

BEST PRACTICES FOR WORKPLACE CHARGING



Employer EV Initiative
Supporting solutions for workplace charging

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Best Practices for Workplace Charging



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Preface

This report was developed to promote adoption of Plug-in Electric Vehicles and specifically focuses on solutions for charging infrastructure at the workplace. In parallel to this work and in collaboration with the California Plug-in Electric Vehicle Collaborative, other documents were developed that are recommended to the interested reader. Those documents include: Case Studies for Workplace Charging and Decision Making Guides for Employers and Employees. All are available for download at www.evworkplace.org and www.pevcollaborative.org.

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1. INTRODUCTION

1.1. THE BENEFITS OF WORKPLACE CHARGING

Adoption and use of plug-in electric vehicles (PEV's) can be encouraged by ensuring the development of appropriate workplace charging scenarios and uses. Workplace charging has often been considered in third place in terms of priority behind home and public charging infrastructure, and has not been given broad attention historically. However in recent months, many, including electric car manufacturers, have begun emphasizing workplace charging as the most important secondary charge point after residential charging, especially in the early years when public infrastructure can be costly to install or upgrade, and slow to roll out.

Employees receive the most obvious benefit from workplace charging in that they can conveniently fuel their vehicle while at the office. But advocates of workplace charging suggest that it benefits everyone involved, including the employer, the community, and the PEV market in the following ways:

1. Employee Benefits:

- Builds range confidence: Range anxiety is a term used to describe consumers' fear that their electric car battery will run out mid-route. Workplace charging can minimize this fear and potentially double the daily driving range of an average PEV by allowing the driver to travel to a further destination after charging at the workplace. It also extends the all-electric range of plug-in hybrid electric vehicles (PHEV's), such as the Chevrolet Volt, giving the driver more "all-electric miles."
- Allows a broader range of employees to purchase PEV's: Workplace charging enables employees with long commutes or without access to home charging to purchase plug-in electric vehicles.

2. Employer Benefits:

- Employee recruitment and retention: Workplace charging can act as a relatively low cost employee benefit that helps an employer achieve business goals while helping their employees with transportation needs. Attracting and retaining a talented workforce is always a challenge. Employers of all sizes are looking for creative approaches to recruiting and retaining high-quality employees. Employee turnover can be very expensive— the equivalent of a significant portion of the departing employee's salary, not to mention negative effect on the remaining employees' productivity and morale.
- Corporate branding: Workplace charging also contributes to a "green corporate image" and enhances the company brand as socially and environmentally responsible. Many companies have active sustainability programs which include overall reduction of energy and materials. Workplace charging fits directly in such programs and PEV charging is a required component for buildings with LEED standard.
- Cost savings: Further, a company can realize cost savings by converting its own

fleet of company cars to PEV's. Operating costs for PEV's are lower than for conventional vehicles. Attractive lease or long-term rental programs for PEV's can provide significant cost savings for a company fleet in some cases.

- Employee productivity: PEV drivers are eligible for high occupancy vehicle (HOV) lane privileges, where they qualify, which can result in shorter commute times, and increased employee productivity.
- Regulatory compliance: In some metro areas, employers have an extra incentive to encourage electric commuting due to regulations from the local Air Districts which mandates that employers take meaningful steps to reduce smog from their employees' commutes.

3. Community Benefits:

- Pollution control: Workplace charging can significantly improve the quality of life of a community by reducing local air pollution. An overwhelming majority of commuters today drive alone to the office in internal combustion vehicles, which contributes significantly to harmful emissions in the air.
- Greenhouse Gas reduction: Cities and counties have started monitoring their GHGs and vehicles are a large contributor to overall GHG emissions. Increased use of PEV's will be required as one of the actions to reduce local and regional GHGs.

4. PEV Market Benefit:

- Attracts new EV drivers: Having a variety of PEV's at a workplace parking lot accelerates the market for PEV's by becoming a 'natural showroom' for these vehicles, which can encourage adoption of PEV's among greater number of employees.

Presently, the number of companies that have installed charging infrastructure is small but growing. Exact numbers are not available. The Alternative Fuels Data Center, hosted by the U.S. Department of Energy, reports about 6000 private locations for charging which could be approximated as workplace.¹ CALSTART has surveyed California companies and has confirmed approximately 800 charging stations (Level 1, Level 2, and fast chargers) at 27 companies in the state in 2012, and the numbers continue to climb.

According to data from Navigant Research, the investment in charging infrastructure equipment was around \$92 million in 2012. Expenditures on commercial and residential EVSE are expected to exceed \$172 million in North America and more than \$713 million globally during 2013.²

¹Alternative Fuels Data Center, U.S. Department of Energy.
http://www.afdc.energy.gov/fuels/electricity_locations.html

² John Gartner. *Slowly, EV Ecosystem Takes Root*. May 7, 2013.
<http://www.navigantresearch.com/tag/ev-charging>

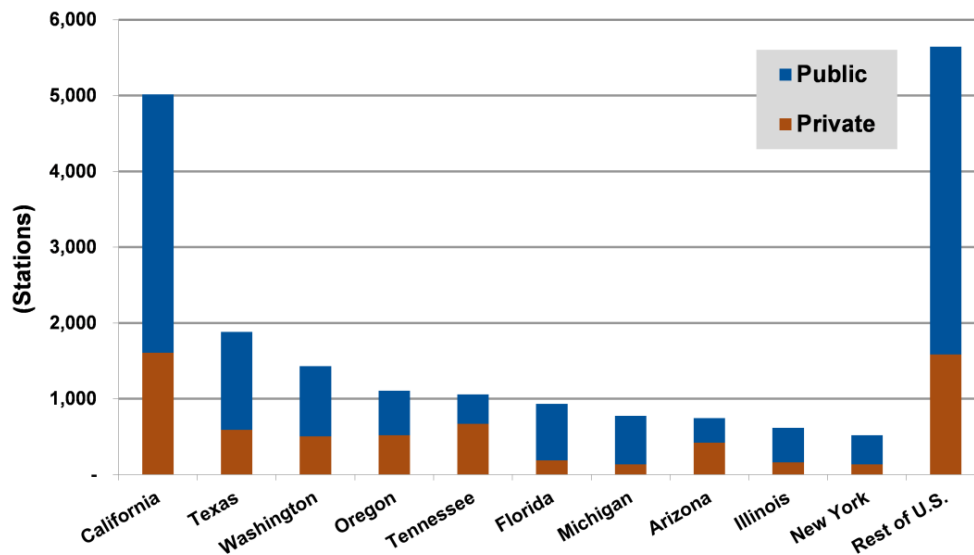


Figure 1: Total Installed Commercial EVSE Stations by Accessibility and State, Top 10 U.S. States: 2012 (Source: Navigant Consulting: <http://www.navigantresearch.com/tag/ev-charging>)

1.2. BACKGROUND WORK

1.2.1. CALSTART'S EMPLOYER EV INITIATIVE (EEVI) PROJECT

Generally speaking, employers still lack the information on the benefits of installing charging infrastructure or the process involved. CALSTART has heard a clear need from employers of all sizes for the development of “best practices” relative to the installation and use of PEV infrastructure and charging equipment at workplaces. To that end, CALSTART began the Employer EV Initiative (EEVI) (www.evworkplace.org) to accelerate the pace of learning on a nationwide basis by helping businesses learn from the practices of their pioneering colleagues with regard to workplace charging of both employee and fleet vehicles. The employers who participated in the Initiative pledged to support a pro-PEV set of principles, to:

- Develop solutions for providing PEV charging opportunities for employees;
- Share non-proprietary information with other employers;
- Provide resources and information to employees about PEV solutions;
- Evaluate adding PEV's to their company fleet mix.

In the development of this document, the Initiative accomplished the following steps:

- Survey outreach to companies to develop an initial understanding of programs in place and the issues and barriers for workplace charging (provided in the Appendix);
- Creation of a Workplace charging Forum that consisted of web-based monthly meetings to develop a consensus on best practices;
- Development of this Best Practices for Workplace charging document to enable employers to install charging infrastructure and encourage the purchase of PEV's among their employees.

This document is designed to support the deployment of charging infrastructure nationwide. It was developed based on the information and input collected from employers mainly during the monthly web meetings, as well through individual conversations with participating or interested employers. The guided meetings included a case study overview and discussion on topics related to workplace charging. The meeting notes and presentations from each of the meetings can be found on the website (www.evworkplace.org).

