residents also will want to know where to find regional public charging infrastructure 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. They will want to know the business proposition and green marketing opportunities of investing in charging infrastructure and of incorporating PEVs into their fleets. Helpful information that governments can provide might include employers or employer associations that are working to become PEV ready. One such group is the Business Council on Climate Change www.bc3sfbay.org/.

In addition to the resources listed below, also refer to the extensive list of current PEV activities throughout California and beyond in Appendix B.

Additional Resources

Comprehensive PEV Information

Program/Sponsor	Description	Website
California PEV Resource Center		www.driveclean.ca.gov/pev/
U.S. Department of Energy Clean Cities Guides	<p>Consumers</p> <p>Fleets</p> <p>PEV infrastructure installers</p> <p>Public charging station owners</p>	<p>www.afdc.energy.gov/afdc/pdfs/51226.pdf</p> <p>www.afdc.energy.gov/afdc/pdfs/pev_handbook.pdf</p> <p>www.afdc.energy.gov/afdc/pdfs/51228.pdf</p> <p>www.afdc.energy.gov/afdc/pdfs/51227.pdf</p>
Electric Drive Transportation Association (EDTA)		www.GoElectricDrive.com
PEV Collaborative	<p>List of existing consumer incentives for PEVs and infrastructure</p> <p>Communication guides</p> <ol style="list-style-type: none"> 1. How do PEVs benefit California? 2. What are the benefits of driving a PEV? 3. PEV charging: Where and When? 4. Fuel costs: PEVs vs. gasoline cars 5. How do communities become PEV ready? 6. How do multi-unit dwellings become PEV ready? 7. Workplace charging: Why and How? 8. PEV batteries: Safety, Recycling, Re-use? 	www.pevcollaborative.org/policy-makers

Additional Resources (continued)

Local Stakeholder and Government Outreach

Program/Sponsor	Description	Website
SoCalEV	Consumer outreach website	www.socalev.org/index.htm
Bay Area Business Council on Climate Change	Regional EV-Friendly Business Guide	www.bc3sfbay.org/ev-guide-for-businesses.html
San Diego Region and San Joaquin Valley PEV readiness website	For residents, businesses and municipalities	www.energycenter.org/plugin-ready
City of Palo Alto		www.cityofpaloalto.org/depts/utl/utilities_engineering/news/details.asp?NewsID=1613&TargetID=244
City of Beverly Hills		www.beverlyhills.org/services/building/electric_vehicles.asp
Model community outside of California: Raleigh, North Carolina		www.advancedenergy.org/transportation/programs_and_initiatives/nc_getready.php www.afdc.energy.gov/afdc/vehicles/electric_deployment_case_study_raleigh.html

Electric Utility Outreach

Los Angeles Department of Water and Power	Charge UP LA! Program	https://www.ladwp.com/ladwp/faces/wcnav_externalId/r-gg-drivelec?_adf.ctrl-state=nemaf7kg0_90&_afLoop=222740975056253
Pacific Gas & Electric		www.pge.com/myhome/environment/pge/cleanair/electric-drivevehicles/
Sacramento Municipal Utility District		www.smud.org/en/residential/environment/plug-in-electric-vehicles/
San Diego Gas & Electric		www.sdge.com/clean-energy/electric-vehicles/electric-vehicle
Southern California Edison		www.sce.com/info/electric-car/default.htm



Additional Actions **for Expanded Readiness**

This section briefly highlights the main elements of readiness actions #6 to #12, and will be expanded in the future.

Action #6: Develop a Regional Public Charging Station Site Selection Plan

Create a methodology and a 3- to 5-year plan for identifying sites and deploying workplace and publicly available charging infrastructure. Steps include:

- Review land-use patterns, residential and work locations, and travel routes
- Prioritize zoning, property type, and building types where infrastructure could be placed
- Evaluate charging levels necessary at public locations (Level 1, Level 2, DC Fast Charge)
- Evaluate how charging infrastructure should integrate with (and complement) mass transit, walk/bike throughways, etc.
- Establish a policy for charging infrastructure at street-side parking
- Adopt surface street signage policies (using state/federal signs) to direct drivers to public charging (also acts as outreach to encourage PEV usage)
- Plan PEV infrastructure corridors between urban centers along major routes
- Survey current PEV drivers on their preferences for new public charging

