Electric Vehicle Supply Equipment Guidance Document

California Department of General Services

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Contents

Introduction

This guidance document is intended to assist facility and fleet managers in the planning, budgeting, installation, and data collection of electric vehicle supply equipment (EVSE) at state-owned buildings, parking garages and surface lots. The addition of EVSE to state-leased facilities is a different process handled by the lessor through the DGS Leasing and Planning Section.

The intention of this document is to augment the publication entitled Zero–Emission Vehicles in California: Community Readiness Guidebook (CRG) released in the fall of 2013 by the Governor's Office of Planning and Research. This guidance document will assist with state government specific processes, resources and provide additional technical information regarding EVSE. Summaries and references to the CRG are often given to assist the reader in their understanding of this emerging field. The CRG contains a summary of acronyms on page 5 and a glossary of terms on page 153.

The EVSE industry is rapidly changing as battery technology, vehicle range and standards evolve; and flexibility in planning for a dynamic market is important. This document will be revised periodically, allowing for state agencies to remain current with EVSE technology and industry.

Components necessary to charge electric vehicles on state-owned facilities are readily available. Most new or existing state facilities have or will have parking areas with electricity to provide safety lighting for visibility before and after daylight hours. Therefore, the challenge is to determine current and future EVSE needs and use existing or build up electrical capacity to allow increased usage for electric vehicles now and into the future.

Within the planning section of this guidance document there is an introduction to current EVSE equipment and standards. When determining needs per new or existing state facility or site, EVSE equipment should be considered to make the best possible use of infrastructure resources and account for future growth.

The budgeting section will provide cost ranges for EVSE equipment to assist state agencies in the budgeting process. Costs will vary by location and this guidance document will attempt to provide ranges for the more common situations. Actual installation costs of EVSE systems will vary widely depending on the actual site conditions.

Energy Data Collection is required by Executive Order B-18-12. DGS will work with agencies that install EVSE to capture usage data and report this metric as this information becomes available.

On November 8, 2013, six million dollars of electric vehicle charging infrastructure funding was made available through the California Energy Commission. The application

deadline, pending any amendments, is February 4, 2014 as outlined in the Budgeting Phase section of this document.

Understanding the Technology

Levels of EVSE

For an overview of zero-emission vehicles (ZEVs), descriptions of plug-in hybrid electric vehicles (PHEVs), plug-in electric vehicles (PEVs), battery electric vehicles (BEVs) and the three levels of vehicle charging, refer to the CRG on pages 11 and 12. This document will use the term of electric vehicle (EV) to simplify terminology.

EVSE is commonly referred to as a "charger" however this is technically incorrect. The actual charger for Levels 1 & 2 is onboard the vehicle. It converts alternating current (AC) power to direct current (DC), regulates the amount of amperage flowing to the battery cells and communicates with the EVSE unit. EVSE is the electrical energy transfer device that conducts and regulates power from the electrical portal connection to the EV inlet.

EVSE systems currently approved by the Society of Automotive Engineers International (SAE) and National Electrical Manufacturers Association (NEMA) can be used safely indoors or out, even in wet conditions, when properly rated for the weather exposure. As with any electrical equipment, care must be taken to regularly check for cord wear, frayed wiring and properly functioning equipment.

For reference, a brief description of EVSE types is as follows:

- **Level 1 AC**

  Level 1 AC is the most abundant type of charging connection, since it can be done through a common 120 volt AC three prong convenience outlet. Most vehicles are equipped with a portable EVSE that can be used nearly anywhere electrical service is available. However, it has the slowest charge rate at approximately 4 to 6 miles per hour. Higher amperage allows for a faster charge rate. Level 1 EVSE may be portable or permanently wired to the electrical service. A 15 amp breaker is the minimum required however a 20 amp breaker or higher is generally recommended, depending on the model of EVSE used. Note that the electrical code requires the breaker to be down-rated when used in a continuous mode such as EVSE. A dedicated circuit is also recommended since multiple loads may overload the circuit and the EVSE could cause interference with other electrical devices.

- **Level 2 AC**

  This type of charging connection is the most prevalent for charging EV since it is generally twice as fast as Level 1 and provides 10 to 20 miles of range per hour of charging. It requires 240V service which is readily available in many buildings and homes but may not be available at some surface lots and smaller facilities. Other voltages such as 208V or 277V can be transformed to 240V with additional expense. Amperage will vary depending on EVSE used and the service available varying from 40 to 100 amps. Again, higher amperage allows for a faster charge rate, provided the vehicle is designed to accept higher amperage. Level 2 EVSE are nearly always hard-wired to the electrical portal. However, some EVSE manufacturers market a Level 2 portable device with a NEMA 14-50 plug that can be used in a common clothes dryer or recreational vehicle outlet, which may not meet local electrical codes.