This document also builds on materials developed and published in the industry. As an Ambassador to the Department of Energy's Workplace Charging Challenge, CALSTART is supportive of the goals that DOE has set forward and we expect this document will contribute to reaching and surpassing those goals.³



Figure 2: Workplace Charging and solar array at CALSTART's Pasadena Headquarters

1.2.2. CALIFORNIA PLUG-IN ELECTRIC VEHICLE (PEV) COLLABORATIVE, WORKPLACE CHARGING PROGRAM

The California Plug-In Electric Vehicle (PEV) Collaborative is also working on encouraging workplace charging.⁴ The PEV Collaborative is a multi-stakeholder public-private partnership that is working together to ensure a strong and enduring transition to a plug-in electric vehicle market in California. The Collaborative embodies all key California PEV stakeholders including elected and appointed officials, automakers, utilities, infrastructure providers, environmental organizations, research institutions and others. The Collaborative, through this member-driven process, is developing workplace charging case studies, best practices and decision-making guides to help employers determine how best to install chargers. In addition, they are working to organize a Governor's CEO Roundtable to charge CEO's to make new commitments to charging infrastructure and PEV purchases.

1.3. KEY TERMINOLOGY

The following terminology will be used throughout this document:

- **BEV's** (battery electric vehicles) are powered only by one or more electric motors. They receive electricity by plugging into the grid and store it in batteries. They consume no petroleum-based fuel while driving and produce no tailpipe emissions.

³ U.S. Department of Energy, Energy Efficiency and Renewable Energy, Vehicle Technologies Office, *EV Everywhere Workplace Charging Challenge*.

http://www1.eere.energy.gov/vehiclesandfuels/electric_vehicles/workplace_charging.html

⁴ California Plug-In Electric Vehicle Collaborative: <http://www.pevcollaborative.org/about>

- **PHEV's** (plug-in hybrid electric vehicles) use batteries to power an electric motor, plug into the electric grid to charge, and use a petroleum-based or an alternative fuel to power an ICE or other propulsion source.
- **PEV's** (plug-in electric vehicles) derive all or part of their power from electricity supplied by the electric grid. They include BEVs and Plug-in Hybrid Vehicles (PHEV's).
- **EVSE** (electric vehicle supply equipment) delivers electrical energy from an electricity source to charge a PHEV's batteries. It communicates with the PEV to ensure that an appropriate and safe flow of electricity is supplied. EVSE units are commonly referred to as "charging stations" or "chargers." The actual chargers are on the vehicles themselves.
- **Level 1 EVSE** (120V - AC) use a typical 120-volt, single-phase outlet for a three-prong grounded plug for the U.S. Depending on the vehicle being charged, it typically takes between 8 to 14 hours to fully charge a vehicle. The charging current is about the same as a standard blow dryer. Most, if not all, PEV's will come with a Level 1 standard 115V cordset so that no additional charging equipment is required. On one end of the cord is a standard, three-prong household plug. On the other end is a SAE J-1772 standard connector which plugs into the vehicle (see below for definition).
- **Level 2 EVSE** (208-230V – AC) increase the charge power up to 5 times over Level 1 and decrease the typical full charge time down to 4-8 hours, depending on the vehicle being charged. Level 2 provides charging through 240 V (typical in residential applications) or 208 V (typical in commercial applications) electrical service, and requires special installation of equipment and a dedicated circuit of 20 to 80 amps.
- **DC Fast Charger** (Input: 3 phase 480VAC Output: 300-400VDC) is an off board charger that connects directly to a vehicle's high-voltage battery. It allows for high power transfer and can charge a battery to 80% state of charge in minutes instead of hours.
- **SAE J-1772:** J-1772 is the standard physical, electrical, communication protocol and performance requirement for the charging system and coupler for AC charging in the United States. The latest revision was published in October of 2012.

2. HOW TO INSTALL AND IMPLEMENT WORKPLACE CHARGING

Companies choose to provide workplace charging for a number of reasons briefly detailed in Section 1, believing it can provide benefits to the company and its employees. The following sections describe the steps that a company should follow in order to install a workplace charging solution that will fit its needs, regardless of whether it is a large or small business.

2.1. GAIN INTERNAL SUPPORT

The interest for workplace charging may initiate from the company management (such as the sustainability manager, facility managers, or the CEO) or from enthusiastic employees. In the case where it's the employee who wants to begin a workplace charging program, he or she needs to get buy-in from senior management. Generally, as with any work-related issue, finding

a colleague who is an ally is crucial, especially with larger firms. If the employee can develop a base of internal support then convincing higher level management may become easier. In this way, employees essentially create local 'PEV showrooms' for information sharing on the vehicles. If the initiative is from the management side, getting input and engagement from employees is equally important to ensure that a successful and useful program is developed.

No matter who initiates the program, it will be important to illustrate the benefit to the company overall, estimate the options and costs, and provide examples of companies, preferably in the same industry, that have adopted workplace charging.

2.2. TAKE AN EMPLOYEE INTEREST SURVEY

As a first step, determine the current and future interest level of your employees in charging PEV's at work by taking an Employee Interest Survey. Knowing the number and types of vehicles (BEV's or PHEV's) that may be charged will be the foundation for developing your charging station installation plans.

When choosing among infrastructure options, the first question employers must tackle is what charging rate or charging level is best suited for their company. Most often this comes down to whether to offer Level 1 or Level 2 infrastructure. The answer will largely depend on several factors: (1) the commute distance of the employees who drive PEV's - which can be determined through an Employee Interest Survey, and (2) the cost of the system.

Potential survey questions could include⁵:

- Do you own a PEV?
 - If so, how often do you drive it to work?
 - If so, what is the typical time required to charge your PEV to 90%?
- If you drive to work, approximately how far is your trip (one-way)?
- Are you considering a purchase or lease of a PEV in the future?
- Would you consider purchasing a PEV if workplace charging were available?
- How soon do you plan on buying or leasing your next vehicle (any type)?
- Would the option to charge your car at work be desirable?
- If workplace charging were an option, would you be willing to pay for the service?

If the interested employees work full time and commute approximately 25 miles or less one-way, then Level 1 charging may be adequate. If there are employees who work part-time, or often travel in and out of the office, then Level 2 charging may be required for their needs. According to a household transportation survey administered by the US Department of Transportation, a Level 1 system charges a 32 mile trip in 8 hours, and a Level 2 system charges the same trip in 2 hours.⁶ To determine what system you need, you must survey your employee base, but survey data generally indicates that 75% of all nationwide commuters' drive to work is less than 20 miles one way (see Figure 3 below).

⁵ Electric Vehicle Interest Survey by Anaheim Public Utilities, 2012. Available at: <http://survey.constantcontact.com/survey/a07e2z3rg5kgbtqlfwi/a017nh76gor5k/questions>).

⁶ US DOT, Bureau of Transportation Statistics, Omnibus Household Survey. Research and Innovative Technology Administration. (See Figure 3 below).

As a parallel effort to the survey, you should collect information from your facilities manager about the type of wiring at your location and the size of the circuit breakers in order to assess the level of readiness for the site.

After assessing employee commuting patterns from the survey, and understanding the type of wiring you currently have, you can move to making decisions on the type of charging infrastructure.

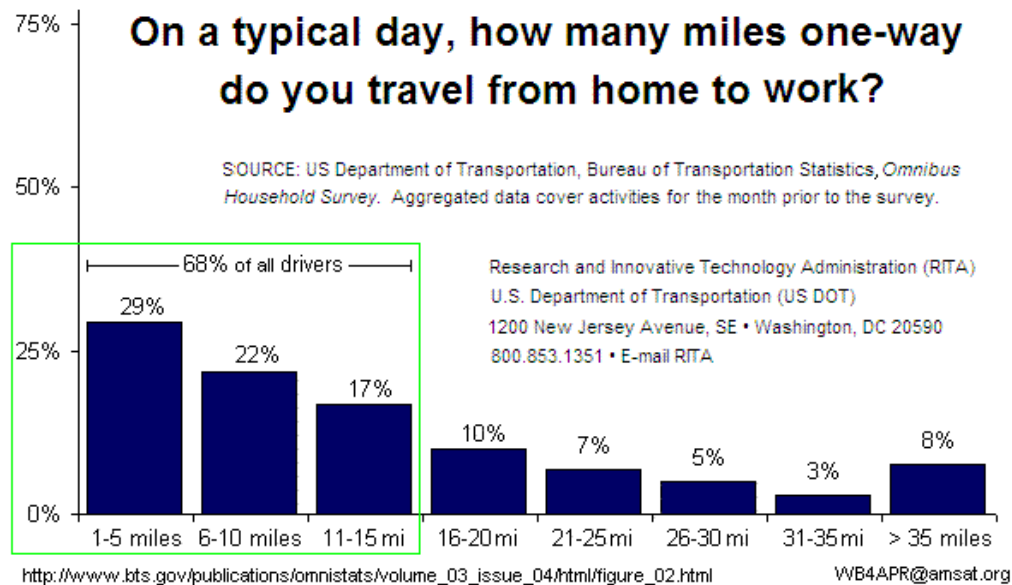


Figure 3: Typical one-way commuter to work nationwide based on US DOT survey

2.3 CHOOSE THE APPROPRIATE SYSTEM

2.3.1. CHARGING EQUIPMENT, OPTIONS AND COSTS

Installing Level I charging is a good entry point for companies new to workplace charging. It is relatively easy and inexpensive, and is likely the most practical approach to meet the needs of employees who are parked for long durations. Level 1 EVSE can be as simple as a cord combined with a standard household electric outlet that provides basic grid connectivity. However, there may be a small risk of overloading a circuit breaker on a limited-amperage circuit, so some Level 1 systems include an electrical outlet and enclosure designed specifically for electric vehicle charging using a dedicated circuit. A few Level 1 EVSE come with a wall-mountable cordset, while others allow you to attach the cord that comes with the vehicle. On the other hand, installing Level 2 EVSE at the workplace allows one charging station to serve many different vehicles throughout the day as long as the vehicles are swapped out when they finished charging.