Existing case studies:

- San Diego's SANDAG guidelines, developed under the EV Project
- UC Davis and UCLA research on charging infrastructure distribution

Action #6: Additional Resources

Resource/Source	Description/Section	Website
<i>Maps and Apps – Today’s Mapping and Location-Based Services for Plug-in Electric Vehicle Charging Infrastructure</i> PEV Collaborative		www.pevcollaborative.org/sites/all/themes/pev/files/Maps%20%26%20Apps%20report%20final%205%273%2712.pdf
<i>Ready, Set, Charge, California</i> Bay Area Climate Collaborative	Streets, sidewalks, and public places, 3.4 Development of guiding principles for siting stations, 5.2	www.ReadySetCharge.org

Action #7: Encourage Local Employers to Install Workplace Charging

Inform local employers and property owners of the benefits of providing workplace charging (to employees), and how to implement it.

Action #7: Additional Resources

Resource/Source	Description	Website
California PEV Resource Center		http://www.driveclean.ca.gov/pev/Resources_For_Businesses.php
<i>Workplace charging: Why and How?</i> PEV Collaborative		www.pevcollaborative.org/sites/all/themes/pev/files/CommunicationGuide7.pdf

Action #8: Support Local Electric Utility Efforts to Minimize Grid Impacts

Stay informed and connected with local utilities about their assessments and new projects to ensure local electrical distribution reliability. Local governments should be aware of and, where feasible, participate in the following ongoing electric utility activities:

- Utility notification protocols for new charger installations
- Utility analyses of potential impacts to the local grid distribution infrastructure
- Utility plans to minimize the effects of charging during peak load times
- Utilities' proposed plans for making widespread utility and grid upgrades
- Plans to ensure that the charging infrastructure or PEV is able to send and receive the information needed to interact with the grid

Action #8: Additional Resources

Resource/Source	Description/Section Number	Website
Fact sheets and consumer information Southern California Edison		www.sce.com/info/electric-car/installers/installers.htm
Consumer information Pacific Gas & Electric		www.pge.com/myhome/environment/pge/cleanair/electric-drivevehicles/pluginready/
<i>Ready, Set, Charge, California</i> Bay Area Climate Collaborative	Utility Considerations, Chapter 6	www.ReadySetCharge.org

Action #9: Develop and Implement Solutions for Multi-unit Dwelling (MUD) Properties

Develop and implement a plan that identifies and addresses the unique challenges of installing infrastructure at multi-family residential buildings of various types. Challenges can include unassigned parking spaces, difficult electrical configurations, and a lack of support from a property owner. Innovative solutions that could be considered to provide charging access to a PEV driver include the following:

- Rely on Level 1 charging
- Install Level 2 charging equipment that can supply multiple parking spaces
- Install charging equipment closest to electrical supply services
- Identify nearby public or workplace charging which tenants can access during non-business hours
- Rely on workplace and DC fast charging public infrastructure

Conduct outreach to local homeowners' associations to work through their concerns and building challenges.

Action # 9: Additional Resources

Resource/Source	Description/Section	Website
<p><i>Addressing Challenges to Electric Vehicle Charging in Multifamily Residential Buildings</i> (2011)</p> <p>UCLA</p>		http://luskin.ucla.edu/content/addressing-challenges-electric-vehicle-charging-multifamily-residential-buildings
<p><i>Prepping for Plug-in Vehicles in Apartments and Condos</i></p> <p>SDG&E</p>		http://sdge.com/sites/default/files/documents/Prepping%20for%20EVs%20Condos.pdf
<p>California PEV Resource Center</p>		http://www.driveclean.ca.gov/pev/Charging/Home_Charging/Multi-unit_Dwellings.php
<p><i>How do multi-unit dwellings become PEV ready?</i></p> <p>PEV Collaborative</p>		www.pevcollaborative.org/sites/all/themes/pev/files/CommunicationGuide6.pdf
<p><i>Ready, Set, Charge, California</i></p> <p>Bay Area Climate Collaborative</p>	<p>Multi-unit dwelling (MUD) charger installation process, 4.2</p> <p>EVSE options for MUDs – site assessment checklist for property owners, 8.5</p>	www.readysetcharge.org