Figure 4: Chevy Volt, plugged in and charging

Level 2 is also ideal for employees and visitors who need a faster charge than what Level 1 provides.

In general, Level 1 charging solutions range from little cost to no cost at all, for example when a cordset is used to plug into a regular outlet. (The outlet must be properly grounded). Commercial Level 1 EVSEs are not available in a wider range yet, but according to a study titled *Ready, Set, Charge, California*, Level 1 hardware generally ranges in cost from \$300 to \$500.⁷ According the same study, Level 2 hardware has a wider range of costs, from \$500 to \$6,000, while fast-charging hardware is likely to be cost-prohibitive for the majority of workplaces since costs can be as much as \$55,000 per unit.

Several companies have considered a hybrid approach with Level 1 serving the needs of most employees, and one or two pay-per-use Level-2 charging stations available for visitors and those that need a quicker charge. EVSE's can now be ordered "online" or at retail locations from a variety of suppliers. For a good list of suppliers of EVSEs, refer to the "Other Resources" at the end of this section.

Comparison of different charging levels is shown in the table below including AC and DC charging.

Type	AC	DC
Level 1	120 VAC ≤ 12 amps, 16 amps ≤ 1.44 kW, 1.92 kW	200 – 450 VDC* ≤ 80 amps ≤ 19.2 kW
Level 2	208 - 240 VAC, 1Φ ≤ 80 amps ≤ 19.2 kW	200 – 450 VDC* ≤ 200 amps ≤ 90 kW
Level 3	TBD* assumed ≥ 19.2 kW 1Φ or 3Φ	200 – 600 VDC* ≤ 400 amps? ≤ 240 kW?

*** Specifications not finalized**

Figure 5: Comparison of Common Charging Levels

The actual charging time will depend on the on-board type of charger, type and level of EVSE, and the state of charge of the vehicle battery. For an approximation of charging times please review the vehicle manual. A guide table is also available at the California Plug-in Vehicle website.⁸

⁷ *Ready, Set, Charge, California! A Guide to EV-Ready Communities*. Developed by the Association of Bay Area Governments, the Bay Area Climate Collaborative, EV Communities Alliance, Clean Fuel Connection and LightMoves Consulting. November 2011. <http://www.rmi.org/Content/Files/Readysetcharge.pdf>

⁸ How long does it take to charge, California Plug-in Vehicle Collaborative, visit http://www.pevcollaborative.org/sites/all/themes/pev/files/Comm_guide3_122308.pdf

Electric vehicles are equipped with on-board chargers that convert AC power from the grid to DC power needed by the battery. DC fast chargers bypass a vehicle's on-board charger and deliver electricity directly to the battery at a higher rate than the on-board chargers would allow.

The list of EVSE manufacturers is extensive. A good source for a listing of EVSE companies can be found on the Plug In America website as well as a few others listed at the end of this section. For a reference on costs of some of the systems, visit the AQMD website that has a list of quotes provide as part of the So Cal EV program.⁹



Figure 6: Level 1 Charging Examples



Figure 7: Level 2 Charging Examples

Other Resources:

California Plug-in Vehicles Collaborative:

http://www.pevcollaborative.org/sites/all/themes/pev/files/Comm_guide3_122308.pdf

Plug In America: <http://www.pluginamerica.org/accessories>

Plug-In Recharge: <http://www.pluginrecharge.com/p/evse-vendors.html>

Drive Clean: <http://www.driveclean.ca.gov>

2.3.2. INSTALLATION COSTS

At the outset, employers should be realistic yet foresighted when determining the number of EVSE to install. Planning estimates should include the anticipated number of employee vehicles to be added over the next three to five years, based the Employee Interest Survey. If expansion is anticipated, the initial installation work should include basic infrastructure (e.g. conduit and trenching if needed, pull wire, available circuit breaker location in supply panel) for the future charger installations. Employers should also consider planned flexibility that allows the site to grow with developing technologies or changes in charging requirements. Employers should also

⁹ For a listing of EVSE pricing from various manufacturers, visit http://www.aqmd.gov/tao/Demonstration/ElectricHybrid/SoCalEV_Ready_Program.htm

consider installing extra circuits and additional electrical capacity during initial construction to minimize overall costs.

Installation costs can be significant and sometimes more costly than the hardware. There are several options that can increase or decrease installation costs. These include power requirements, siting considerations, and the choice of EVSE equipment, as discussed below.

Power Requirements:

In some instances, a new or second electrical panel and circuit breakers might be necessary to support the new EVSE load. A sub-panel upgrade (200A, 120/240 VAC single phase) can amount to approximately \$2,000. In the unlikelyhood that there is inadequate capacity to support the desired number of EVSE's, a utility transformer upgrade may be necessary. Your local utility will determine whether or not the transformers serving the site need to be upgraded. If a service upgrade is required, the utility will work with the property owners to determine allowances and expenses based on utility policy (Rule 16) as regulated by the California Public Utilities Commission for IOU's or Publically Owned Utilities rules.

Siting Considerations:

Avoid costs for trenching and conduits by locating the EVSE close to the existing electrical supply. Adding new circuitry can increase capital costs significantly, since the costs rise per linear foot.¹⁰

- 40A branch circuit: \$10-\$11/linear ft
- 200A feeder circuit: \$17 – 28/linear ft
- Concrete patch: \$14 - \$15/square ft
- Asphalt patch: \$10-\$11/square ft

Choice of EVSE Equipment:

As discussed above, EVSE equipment can range from simple 120V outlet cord sets to fully networked systems, and with this range so does pricing. Some units with network billing capability may require licensing fees and/or monthly network access fees (for a more detailed discussion of metering and networks, see Section 2.3.3.3. below).

Typically, there are relatively few EVSE maintenance requirements. In general, the charging cord should be stored securely so it is not damaged or vandalized, the accessible EVSE parts should be checked periodically for wear, and the system should be kept clean. Periodic inspection, testing, and preventive maintenance by a qualified electrical contractor may be recommended. One estimate of annual maintenance costs ranges from \$25 to \$50 per EVSE unit.¹¹

¹⁰ Data provided in 2011 by Jason Greenblatt, Sempra Utilities, for *Best Fleet Uses, Key Challenges, and the Early Business Case for E-Trucks: Findings and Recommendations of the E-Truck Task Force*, CALSTART, 2012.

¹¹ Rocky Mountain Institute, 2009. Plugging In: A Stakeholder Investment Guide for Public Electric-Vehicle Charging Infrastructure. www.rmi.org/pgr_resources#infrastructure

Below is a table provided by the Federal Energy Management Program that gathers potential cost ranges for the various infrastructure expenses. A value of zero assumes that the given option was not pursued.

Potential Infrastructure Cost Type	Cost (\$)
Charging (and billing) unit	200 – 3,000
Pad Mount	0 – 10,000
Commercial Feeder and Cable Pole	0 – 10,000
Higher Ampage Main Circuit Breaker	0 – 7,500
Termination of fusible switches feeding PHEVs	0 – 20,000
Sawcutting and Trenching	0 – 24,000
Conduit and Wiring	0 – 2,500
Labor	0 – 3,000
Average per charging station	500 – 15,000

Figure 8: Table of Potential Infrastructure Costs (Source: Federal Energy Management Program (FEMP) “First Thursday Seminars 2.0”)

2.3.3 OPERATIONAL COSTS

The operational costs of an EV charging system include: (1) the cost of electricity (\$/kWh), (2) the effect of demand charges, (3) charging network costs, and (4) maintenance costs.

2.3.3.1 COST OF ELECTRICITY

The cost of electricity can vary depending on your location and utility. The commercial rates are different than residential rates, and the electricity can be priced depending on the size of the customer. For larger consumers of electricity, often the per kWh rate is lower. The average rates of electricity for commercial customers in the continental US range \$ 0.8 -0.15/kWh¹².

Several utilities have established special rates for electricity supplied for EV fueling. These rates take many forms, and may include time-of-use (TOU) rates. TOU rates typically offer lower electricity cost during off-peak hours. Some utilities require a separate meter installation in order to take advantage of special EV rates while others may allow a sub-meter. This information is available from your local utility representative who can explain the different options available as well as their impact on your cost.

2.3.3.2 DEMAND CHARGES

It is especially important to note that the additional electrical demand for EV charging may add to an overall higher demand at the commercial site, and thus will impact the cost by higher

¹² US Energy Information Administration, Table 5.6A Retail Price of Electricity to Ultimate Customers by End-Use Sector, http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_6_a, Accessed June, 2013.

demand charges. These so-called “demand charges” are determined by a customer’s peak use in a given month vs. its peak throughout the entire year. They are less well known because they are not applied to residential customers but only to commercial users.

Consideration of demand charges may be important for smaller locations and businesses where the addition of charging may impact the total load, and for those that do not have a huge variation of electricity use. For large sites and employers with a significant existing load, the addition of EV charging will not create a measurable change to the load and/or demand charges. Each utility invoices somewhat differently for demand charges. These charges are a means for the utility to bill for ensuring that the demand of the customer, which may vary greatly, will be met with ready capacity.

Demand charges, which can amount to as much as \$25/new kilowatt¹³, can be avoided. Employers can manage the PEV charging so that it occurs well below the day peak use. This can be determined by examining the historical load of the building or by contacting your utility representative who should provide this information. Employers could also consider load management systems to charge PEV’s off peak. Load management systems automatically sequence multiple EVSE without human intervention, but it is estimated that costs for a complete system could range from \$5,000 to \$13,000 depending on the number of chargers.

2.3.3.3 NETWORK ACCESS FEES

Network access fees apply to charges that allow tracking of billing and usage via a software system connected to the EVSEs. Not all EVSEs are connected to networks and some come in a bundle package (hardware and software), while others can be purchased separately and the network system added later. Generally speaking the network costs consists of one or more of the following parts:

- 1) Monthly or yearly costs per EVSE for the host site (e.g. employer)
- 2) Installation cost for software
- 3) Membership fee annual for the driver/user
- 4) Other transaction costs

Depending on what type of EVSE provider you choose, you may or may not need to pay a monthly fee for the service. Some network providers charge a monthly fee to handle the management and administration of the EVSE, such as Chargepoint and the Blink Network. Both companies provide integrated solutions of hardware and network system software that are proprietary to the company. Networked systems generally allow ease of access by enabling drivers to locate charging stations on a map, find directions, and see if those charging stations are available. They also have special features such as fee collection service, reservations, display advertising, and reporting. For semi-public parking areas shared by employees and the public, networked systems could be a big benefit in attracting potential customers. But where parking lots are private and only available to employees, employers may not be interested in being found on a map of available networked charging stations.

¹³ For example, seasonal average demand charges for the majority of commercial and industrial customers in San Diego are \$22 per kW of demand.

The network provider will generally charge a cost per EVSE installed, which is on the order of \$20-30/ per month. The end user will see a cost for annual membership plus a cost for charging in dollars per hour of charging. Some networks have a transaction cost associated with each transaction, similar to credit card transactions, equal to 7% of total fees paid by the driver. These are general numbers, but depending on the specific agreements and the number of chargers, the costs can vary.

If the employer is not interested in networking options such as usage data or access control, and doesn't want or need the convenience of a technician servicing the system, there are also EVSE solution providers that will integrate with existing billing systems, like Liberty Access Technologies and Control Module. Both companies will build systems that piggyback on a parking garage's existing assets. For example, when someone drives into the garage, they receive a ticket at the gate. They can use that ticket to turn on a charger (via a magnetic swipe or a code system). When they drive out, they pay for parking and charging. If employees use an RFID badge to enter the garage and open doors, that same badge can activate the charger.

Other manufacturer offerings provide four stages of charging intelligence. There is a standard charger for free access and free charging; a controlled-access, no-fee charger; a controlled-access, paid charger; and a build-your-own-network solution. The standard charger can be modified if you want to upgrade the features in the future. Chargers with a variety of billing and access control options are available.¹⁴

Low feature (standard) charging stations cost usually less than \$1,000 for equipment alone. Medium feature (smart) charging stations can amount to approximately \$2,000 for equipment. High feature (networked) stations can cost up to \$5,000 or \$6,000 for equipment. Finally, there is also the option of leasing the entire system- a model offered by several third party service providers.

Please note that many other service fee models exist from different vendors so please check with vendor specific versions.

2.4 INSTALLING THE SYSTEM

Once you have completed the above pre-planning considerations, you are ready to move on to the installation process. Below is a step-by-step checklist for installing the system:

¹⁴ Michael Kent. "Workplace charging: employers face a maze of issues when considering EV charging." Charged, <http://www.chargedevs.com/content/features-inside/workplace-charging-employers-face-maze-issues-when-considering-ev-charging>

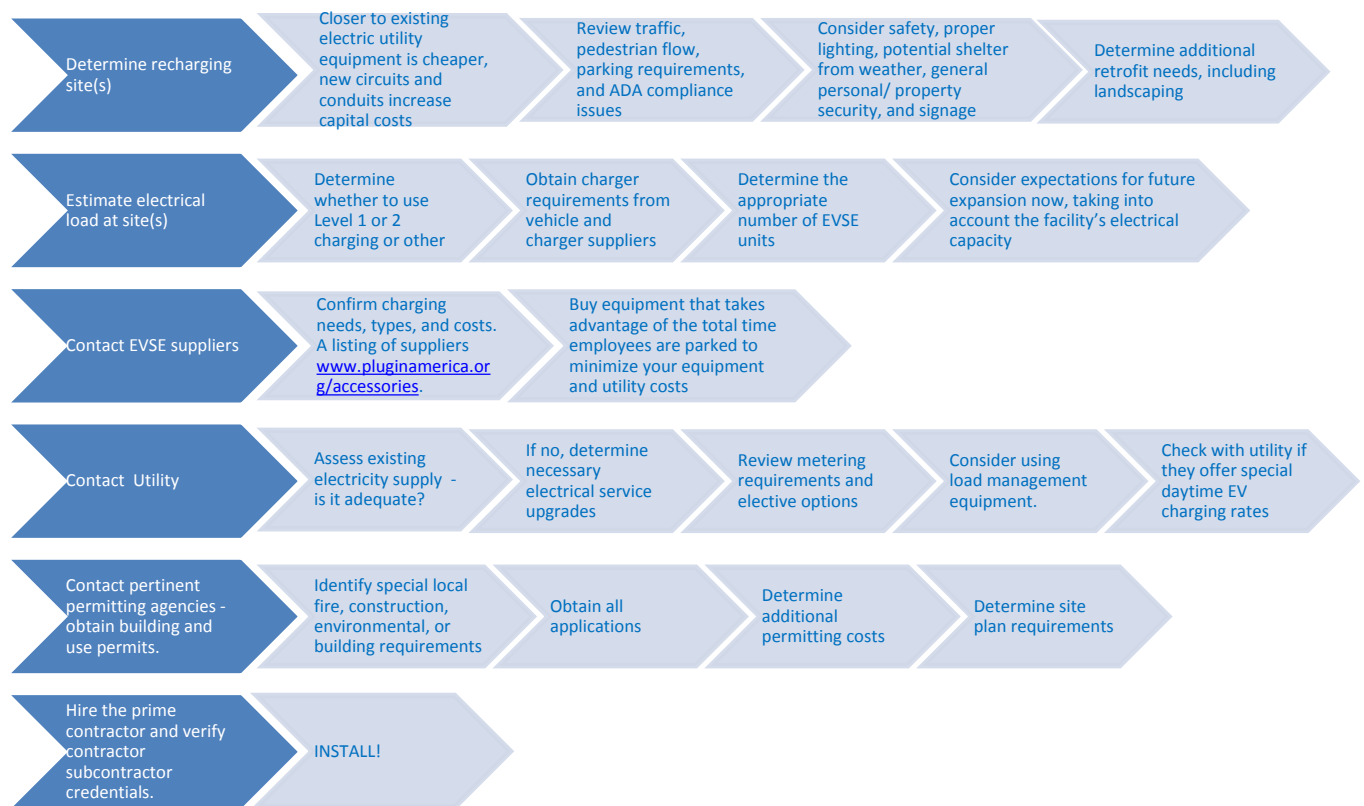


Figure 9: Decision-making steps

When an employer either leases its building or its parking lot, additional installation considerations come into play. For instance, the employer will have to negotiate with a landlord and coordinate among numerous stakeholders regarding parking space allocation and access issues. It may prove beneficial to negotiate the installation of EV chargers as part of the process of extending the lease.

A few suggestions for overcoming common issues when employers don't own their buildings or control the parking facility include the following:¹⁵

- Set up an advisory committee of interested parties – including other tenants
- Partner with a nearby parking lot owner or business to develop a cooperative PEV charging program, if an agreement with landlord cannot be reached

2.5 ESTABLISHING INTERNAL PROCEDURES

Once the installation is complete, employers are faced with a broad range of internal procedures from which to choose. They include determining billing costs, methods for controlling access, and providing for pay-for-use of the charging service as well as some baseline rules around courtesy. The policy should be shared with all employees.