Action #10: Incorporate PEVs and Charging into Local Vehicle Fleets

Local governments can become models for other communities in many ways. One way is to incorporate PEVs and charging into their fleets:

- Set a target number of PEVs to purchase over a set period of time
- Establish purchase and evaluation criteria that examine a range of costs and benefits of PEVs, including:
 - higher upfront costs but lower operating costs over time
 - environmental benefits
 - how PEVs in the fleet can help meet a city's climate action plan
- Co-locate fleet charging stations with public access stations to allow for shared use and provide additional educational opportunities (i.e., public sees fleet vehicles charging)

Action #10: Additional Resources

Resource/Source	Description/Section	Website
Vehicle calculator online tool U.S. DOE Clean Cities		www.afdc.energy.gov/afdc/calc/
<i>Electric Vehicle Charging Stations Program and Installation Guidelines</i> (2011) County of Sonoma		www.sonoma-county.org/prmd/docs/misc/ev_prog_guidelines.pdf
<i>Ready, Set, Charge, California</i> Bay Area Climate Collaborative	Greening the Fleet, 7	www.readysetcharge.org
California PEV Resource Center		http://www.driveclean.ca.gov/pev/Resources_For_Fleets.php

Action #11: Create Local Incentives to Encourage PEV Usage and Sales

- Identify new incentive programs that can encourage vehicle purchase and use in your region
- Establish vehicle test drive and/or vehicle loan programs to get residents behind the wheel for extended periods of time

Action #11: Additional Resources

Resource/Source	Description/Section	Website
California PEV Resource Center		http://www.driveclean.ca.gov/pev/Incentives.php
California Incentives for Vehicles and Charging Stations PEV Collaborative		http://www.pevcollaborative.org/sites/all/themes/pev/files/PEV%20incentives%20spreadsheet-FINAL%202-8-12.pdf
<i>Ready, Set, Charge, California</i> Bay Area Climate Collaborative	Investment and revenue sharing models, 5.6 Matrix of incentives, 8.3 Public agencies with alt-fuel related incentives or requirements, 8.4	www.readysetcharge.org

Action #12: Encourage Linkages with Renewable Energy

Local governments and private developers could encourage and implement renewable energy installations that are linked with PEV charging, such as solar carports and residential rooftop solar installations.

Action #12: Additional Resources

Resource/Source	Description	Website
Center for Resource Solutions		www.resource-solutions.org/index.php
California Center for Sustainable Energy		www.energycenter.org/

Appendices

Appendix A: Existing Community-Readiness Guidelines

Primary References (cited throughout this toolkit)

- *Ready, Set, Charge, California*, statewide readiness guidelines coordinated by the Bay Area Climate Collaborative
 - Scope: Applicable to any community in California
 - www.readysetcharge.org
- *Community Planning Guide for Plug-in Electric Vehicles*, community readiness guidelines focusing on stakeholder partnerships and collaboration approaches, developed by Advanced Energy (North Carolina)
 - Scope: Written for any community nationwide
 - www.advancedenergy.org/transportation/resources/Community%20Planning%20Guide.pdf
 - www.advancedenergy.org/transportation/evse/charging_station_installation_handbook.php

Additional References

- *Sonoma County Electric Vehicle Charging Station Program and Installation Guidelines*, for regional PEV infrastructure planning and support (Northern California)
 - Scope: Written for Sonoma County, use as a case study
 - www.sonoma-county.org/prmd/docs/misc/ev_prog_guidelines.pdf
- City of Riverside regional guidelines, in collaboration with the Western Riverside Council of Governments (Southern California)
 - Scope: Written for Riverside communities, use as a case study
 - www.riversideca.gov/building/pdf/handouts/EV-Charger-Guidelines.pdf
 - www.greenriverside.com/userfiles/EV%20Charger%20Guidelines.pdf
- *Project Get Ready*, developed by Rocky Mountain Institute, featuring key PEV readiness elements for local planners
 - Scope: Written for any community nationwide
 - www.projectgetready.org
- *Electric Vehicle Charging Infrastructure Deployment Guidelines for the Greater San Diego Area*, developed by ECOtality for San Diego and other communities
 - Scope: Written for San Diego under The EV Project
 - www.ecotality.com/transportation/evse/charging_station_installation_handbook.php

Appendix B: Current PEV Activities throughout California (and Beyond)

This section summarizes the substantial efforts underway to develop and support the emerging PEV market; most of the referenced activities are California-specific, although a few are resources from other states. This is a preliminary list; it cannot possibly capture all of the activities that are occurring.