¹⁵ Drive Electric Florida. "Providing Workplace Charging for Your Employees' Plug-in Electric Vehicles." www.DriveElectricFlorida.org or www.FPL.com/electricvehicles.

Start by defining a policy and implementation plan that supports your company's objectives, while serving EV drivers' needs at the lowest cost. It is important to keep the costs of charging as close to that of home charging in order to encourage use broader user of PEV's for commuting. Below are some issues to consider:

2.5.1 Payment policy

- Determine whether to require payment from employees for usage of company charging equipment, to or offer it as an employment benefit (*See Section 4.3, IRS Reporting Requirements, for tax implications of this choice*)
 - If you choose to charge a fee, you will need a payment system and access control.
 - It is generally wise to keep installation costs low, so that high fees don't have to be charged to recover costs, which could discourage use of the system.
 - Employees can either pay with a pre-paid balance system, you can bill them directly, or you can pay a third-party electric vehicle service provider that handles billing, installation, and maintenance.
- Determine how to structure the payment, if required
 - Determine whether to charge on a flat fee of dollars per hour, or dollars per actual electricity charged (\$/h vs. \$/kWh)
- Charging a flat monthly fee to users will be based on estimated usage
- Billing for exact usage by kWh may require pricier metering equipment

2.5.2 Level of Access

- Determine whether charging stations are required to be open for public or fleet use
- Prioritize charging of fleet vehicles vs. employee vehicles vs. public vehicles.

2.5.3 System Optimization

- Manage usage among multiple employees, and determine the maximum charging time per vehicle
 - Some companies have created email distribution lists so that employees who are EV drivers can communicate with each other to share helpful tips and let the group know when a charging station is available. (*See the Evernote Case Study in Section 3 below.*)
- Establish timing schedules to avoid demand charges from the utility during peak load periods – consider time of use rates and demand charges. Some companies have established a daily schedule in which each employee charges for a specific window of time each day (e.g. 2 hours).
- Consider connecting chargers with clean distributed generation (DG) such as solar or wind resources
- Consider entire system load– integrating with the building load and managing the peak load of building or site. Managing the peak load can be important in order to keep the peak from increasing with addition of vehicle charging. Most important is that the load from vehicle charging and the building load should be considered as one system. Contacting your utility for assistance is advised, in addition to an energy management company that can provide more details on best management practices including combination of energy storage devices and distributed generation.
- Consider in the future possibilities of V2B or V2G – via implementation of bi-directional power flow from the grid (or building) to vehicle and vice-versa from the vehicle back to

the building and grid. In this scenario the batteries on the vehicles can be used as energy storage that can play in demand response program or ancillary services markets directly with ISOs (Independent System Operators) and RTOs (Regional Transmission Operators).

2.5.4 Program Evaluation

While a number of employers have adopted workplace charging programs, the vast majority have not. The slow penetration may be due to the lack of data on the how this benefit can affect recruitment and retention. Data still needs to be collected on the bottom-line impact of workplace charging: has there been on turnover as a result of implementing workplace charging? Recruitment? Workforce stability? Developing hard data to quantify the value proposition is essential, but few standards currently exist to help employers determine what data to collect. Below are some suggestions:

- *Launch your workplace charging program with an eye towards program evaluation.* It is much easier determine return on investment when your program is designed and implemented an evaluation component already in place.
- *Determine the metrics for your program.* Select data points that will be meaningful your organization and ensure they are collected on an ongoing basis.
- *Make program evaluation a priority.* Determine early on who in the organization will be responsible for data collection and analysis of your charging program. Build this task into the regular work program to ensure that this task is given adequate time and does not have to compete with other priorities.

Other optimization tactics could include a more comprehensive evaluation of PEV charging as a part of the entire electrical system, which includes the building and other potential sources of electricity, such as solar or wind resources adding to the mix.

Other Resources:

San Diego Gas and Electric, “Key points to know when considering workplace charging.”

<http://www.sdge.com/employers-and-property-owners>

Southern California Edison, Workplace: Employee Electric Vehicle Charging.”

https://www.sce.com/wps/wcm/connect/552cf7ec-e2da-4c34-becd-2c3e9fea1193/PEV_Business_EmployeeVehicleCharging.pdf?MOD=AJPERES

US Department of Energy, Workplace Charging Challenge Resources:

http://www1.eere.energy.gov/vehiclesandfuels/electric_vehicles/resources.html

3. EMPLOYER CASE STUDIES AND POLICIES SUPPORTIVE OF PEV

Employer Case Studies

Below is a brief inventory of some of the strategies and policies that specific employers have established, and problems they have overcome, in the process of installing workplace charging. Some of these case studies were reviewed as part of the monthly web meeting of the EEVI. A more detailed review of case studies will be published shortly by the California Plug-in Electric Vehicle Collaborative reviewing 20 or more case studies of workplace charging.

California Department of General Services:

The California Department of General Services was awarded funding by a grant from the California Energy Commission and the US Department of Energy for the purchase and installation of 24 Level 2 charging stations. In this case, the parking spots used for charging are required to be available to public and to state employees. There will be 9 additional charging spots installed in the future and they will also be funded by a grant. A big motivation for installing charging infrastructure was to address greenhouse gas emissions and the government's interest in electric vehicles.

SAP Labs, Palo Alto, CA:

At the inception of the workplace charging program at SAP Labs, there were more interested users than available charging spots, so there were some initial challenges with regard to determining protocols for sharing the plugs among employees. Coulomb's reservation software was helpful in overcoming this issue. The 2010 Nissan Leaf program was what created the initial demand for workplace charging at SAP. Each of the SAP chargers has a Level 1 and a Level 2 socket, but few drivers are currently using Level 1. The charging stations have up to 7.2 kW output delivering Level II (208/240 VAC @ 30 A) charging via the standard SAE J1772™ connector and fixed 18-foot cable, and a 2 kW output delivering Level I (120 VAC @ 16 A) charging via a standard NEMA 5-20 receptacle protected behind a locking door. The largest costs SAP has encountered during installation were for paving and wiring, and the most unexpected cost was the municipal requirement for emergency power-off switches.

University of California, Davis:

UC Davis is a unique case study since the campus is 8 square miles and is more like a small municipality than an office park. There are 20,000 employees including staff and faculty and 30,000 students. The campus also has a fairly large fleet: 1,200 licensed road vehicles including 300 to 400 sedans. They are gradually moving towards PEV's and alternative fleet vehicles. The campus is not under the jurisdiction of the County so there are fewer permitting requirements than many employers will encounter.

Currently, the charging stations are well-dispersed across campus, but were simply deployed where it was cheaper to do so, such as in locations where wall mounts already existed, or where there was not a lot of trenching required, or where construction was already in progress. There are 25 Level 2 chargers and 5 Level 1 chargers available. Certain locations are more heavily

subscribed than others.

There is currently no cost for charging but the campus will soon be determining how to charge the users going forward. Users do pay for parking, but at the moment, the electricity is paid by the campus. The campus is responsible for handling and maintenance of chargers.

20th Century Fox, Los Angeles, CA:

20th Century Fox Studios currently has 20 Level 2 chargers – 17 are Blink and 3 are Clipper Creek. Most are distributed in parking structures, a few are located in a parking lot, and one is in the transportation services department. There were approximately 40-50 EV and PEV drivers using the system at the time of publication. The drivers can schedule their usage online. The main reason for initially installing chargers at the studio was employee interest.

Users are charged a fee of \$1 per hour for using the chargers. Collaborating and engaging the employees in decision making from early on is highly recommended. The average charging time per vehicle is 3-4 hours. The company also provides an incentive to employees that purchase or lease an EV or plug-in hybrid vehicle. The incentive is up to \$4,000 and is hugely popular.

Rutgers University, New Jersey:

The University has three Level 2 chargers now and four more in the planning stages. They are in the vicinity of a solar parking canopy. Visitors as well as employees use the charging. The average length of time that vehicles are charging is between ½ - 2 h.

The program was funded by ARRA stimulus funding and required matching location funds for installation. The University agreed to provide charging for free and support the studies of usage. Future plans include installing charging in parking garage structure. Both students and faculty have parking passes to the structure and use it. The installation of the two units still was high (~\$11,000) mostly due to conduit installation to parking lot and adding circuits to the panels.

Boeing Company, Arizona

Boeing is currently implementing a workplace charging pilot study at their facility in Mesa, Arizona. The company has 4 EVSE available to its employees – two dual stations: 1) the first with two 240V stations and 2) the second with one 120V and one 240V station. Boeing requires employees to pay for the service at the rate of \$1 per hour with a maximum of 4 hours. It is a flat rate with no difference between morning and afternoon. The 4 hour time limitation is enforced by parking security who will give a violation notice if the limitation is exceeded. It is a turnkey system that accepts major credit cards. When employees' cars are fully charged, they receive an email to notify them to move their vehicles out of the charging space. The public demand for use of the chargers from the event center across the street was most challenging issue encountered. The Mesa facility does now offer access to public. The company implements the charging program as part of its regulatory trip reduction requirements. Final data on the program is not yet available.

Employer Policies

Several employers today are offering special incentives to their employees to use, purchase, or

lease PEV's, aside from installing charging infrastructure for workplace charging. The incentives, in most part, come in the form of monetary incentives for purchasing or leasing a PEV or hybrid by the employee. In some cases, the company owns a fleet of PEV's and encourages the employees to use them and experience them prior to purchasing a vehicle. Other examples include a car-share program operated on the campus that consists of PEV's vehicles that the employees can use on an hourly or daily basis.

Evernote, Redwood City, California

According to its company profile, Evernote is a web company providing full-featured desktop and mobile apps designed to allow users to easily capture and find information, memories, and content in any environment. The company is located in Northern California.



Figure 10: Workplace charging using the Blink Network at Evernote

Evernote has launched a first-of-its-kind workplace charging program that is designed to enhance employee productivity. The company has installed 10 Level 2 charging stations and one DC fast charger, but also offers each employee a monthly \$250 allowance to lease or buy any vehicle that qualifies them to get a California carpool lane sticker. Before the monthly subsidy is provided, the company requires proof of the employee's HOV sticker. The program is based on the theory that access to the carpool lane will allow employees to spend less time in traffic and get to and from work in sometimes half the time, thereby increasing their productivity.

If an employee purchases a Nissan LEAF, the allowance completely covers the cost of the lease since Evernote negotiated a special deal with Nissan. Evernote also covers the cost of the charging. Employees are each given a Blink card (connected to one corporate account) when they get purchase their EV. The charging stations are open to the public as well, since the EV Project partially funded the installation and the grant requires public access.

For managing usage of the charging stations among the employees, the company has created a charging calendar for all employees. The length of time they have on a charger correlates with the distance they commute. They all have access to the calendar and communicate with one another via a Google group. When someone is going to be out of the office or on vacation, they email the group in case someone else needs extra time on a charger.

Evernote reports that the system has been working well and 44 employees currently take advantage of the HOV subsidy program. This is about 20% of the employees at the Redwood City location. Additionally, they hope to add 10 more Level 2 stations in the coming years.

Google, Mountain View, CA



Figure 11: Workplace charging at Google's Mountain View campus

Google is one of the pioneers in installing workplace charging and is deeply committed to sustainable business practices, including its transportation initiatives. To encourage its employees to drive zero emissions vehicles, Google provides free workplace charging at its Mountain View headquarters and more than 10 other locations in the US. This has been a significant enabler for employees who wish to drive a plug-in vehicle, but have long commutes or do not have easy access

to charging facilities at their place of residence. Google's goal for the Mountain View campus is to provide charging capability at 5% of its regular parking spaces, and currently there are over 450 Level 2 and 180 Level 1 charging ports deployed there.

Workplace charging at Google also supports a fleet of 50+ vehicles in a carsharing program called GFleet. GFleet cars are available for employees who commute using alternative transportation methods such as the commuter shuttle bus service, carpooling/vanpooling, biking and public transportation. The fleet is comprised exclusively of plug-in vehicles (save for one minivan) to help minimize its environmental impact, e.g. air quality and GHG emissions, as well as to reduce Google's spend on fuel & maintenance costs

STMicroelectronics

STMicroelectronics, one of the world's largest semiconductor companies, augments the company's monthly automobile allowance to North America-based employees who drive fuel-efficient vehicles. (ST's corporate headquarters are in Geneva, and their U.S. Headquarters are near Dallas, Texas.) Vehicles with fuel consumption ratings of 39.2 mpg to 46.9 mpg receive an additional \$83.34 in the monthly allowance. Vehicles with 47 mpg or higher receive an additional \$166.67 per month.

Patagonia

Patagonia, an outdoor apparel company, provides up to \$2,000 to workers who buy hybrids or alternative fuel cars.

Los Angeles County Board of Supervisors

On February 12, 2008, the Los Angeles County Board of Supervisors established a Vehicle Purchasing Services Program (VPSP) for alternative fuel vehicles. The Program provides an incentive for Los Angeles County employees, retirees, family members, and contractors/sub-contractors to purchase “green” vehicles to help lessen the environmental impact when commuting to and from work.

Other Resources:

Corporate Incentives for Hybrids and Alternative Cars. May 11, 2011.

<http://www.hybridcars.com/corporate-incentives>

4. COST RECOVERY AND TAXES

4.1 ASSESSING AND RECOVERING COSTS

To date, many existing PEV workplace charging programs are free for employees to use. This approach is designed to incentivize employees to make clean transportation choices and to allow the organization to evaluate the best use of the workplace charging. However, a reasonable fee for using the charging stations equipment can make sense for some employers. But what is a reasonable fee? The California Center for Sustainable Energy (CCSE) and the California Air Resources Board (ARB) found that California EV owners are willing to pay 40% – 70% more for public and workplace charging compared to standard residential electricity rates.¹⁶ The Energy Information Administration reports an average retail price of electricity for residential customers in California at \$0.15/kWh in March 2013. If California EV owners are willing to pay 40 – 70% more, it means they are willing to pay \$0.21 – 0.26/kWh.¹⁷

We would caution that these results may be biased by early adopter views and willingness to pay. It does remain of interest to understand the impact of charging fees for employees and how to best arrive at a reasonable fee that will encourage adoption of PEVs. Other reasons

¹⁶ *California Plug-in Electric Vehicle Owner Survey*, California Center for Sustainable Energy (CCSE) and the California Air Resources Board, July 2012. Online at <http://energycenter.org/>.

¹⁷ For a detailed discussion on how to maximize the return on investment of your EV project, please refer to “ELECTRIFY YOUR BUSINESS, Moving Forward with Electric Vehicles, A BAY AREA BUSINESS GUIDE,” prepared by Business Council on Climate Change (BC3) and the Bay Area Council (BAC). <http://www.bc3sfbay.org/ev-guide-for-businesses-full-length.html>. For a detailed discussion on cost and revenue drivers that impact cost recovery specifically for commercial site owners, please refer to “Financial Viability Of Non-Residential Electric Vehicle Charging Stations,” prepared by UCLA Luskin Center for Innovation. <http://luskin.ucla.edu/sites/default/files/Non-Residential%20Charging%20Stations.pdf>

beside cost recovery may justify fees. Researchers at UC Davis, for example, point out that a fee is desirable in order to support charger management.¹⁸

While the workplace charging market is still nascent, many employers will choose not to collect direct revenue generated from EV charging fees since the costs are relatively modest. If employers are concerned about their charging stations becoming the primary source of charging for EV owners, they can implement time restrictions to ensure that no one monopolizes a parking spot or charging station

4.2. THE ROLE OF INCENTIVES

Employers considering EV charging installations should always check with their local and regional governments, and the local electric utility to see if they have established any incentive programs. Twenty-seven states and D.C. have EV incentives for individuals. Thirteen states currently have pending legislation relating to incentives. These incentives include high-occupancy vehicle lane exemptions for PEV's as well as monetary incentives, such as tax exemptions or credits and registration fee reductions, emission test exemptions and parking incentives.¹⁹ As an example of local incentives, the Bay Area Air Quality Management District (BAAQMD) in Northern California is providing \$1.5 million to support EVSE installations at workplaces and multi-family units. The program is expected to launch at the end of 2013.²⁰

There are a few incentives offered by the Federal government. If you own a business and purchase and install an EV charging station before December 31, 2013, you can deduct up to 30% of the cost of the equipment and installation, up to \$30,000, under the Alternative Fuel Vehicle Refueling Property Credit Act.²¹ This provision extends a tax credit of up to 30 percent the cost of refueling infrastructure, subject to a cap of \$1,000 for personal use property and \$30,000 for businesses/ investment use property. The extension applies retroactively to cover all alternative fuel infrastructure put into service in 2012, and includes the installation of fueling equipment for plug-in electric vehicles.

Additionally, PEV's purchased in or after 2010 may be eligible for a federal income tax credit of up to \$7,500. The credit amount will vary based on the capacity of the battery used to fuel the vehicle.²²

Businesses can also earn credits for installing EV charging stations, under the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) building certification program. Up to three LEED points are available under the New Construction Sustainable Sites Credit #4.3 "Alternative Transportation, Low-Emitting, and Fuel-Efficient Vehicles"²³.

¹⁸ Nicholas, Michael, and Gil Tal. 2013, July. Charging for Charging at Work: The Paradox of Free Charging and its Detrimental Effect on the Use of Electric Vehicles Davis, CA: University of California, Davis. Institute of Transportation Studies, UCD-ITS-WP-13-02.