Automakers

All major automakers are or will be selling PEVs in California. Beyond simply providing vehicles for sale, they are working with third-party consultants and charging station partners to help homeowners with equipment. They also are working with utilities on electric loads and equipment interface, and more.

The following websites list all PEV products either on the market today or coming soon. The U.S. EPA site offers comparisons of PEVs and internal combustion vehicles.

- www.driveclean.ca.gov/pev/
- www.plugincars.com/cars
- www.pluginamerica.org/vehicles
- www.GoElectricDrive.com
- www.epa.gov/greenvehicles

Electric Utilities

All major California utilities have PEV infrastructure programs. While the scope of these programs varies by utility, generally all utilities are working with city officials to develop residential charging station installation procedures, planning for local infrastructure enhancements, providing time-of-use rate and meter options for homeowners and businesses, and working in partnerships to demonstrate public infrastructure programs.

- Southern California Edison
www.sce.com/PowerandEnvironment/PEV/default.htm
- Pacific Gas & Electric
www.pge.com/myhome/environment/pge/cleanair/electricdrivevehicles/pluginready/
- San Diego Gas & Electric
www.sdge.com/environment/cleantransportation/resources.shtml
- Sacramento Municipal Utility District
www.smud.org/en/community-environment/evs/Pages/index.aspx
- California Municipal Utilities Association, Electric Transportation Committee
www.cmua.org/electric-transportation.html
- Los Angeles Department of Water and Power
www.ladwp.com/ladwp/cms/ladwp002056.jsp

Infrastructure Coordination and Demonstration Partnerships

In addition to individual stakeholder actions, a large number of partnerships have been formed to coordinate regional infrastructure efforts and demonstrate technology. This ever-changing landscape fosters innovative ideas and allows stakeholders to experiment and learn from other organizations.

- U.S. Department of Energy Clean Cities Program promotes green fleet strategies by region
 - Each Clean Cities chapter is unique, but most have PEV activities around local infrastructure planning, outreach to dealerships, outreach to fleet managers, and more
 - 13 California Clean Cities,
www.afdc.energy.gov/cleancities/progs/coalition_locations.php

- The EV Project – ECOtality provider and coordinator, 16 major U.S. cities
 - Partners: U.S. DOE, San Diego, South Coast AQMD, San Francisco, auto and utility partners
 - Core role: infrastructure equipment and planning, network services, data
 - www.theevproject.com/

- Smart City San Diego
 - Partners: City of San Diego, GE, SDG&E, UC San Diego, CleanTECH San Diego
 - Core role: test smart technology, streamline PEV charging station installations, renewable power, study consumer behavior
 - www.smartcitysd.org

- San Diego Regional Electric Vehicle Infrastructure Working Group
 - Partners: CCSE, 19 jurisdictions throughout the San Diego region, Port of San Diego, NECA, IBEW, ECOtality, AeroVironment
 - Core role: Convene key regional stakeholders to establish and disseminate PEV infrastructure best practices throughout the region.
 - www.energycenter.org/pluginready

- Bay Area Air Quality Management District (BAAQMD) EV projects
 - Partners: MTC, Clean Cities, multiple charging providers
 - Core role: Grants, facilitate best practice discussions, outreach workshops, outreach to fleet managers, data collection
 - www.baaqmd.gov/?sc_itemid=367B61C6-2327-476B-B452-E4A43253BAC9

- South Coast Air Quality Management District (SCAQMD) EV projects
 - Private partnerships typically average \$3 for every AQMD \$1
 - Core role: Clean Fuels Program, more than \$16 million in 2009, 20% of which was for electric vehicles and hybrids
 - www.aqmd.gov/tao/about.html

- Bay Area Climate Collaborative (BACC)
 - Partners: led by city mayors, Silicon Valley Leadership Group, Bank of America, PG&E, EV Communities Alliance, BetterPlace, Coulomb, Association of Bay Area Governments (ABAG), BAAQMD
 - Core role in PEVs:
 - ◆ EV Strategic Council – Bay Area stakeholder leader forum
 - ◆ \$5 million project to get EVs in Bay Area municipal fleets
 - ◆ EV fleet working group
 - <http://baclimate.org/>