¹⁹ National Conference of State Legislatures. <http://www.ncsl.org/issues-research/energyhome/state-electric-vehicle-incentives-state-chart.aspx>

²⁰ BAAQMD, Strategic Incentives Division. <http://www.baaqmd.gov/Divisions/Strategic-Incentives.aspx>

²¹ Apply for the Alternative Fuel Infrastructure Tax Credit at <http://www.irs.gov/pub/irs-pdf/f8911.pdf>.

²² For a list of electric vehicles that are eligible for a federal tax credit, visit the Energy Department's fuel economy tax center site at <http://www.fueleconomy.gov/feg/taxevb.shtml>.

²³ More details on the LEED program are available at www.usgbc.org/LEED.

Large employers in the Los Angeles metro area have an extra incentive to encourage electric commuters via Rule 2202 of the South Coast Air Quality Management District (AQMD): the On-Road Motor Vehicle Mitigation Options, Employee Commute Reduction Program. The regulation is intended to “provide employers with a menu of options to reduce mobile source emissions generated from employee commutes,” and mandates that employers with a staff of 250 or more at a single site take meaningful steps to reduce smog from their employees’ commutes. These steps include encouraging the use of public transit, carpooling, shuttles, augmented work schedules, **and EV driving**, as of a revision on October 7, 2011.²⁴ *Check with your local Air District to see if it has a similar commute reduction regulation that may be applicable to your business.*

As mentioned previously, many electric utilities around the country offer special rates, including time-of-use (TOU) rates, to reduce the cost of powering an electric car or plug-in hybrid. As an example of a different kind of utility incentive, Anaheim Public Utilities is offering a Plug-in Electric Vehicle Charger Rebate to customers who install a Level 2 (240-Volt) plug-in electric vehicle (EV) charger. Through this program, Anaheim Public Utilities will reimburse customers for out-of-pocket expenses up to \$1,500 per charger. Eligible expenses include the charger purchase price, and installation costs. In addition to the \$1,500 rebate, we will waive the City’s permit application fees related to the installation of the EV charger.²⁵ *Check with your local utility company for exact rates and other details.*

The American Recovery and Reinvestment Act (ARRA) of 2009 had a large impact on the rollout of ESVE infrastructure across the nation. Numerous PEV and EVSE projects were made possible by ARRA funding via the Transportation Electrification Initiative administered by the Department of Energy. ChargePoint America and ECotality North America both received ARRA funding to deploy EVSE throughout the U.S. ChargePoint installed 4,600 Charge-Point Networked Charging Stations at residential and public sites across the nation. ECotality installed roughly 14,000 Level 2 EVSE across the U.S. and 300 DC Quick Charge stations in 16 major cities. Currently, ECotality is offering free Blink Level 2 hardware as well as an installation credit up to \$1,000 to interested commercial host sites in the markets of Atlanta, Chicago, and Philadelphia for a limited time. Commercial host sites may also receive a free Blink DC Fast charger as well as a subsidized installation cost.²⁶

EV incentives are being tracked by various organizations that are listed immediately below.

²⁴ Rule 2202, Employee Commute Reduction strategies, provides – 18. “Other Strategies” include electric vehicle infrastructure; 8. “Employee Clean Vehicle Purchase incentive.”

http://www.aqmd.gov/trans/doc/r2202_ecrp_guide.pdf

²⁵ For more information on the Anaheim PEV Charger rebate, visit

<http://www.anaheim.net/article.asp?id=4946>.

²⁶ To find out if you are eligible as a commercial host site in the EV Project, visit

<http://www.theevproject.com/education.php>.

Other Resources:

California Plug-In Electric Vehicle Collaborative:

http://www.pevcollaborative.org/sites/all/themes/pev/files/PEV_Incentives_120827.pdf

Plug In America: <http://www.pluginamerica.org/incentives>

DOE's Alternative Fuels Data Center: <http://www.afdc.energy.gov/laws/matrix/tech>

National Conference of State Legislatures: <http://www.ncsl.org/issues-research/energyhome/state-electric-vehicle-incentives-state-chart.aspx>

4.3. IRS REPORTING REQUIREMENTS

There may be legal, regulatory and other requirements that are involved when setting up workplace charging. For instance, if you decide to offer charging at no cost, many organizations have wondered if this may be considered as a reportable employee benefit. We should point out that no specific ruling is in place currently that addresses the treatment of electricity for charging EV's at place of work. For the most reliable advice on this topic, companies are strongly encouraged to check with their legal counsel. However in order to provide some information on this topic, we offer some examples that should be only used as a guide.

One example has been the use of the "*de minimis*" definition which provides taxpayers the opportunity to exclude from gross income any fringe benefit that qualifies as a "*de minimis*" fringe benefit (section 132(a)(4) of the Code). A "*de minimis*" fringe benefit is any property or service whose value is (after taking into account the frequency with which the employer provides similar fringes to his or her employees) so small that accounting for it is unreasonable or administratively impracticable.

According to IRS 2012 Employer's Tax Guide to Fringe Benefits, - (page 20 for information on Transportation (Commuter) Benefits) - workplace charging is not specifically identified, and it remains to be verified if it is a Transportation/Commuting benefit that falls under a "*de minimis*" threshold. In addition, Section 132 (f)(2)(B) of the Internal Revenue Code, "Commuter Tax Benefits," allows for a fringe benefit exclusion for qualified parking. In 2013 this value was \$245 per month.

As of the publication date of this document, the IRS has not made a conclusion specific to whether EV charging is a taxable benefit. *Always consult your tax advisor about possible tax implications.*

Other Resources:

<http://www.irs.gov/Government-Entities/Federal,-State-&-Local-Governments/De-Minimis-Fringe-Benefits>

"...a de minimis benefit is one for which, considering its value and the frequency with which it is provided, is so small as to make accounting for it unreasonable or impractical."

http://www.irs.gov/publications/p15b/ar02.html#en_US_2013_publink1000193740

"A de minimis transportation benefit is any local transportation benefit you provide to an employee if it has so little value (taking into account how frequently you provide transportation to your employees) that accounting for it would be unreasonable or administratively impracticable. For example, it applies to occasional transportation fare you give an employee because the employee is working overtime if the benefit is reasonable and is not based on hours worked."

5. SUMMARY AND RECOMMENDATIONS

The purpose of this document is to provide a resource for employers and employees who are interested in launching a workplace charging program at their place of business. It includes logistical details for implementing and installing a workplace charging program, and includes a practical checklist for deploying EV charging infrastructure. It also provides references to key suppliers and support companies, and identifies potential funding opportunities. We have also incorporated financial and implementation analyses to streamline the decision, justification, and installation process of implementing a workplace charging program at your business.

Businesses play a critical role in the adoption and expansion of electric vehicles and EV charging infrastructure. In order to lead the transition to electric vehicles, we recommend that businesses implement their best individual options, while understanding that there is no one solution that fits all. It is crucial, however, to keep the process as inexpensive and simple as possible, both for the employer and the for the end-user employees. Workplace charging programs don't have to be costly or complicated, yet they can provide a valuable benefit to employees who own EVs, and create an increasingly effective marketing tool for a business to attract and retain employees. Finally, they can encourage adoption of electric vehicles by providing a reliable and easy place for EV drivers to plug-in and charge their vehicles.

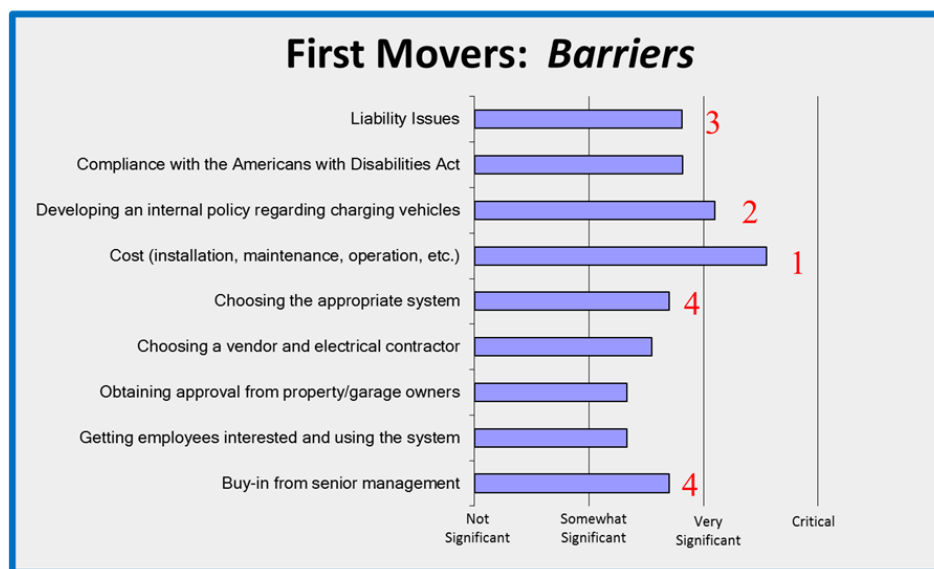
APPENDIX

EMPLOYER EV INITIATIVE: SURVEY RESULTS

CALSTART began the Employer EV Initiative in 2012 (www.evworkplace.org) to accelerate the pace of learning on a nationwide basis by helping businesses learn from the practices of their pioneering colleagues with regard to workplace charging of both employee and fleet vehicles. The first order of work of the Employer EV Initiative was ‘barrier-identification’ survey of first-mover companies that have already installed or that are investigating workplace charging in order share their experiences to date and understand the primary barriers and needs that would speed up adoption of workplace charging.