- Ready, Set, Charge, California
 - Partners: EV Communities Alliance, Clean Fuel Connection Inc., ABAG, BACC, CCSE
 - Core role: Community PEV readiness guidelines, outreach to 41 specific communities in California
 - www.readysetcharge.org

- EV Communities Alliance
 - Partners: ABAG, BACC, Monterey Bay EV Alliance, Plug-in Central Coast, Bay Area EV Strategic Council
 - Core role:
 - ◆ Manage the \$4 million Bay Area EV Corridor Charging Infrastructure project
 - ◆ Develop and facilitate the Bay Area EV Strategic Council
 - ◆ *Ready, Set, Charge, California* guidelines development and outreach
 - ◆ *Accelerating California's EV Transition* guide for regional policy makers
 - ◆ Vehicle-to-grid pilot project development

- Sonoma County
 - Recipient of MTC and other infrastructure grants, a large number of charging stations, corridor plans on county property, public fleets
 - Coordinating a countywide planning forum and developing a guideline tool for local cities and businesses (fleets and chargers)
 - Created a legal coordinating entity, the Regional Climate Protection Authority, to help create common permitting between cities in the county

- City of San Francisco
 - Partners: Coulomb, MTC, BACC
 - Core role: Network of public chargers, city fleet of PEVs
 - www.sfenvironment.org/our_programs/topics.html?ssi=7&ti=17

- Los Angeles “SoCalEV”
 - Partners: SCAQMD, LADWP, SCE, and others
 - Core role: outreach and education, streamline infrastructure installations, incentives, etc.
 - www.socalev.org/

- CALSTART
 - Partners: SCAQMD, BAAQMD
 - Convened a California EV infrastructure working group (fall 2010) with the intent to help share ideas between northern and southern California.
 - Vehicle-to-grid (V2G) research and demonstration project
 - Fleet managers outreach and heavy-duty vehicle demonstrations
 - www.calstart.org/projects/Plug-in-Infrastructure.aspx

- Rocky Mountain Institute
 - Project Get Ready, www.projectgetready.org; List of actions local leaders can take to make their community a plug-in pioneer
 - Online calculator for comparing the total cost of operation between PEVs and ICEs, www.projectgetready.com/js/tco.html
 - PEV Readiness Study with Roland Berger Consultants – assessing the readiness of America’s top 50 metro areas (2010); 14 “leader” cities identified six of which are in California

- Clinton Climate Initiative (CCI)
 - 17 international cities, including Los Angeles, Portland, Chicago, and Houston, working to become PEV ready; part of the broader C40 Cities program.
 - The focus is business development, finance options, local incentives, etc.
 - www.clintonfoundation.org/what-we-do/clinton-climate-initiative/

Charging System and Network Providers

Numerous infrastructure companies offer products and network services for the emerging PEV market. Some focus on residential charging station products, others focus on public infrastructure or both. As with the partnerships noted above, this is an ever-changing landscape with business plans evolving rapidly to take advantage of federal and state programs, and in some cases to identify strategic commercial and retail partners.

- List of all Nationally Recognized Testing Laboratory (NRTL) certified charging equipment, on the EDTA affiliated website
 - www.goelectricdrive.com/Charging/FindanEVCharger.aspx

- Electric Vehicle Service Provider (EVSP) Coalition: Better Place, Coulomb and ECotality
 - Partnership to jointly engage with policy development, agencies

- Residential system installers and consultants
 - Clean Fuel Connection, Inc.
 - SPX (GM partner)
 - AeroVironment (Nissan partner)
 - Best Buy (partner for Ford and Mitsubishi)

- ECotality – see earlier notes in “The EV Project”
 - Commercial partners: Best Buy, Macy’s
 - www.ecotality.com/

- Charge Point America – Coulomb Technologies
 - Partners: U.S. Department of Energy grantees
 - Core role: Provide infrastructure to nine U.S. communities
 - www.chargepointamerica.com/
 - www.chargepoint.net/

- Better Place
 - Partners: GE, BAAQMD, Renault
 - Core role: Business model focuses on battery switching technology with test fleets in Tokyo and planned in San Francisco (2012)
 - www.betterplace.com/

- Clipper Creek
 - Partners: California Energy Commission
 - Core role: State grant to upgrade “legacy” chargers with today’s technology and charging standards
 - www.clippercreek.com/

- General Electric
 - Partners: Better Place
 - Core role: Watt Station charging station; battery financing for partners; smart grid technology and services
 - www.ge.com/innovation/electric_vehicles/index.html
 - GE Service Magic program to find qualified local contractors, www.servicemagic.com/ev-charger/ge-wattstation/
 - GE video walks a potential consumer through the PEV basics, www.ge.com/thegeshow/electricvehicles/index.html

- Leviton
 - Charging station solution with direct plug design for residential applications
 - Supplier for partnership with Best Buy and Ford
 - www.leviton.com

- NRG Energy
 - Core role: eVgo network system
 - Funding the construction of a statewide network of PEV charging stations, including at least 200 public fast-charging stations and another 10,000 plug-in units at 1,000 locations in the San Francisco Bay Area, the San Joaquin Valley, the Los Angeles Basin and San Diego County
 - <https://www.evgonetwork.com/>

- 350 Green
 - Fast Charge and Level 2 charging networks in Bay Area, expanding to Southern California
 - Network subscription model based on 350 Green as EVSE owner/operator
 - www.350green.com/

State and Regional Policy Development

California has long been a leader in developing state policies on transportation emissions and energy use. Many state agencies and commissions have active programs involving PEVs and electric infrastructure; some are regulations and others are incentive programs.

- California Governor's Office
 - Executive Order S-03-05 establishes the goal to reduce greenhouse gas emissions 80% below 1990 levels by 2050
 - Executive Order B-16-2012 sets targets for zero-emission vehicles; by 2015 all major cities will have adequate infrastructure and be PEV ready, and by 2025 there will be 1.5 million zero-emission vehicles on the road
 - Office of Economic Development helps local governments on PEV topics
- California Public Utilities Commission
 - SB 626 (2009), Order Instituting Rulemaking 09-08-009: Investor Owned Utility time-of-use rates, second meter rules/ownership, directives for utilities to collect data, and more
 - ◆ www.cpuc.ca.gov/PUC/hottopics/1Energy/090814_ev.htm
 - SB 17 (2009): Develop smart grid deployment plan considering PEVs
 - ◆ www.cpuc.ca.gov/PUC/energy/100317_preso.htm
 - 2020 Renewable Portfolio Standard for electric grid
- California Energy Commission
 - AB 118 (2007) - Provides grants for regional planning teams, infrastructure projects; requires lessons learned sharing; local government guidance document on PEV infrastructure
 - ◆ www.energy.ca.gov/drive
 - SB 1455 (2010) - Website outreach tool to be developed on PEV infrastructure
 - Partnership with National Renewable Energy Laboratory on program development
- California Air Resources Board
 - Zero Emission Vehicle (ZEV) Regulation establishes statewide ZEV sales requirement, assesses economic and environmental impact, technology and cost,
 - ◆ www.arb.ca.gov/zev
 - Website for consumers, www.driveclean.ca.gov/
 - AB 118 vehicle incentives program, administered by California Center for Sustainable Energy; leading consumer PEV education throughout the state,
 - ◆ www.energycenter.org/cvrp

- Low Carbon Fuel Standard, includes an inter-agency work group on electric metering
- SB 375 (2009) – Directs regions to establishes regional greenhouse gas reduction targets
- SB 71 (2009) - Approves sales and use tax exemptions through 2020 on manufacturing equipment for PEVs and other advanced technologies. This is part of the California Alternative Energy and Advanced Transportation Financing Authority.
- California Department of General Services - Division of State Architects
 - Interim Disabled Access Guidelines for EV Charging Stations (Policy # 97-03); References the federal Americans with Disabilities Act (ADA)
- California Building Standards Commission
 - 2010 CA Building Code – Chapter 11C addresses ADA requirements
 - January 2011: California Green Building Standards Code update
 - California Department of Housing & Community Development (HCD) for residential buildings
 - ◆ Voluntary EV charging “readiness” standard in residential new construction (code proposal April 2011, Appendix A4 of code)
 - ◆ Education/outreach to local building departments; willing to distribute stakeholder guidelines for PEVs and charging stations
- California Department of Food and Agriculture
 - Regulates second meters for private enterprises selling electricity
 - Regulates signage for “motor vehicle fuels” (electricity is not yet considered a motor vehicle fuel) – conveying information that is “fair, consistent, and accurate.”
- Caltrans (California Department of Transportation)
 - Manages federal transportation funds for California
 - Manual on Uniform Traffic Control Devices (MUTCD) – “signage”
 - ◆ CA MUTCD – G66-21, guidance signage for EV station
 - Federal Highway Administration (FHWA) – D9-11bP and D9-11b (alternate)
 - No “regulatory” signage exists in California or at the federal level