The survey was designed to identify key opportunities, barriers and actions that are needed to speed the effective deployment PPEV’s and associated charging infrastructure. It was not intended to serve as a comprehensive examination of all possible users, but rather was a targeted compilation of the valuable knowledge and experience of those who have first entered the market to use workplace charging.

Responses were received from 60 public/private employers across the California. Fifty-three percent (32 out of 60) of respondents had workplace charging installed at the time of the survey. Below is a summary of the primary barriers that were cited by the respondents.



ADDITIONAL BARRIERS IDENTIFIED VIA WEB FORUM

The EEVI participants identified additional barriers that were not included in the survey during the course of the web-meetings. These barriers include the following:

- Determining protocols for plug-sharing among employees.
- Understanding IRS rules regarding employee benefits as it relates to workplace charging.
- Evaluating future infrastructure needs during the initial installation.
- Assessing installation costs (including permitting and other municipal requirements).

- Assessing future operational costs (such as electricity rate structures and charging software costs).
- Pricing of electricity provided at worksite to employees.
- Understanding the federal grant process for the purchase and installation of EV charging stations – how to apply, what terminology to use?
- Apportioning charging spaces between employees and the public, and understanding the conditions when public access is required.
- Who within the company owns and operates the program? (Facility managers, parking managers, sustainability director, transportation demand manager, ...)

SURVEY QUESTIONS SUMMARY ANSWERS

Provided below.

Workplace Charging Readiness Survey for Employers



1. Name

Response
Count

75

answered question

75

skipped question

0

2. Title

Response
Count

75

answered question

75

skipped question

0

3. Company Name

Response
Count

75

answered question

75

skipped question

0

4. Company Address

Response
Count

75

answered question

75

skipped question

0

5. Phone

Response
Count

59

answered question

59

skipped question

16

6. Email Address

Response
Count

75

answered question

75

skipped question

0

7. Approximate Number of Employees

Response
Count

75

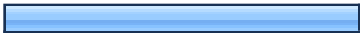
answered question

75

skipped question

0

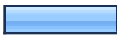
8. Do you currently have any Electric Vehicle Charging Stations available and operational at your workplace?

		Response Percent	Response Count
Yes		53.3%	40
No		46.7%	35
Other (please specify)			8
answered question			75
skipped question			0

9. HOW MANY Charging Stations do you currently have of EACH TYPE listed below?

	Response Average	Response Total	Response Count
Level 1 (120 v)	15.78	363	23
Level 2 (240 v)	17.93	538	30
Fast Chargers (480 v)	0.35	6	17
answered question			34
skipped question			41

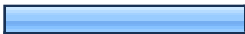
10. WHO can use the Charging Stations?

		Response Percent	Response Count
Employees		50.0%	18
Public		19.4%	7
Company Fleet		38.9%	14
All of the above		41.7%	15
Other (please specify)		16.7%	6
answered question			36
skipped question			39

11. Do you require a fee for use of the Charging Stations?

		Response Percent	Response Count
Yes		25.0%	9
No		75.0%	27
If YES, please describe how the fee is assessed:			7
answered question			36
skipped question			39

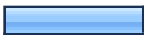
12. How many employees are currently charging at work?

		Response Percent	Response Count
1 - 5		35.7%	10
6 - 10		17.9%	5
11 - 15		17.9%	5
16 - 20		3.6%	1
More than 20		25.0%	7
Other (please specify)			8
answered question			28
skipped question			47

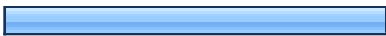
13. Do you have an internal company policy regarding workplace charging (i.e., who can charge and when)?

		Response Percent	Response Count
Yes		33.3%	12
No		66.7%	24
Other (please specify)		0.0%	0
answered question			36
skipped question			39

14. Who monitors the program?

		Response Percent	Response Count
Human Resources Manager		2.9%	1
Facilities Manager		35.3%	12
Fleet Manager		8.8%	3
Employees/Users		20.6%	7
No one		17.6%	6
Other (please specify)		41.2%	14
answered question			34
skipped question			41

15. Are you using any renewable energy options in connection with your Charging Stations (i.e., use of solar or wind generated electricity)?

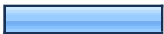
		Response Percent	Response Count
Yes		42.9%	15
No		57.1%	20

If YES, please specify which option:

13

answered question			35
skipped question			40

16. Do you have a plan to avoid on-peak charging during the day (i.e., from 2pm to 5pm)?

		Response Percent	Response Count
Yes		23.5%	8
No		76.5%	26

If YES, please describe the plan:

7

answered question	34
skipped question	41

17. In the next year, please indicate the number of Charging Stations of each type that are planned for installation, if any.

	Response Average	Response Total	Response Count
Level 1 (120 v)	8.06	282	35
Level 2 (240 v)	9.39	413	44
Fast Chargers (480 v)	0.22	6	27
answered question			50
skipped question			25

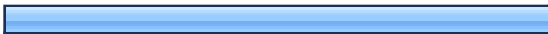
18. Does your company own or lease its building?

		Response Percent	Response Count
Own		61.2%	41
Lease		26.9%	18
Other (please specify)		11.9%	8
answered question			67
skipped question			8

19. Does your company own its parking lot or rent?

		Response Percent	Response Count
Own		64.2%	43
Rent		10.4%	7
Lease spaces		10.4%	7
None of the above		1.5%	1
Other (please specify)		13.4%	9
answered question			67
skipped question			8

20. Does your company own a fleet of vehicles?

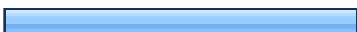
		Response Percent	Response Count
Yes		81.8%	54
No		18.2%	12

If YES, how many and what type?

27

answered question	66
skipped question	9

21. If yes to Question 20, are any of the vehicles in your fleet plug-in electric vehicles?

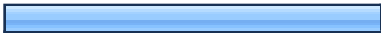
		Response Percent	Response Count
Yes		47.4%	27
No		52.6%	30

Other (please specify)

6

answered question	57
skipped question	18

22. How many plug-in electric vehicles does your company plan to acquire for its fleet in the next year, if any?

		Response Percent	Response Count
None		56.4%	31
1-5		32.7%	18
6-10		1.8%	1
11-15		1.8%	1
16-20		1.8%	1
More that 20		5.5%	3
Other (please specify)			11
answered question			55
skipped question			20

23. If you want (or already have) charging stations at your workplace, what are your motivations for acquiring EV infrastructure?

		Response Percent	Response Count
Reducing overhead energy costs		19.0%	11
Employee benefit for recruitment/retention		62.1%	36
Green corporate image		72.4%	42
Other (please specify)		32.8%	19
answered question			58
skipped question			17

24. If you have already installed charging stations, which of the following barriers did you encounter during the process? If you have NOT installed charging stations but are interested in doing so, which anticipated barriers concern you the most? Please rate the following possible barriers in order of significance:

	Not Significant	Somewhat Significant	Very Significant	Rating Average	Rating Count
Buy-in from senior management	51.0% (26)	33.3% (17)	15.7% (8)	1.65	51
Getting employees interested and using the system	63.5% (33)	25.0% (13)	11.5% (6)	1.48	52
Obtaining approval from property/garage owners	71.2% (37)	17.3% (9)	11.5% (6)	1.40	52
Choosing a vendor and electrical contractor	57.4% (31)	31.5% (17)	11.1% (6)	1.54	54
Choosing the appropriate system	52.9% (27)	27.5% (14)	19.6% (10)	1.67	51
Cost (installation, maintenance, operation, etc.)	13.0% (7)	25.9% (14)	61.1% (33)	2.48	54
Developing an internal policy regarding charging vehicles	36.5% (19)	40.4% (21)	23.1% (12)	1.87	52
Compliance with the Americans with Disabilities Act	43.4% (23)	34.0% (18)	22.6% (12)	1.79	53
Liability Issues	38.5% (20)	42.3% (22)	19.2% (10)	1.81	52
Other (please specify)					8
answered question					56
skipped question					19

25. Please provide any additional comments, questions, or feedback. Thank you for your participation!

Response Count	
11	
answered question	11
skipped question	64

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