National Codes and Standards Development

A number of standards have been completed in recent years, or are in active development, in preparation for the PEV market.

- SAE Standards Committee
 - J1772 – EV Conductive Charge Coupler
 - J2293 – Establishes requirements for the transfer of electrical energy from a utility source to a PEV; “EV Energy Transfer System”
 - J2847 – Provides specifics on digital communications
 - J2836 – Provides use case for digital communications
 - J2894 – Addresses onboard charger power quality
 - J551 – Provides standards for electromagnetic compatibility

- National Electric Code, NFPA 70
 - Section 625 addresses electric vehicles and charging stations
 - Signage requirements included

Outreach and Education

A wide variety of stakeholders, including environmental organizations, industry or trade associations, and enthusiast groups, are engaged in outreach and education. The list below includes websites from a few government stakeholders as well.

Consumer and Environmental Nonprofit Organizations

- American Lung Association, www.lungusa.org
- CalCars, www.calcars.org
- Electric Auto Association, www.electriconline.org
- Natural Resources Defense Council, www.nrdc.org/energy/vehicles/electric.asp
- Plug In America, www.pluginamerica.org/
- Sierra Club, www.sierraclub.org/electric-vehicles/
- Union of Concerned Scientists, www.ucsusa.org/clean_vehicles/
- California Center for Sustainable Energy, www.energycenter.org/pluginready

Charging station mapping services (online Web tools and mobile apps)

- Visit the PEV Resource Center for a full list of sites, http://www.driveclean.ca.gov/pev/Charging/Find_Charging_Stations.php
- www.afdc.energy.gov/afdc/locator/stations (U.S. DOE system)
- www.recargo.com (managed by EV users)
- www.evchargernews.com (managed by EV users)
- www.electric.carstations.com
- www.ecotality.com
- www.chargepoint.net/

Vehicle operation comparison tools – “calculators”

- Visit the PEV Resource Center for a full list of calculators, http://www.driveclean.ca.gov/pev/Costs/Calculate_Your_Costs.php
- SCE, www.sce.com/nrc/pev/index.html
- DTE Energy, www.dteenergy.com/residentialCustomers/productsPrograms/electricVehicles/eVCalculator.html
- Electric vehicle service equipment (EVSE) comparison website, www.advancedenergy.org/transportation/evse/
- Virtual Vehicle company, www.vevdrive.com (UC Berkeley)
 - Offers a virtual buying experience and test drive of PEVs to help potential consumers understand how PEVs would fit into their lives and the costs

Popular PEV blogs and social media sites

- www.mynissanleaf.com/
- www.gm-volt.com/forum
- www.plugincars.com

Industry or Trade Associations

- California Electric Transportation Coalition – state advocacy on PEV policies
 - Coordinating utility notification and “opt-out” notice for PEV buyers
 - www.caletc.com
- Electrification Coalition – national advocacy on policy (federal “communities” bill)
 - Comprehensive, multi-stakeholder roadmap reports on light-duty vehicle consumer and fleet markets, benefits to national priorities
 - www.electrificationcoalition.org/
- Electric Drive Transportation Association – National Plug-in Vehicle Initiative
 - www.goelectricdrive.com/
- Electric Power Research Institute, Plugging In: A Consumer’s Guide to the Electric Vehicle
 - http://my.epri.com/portal/server.pt?Abstract_id=00000000001023161

Government Outreach

- California Air Resources Board, www.driveclean.ca.gov/
- U.S. Department of Energy Alternative Fuels Data Center
 - GeoEVSE - National PEV infrastructure mapping initiative
 - Case studies on regional infrastructure planning (best practices)
 - ◆ www.afdc.energy.gov/afdc/vehicles/electric_deployment_case_studies.html
 - Outreach/education web pages on BEVs and PHEVs:
 - ◆ www.afdc.energy.gov/afdc/fuels/electricity.html
 - ◆ www.afdc.energy.gov/afdc/vehicles/electric.html
 - Vehicle buyers guide, www.afdc.energy.gov/afdc/pdfs/49488.pdf
- U.S. Department of Energy “Greet Fleet Calculator”
 - Focuses on emissions and fuels for medium- and heavy-duty vehicles. Designed to support Clean Cities stakeholders looking to estimate benefits from fleets.
 - http://greet.es.anl.gov/carbon_footprint_calculator

Research

A number of organizations in California are conducting research on the PEV market, vehicle and infrastructure technology, and environmental and energy impacts. A few are listed here, but many more exist.

- California Center for Sustainable Energy
 - Partner with ARB to implement AB118 incentives
 - Leading battery second life research project with California Energy Commission and NREL

- Leading PEV consumer behavioral study of PEV drivers throughout California focusing on charging behavior, knowledge/use of PEV utility rates and the link between PEV and solar PV
 - <http://energycenter.org/>
- Center for Resource Solutions – studying Renewable Energy Credits (RECs) for vehicle programs, renewable power connections generally
 - www.resource-solutions.org/index.php
- Electric Power Research Institute
 - Convenes the Infrastructure Working Council (formed in 1991)
 - Developing framework for utility PEV readiness programs
 - Utility impacts analysis from PEVs
 - Smart grid research, including codes/standards for PEV communication
 - Commercial fleet manager PEV value proposition
 - Economic analysis, environmental and policy analysis for electric transportation
 - www.epri.com
- International Council on Clean Transportation
 - Vehicle Electrification Policy Study
 - ◆ <http://theicct.org/vehicle-electrification-policy-study-task-1---technology-status>
 - ◆ <http://theicct.org/vehicle-electrification-policy-study-task-2-%E2%80%94-metrics>
 - ◆ <http://theicct.org/vehicle-electrification-policy-study-task-4-%E2%80%94-complementary-policies>
- UC Berkeley
 - California Energy Commission grants on battery second life, home energy storage, EV scale up
 - Toyota PHEV demonstration and consumer survey project
 - <http://tsrc.berkeley.edu/projectarea/advancedvehicles>
- UC Davis PH&EV Center
 - Research for California Energy Commission and other stakeholders on PEVs
 - Convenes an Advisory Council of leading stakeholders
 - Research on consumer response to PEVs, PEV driver behaviors and infrastructure needs
 - <http://phev.its.ucdavis.edu/>
- UC Los Angeles Luskin Center for Innovation, School of Public Affairs
 - Study local policies to incentivize PEV adoption
 - EV market study for Los Angeles
 - Policies to manage EV public charging
 - <http://luskin.ucla.edu/ev>

Appendix C: References

1. *Taking Charge: Establishing California Leadership in the Plug-in Electric Vehicle Marketplace* (2010)
California Plug-In Electric Vehicle Collaborative
www.pevcollaborative.org/sites/all/themes/pev/files/docs/Taking_Charge_final2.pdf
2. *Ready, Set, Charge, California: A Guide to EV-Ready Communities* (2011)
Bay Area Climate Collaborative
www.readysetcharge.org
3. *Community Planning Guide for Plug-in Electric Vehicles* (2011)
Advanced Energy Corporation
www.advancedenergy.org/transportation/resources/Community%20Planning%20Guide.pdf
4. *Charging Station Installation Handbook for Electrical Contractors and Inspectors* (2011)
Advanced Energy Corporation
www.advancedenergy.org/transportation/evse/Charging%20Handbook.pdf
5. *Electric Vehicle Charging Station Program and Installation Guidelines* (2011)
County of Sonoma
www.sonoma-county.org/prmd/docs/misc/ev_prog_guidelines.pdf
6. *Project Get Ready: A list of Actions that Leaders can Take to Make Their Community a Plug-in Pioneer* (2009)
Rocky Mountain Institute
www.rmi.org/Knowledge-Center/Library/2009-02_ProjectGetReadyMenu
www.projectgetready.org/



www.PEVCollaborative.org