- **Level 3 DC Fast Chargers**

  This type of charging connection can raise the rate of charge to approximately 75% to 80% in as little as 20 to 30 minutes, depending on battery size. This type of EVSE uses an off-board charger that transforms AC power to DC and bypasses the on-board charger. Generally, 208V three-phase or 480V service is required for this type of charging and may not be commonly available. In many cases, a new separate service will need to be installed by the local utility.

  A major issue with DC fast charging is the lack of uniform standards in regard to connectors as discussed below. Level 3 DC units and infrastructure cost significantly more and are currently used in only specialized situations or major transportation corridors.

  With the significant advantages of fast charging and the rapid adoption of electric vehicles, this level of charging will likely become more widely available in the next few years. Vehicle owners should consult the owner's manuals of their EV since some battery manufacturers suggest that repeated Level 3 charging could shorten battery life.

Common Types of Couplers

The currently available light-duty vehicles and Levels 1 & 2 EVSE marketed in the US use the standardized SAE J1772-2009 round coupler and inlet which offer significant levels of safety and convenience. This standard should be used in most instances. This type of coupler is designed specifically for vehicles, prevents inadvertent disconnection, has an interlock device that prevents vehicle start-up and has a first-in/last-out ground connection. For safety reasons, the cord and coupler are not energized until it is mated with the inlet and the EVSE communicates with the vehicle's charger.

Level 3 DC fast charging doesn't currently have a universally adopted coupler which is a source of confusion. Some vehicles such as the Nissan Leaf, Mitsubishi i MiEV and the future Subaru model use the Japanese developed trade name CHADdeMO coupler which is somewhat larger than the J1772 device. The vehicle must also be specifically equipped for fast charging which is generally an option at added expense.

Most American manufacturers will be using the newly developed SAE J1772-2009 Combo coupler approved by SAE in the fall of 2012. This type of connector is not common but is planned to be widely used in future models. It is a variant of the standard J1772-2009 coupler with two extra pins for Level 3 fast charging as well as Levels 1 & 2. The regular J1772-2009 coupler can also be used with vehicles equipped with the Combo coupler.

There are past versions of connectors, sometimes known as "legacy chargers," from previous models of light duty autos and EVSE legacy chargers can be found in many parking facilities in California. Some of those models are still in use and EVSE should remain if those locations are regularly being used. The most common type is the inductive paddle charger used by General Motors EV-1 and Toyota RAV4 EV. Also currently in use is the J1772-2001 rectangular conductive coupler which is being phased out and can be converted with an adaptor to the newer 2009 standard.

Some after-market conversions of hybrids to plug-in hybrids use a standard three prong plug configuration and don't require any specialized coupler but can't use the newer style EVSE. However, this style of connection is relatively uncommon and can use a standard 120V outlet.

Tesla Motors has a proprietary Level 3 system and protocol known as a "Super Charger". While the model S supports the J1772-2009 connector for Level 1 and 2, the Level 3 is not compatible with the CHAdeMO coupler or the J1772 Combo without adaptors. Tesla Motors is currently constructing a network of proprietary Super Charging stations across the US and is also testing battery swapping as an option.

European manufacturers are developing their own standard known as Mennekes for Level 3 charging, but these are not being widely used in the US at this time.

Basic and Smart EVSE

- **Basic EVSE**

  Different models of EVSE have different levels of networking capabilities. Basic models, sometimes called "dumb chargers," communicate only with the vehicle as the "handshake" begins the charging session and ends when the vehicle's charger completes the session or the charge is interrupted by the EVSE or uncoupling.

Basic EVSE is simple to operate, maintain, and is generally much less expensive than smart EVSE. It doesn't need any connection other than with the electrical infrastructure. Models are available in Levels 1, 2 and 3 and are manufactured for light duty and commercial duty service.

Basic chargers are usually adequate for fleet charging applications and employee parking where fee collection is not a priority. Some types of basic chargers are equipped with keypads to allow for access control and payment of fees via cell or smart phones.

- **Smart EVSE**

  Smart EVSE are offered in Levels 1, 2, and 3 commercial duty qualities and are generally more expensive than basic chargers. They offer differing levels of communication with the user, site host, utility grid, and the Internet, depending on model and manufacturer. They also offer the option of collecting fees for the charging session and a high level of reporting capabilities.

  Smart EVSE generally connect with the Internet using cellular connections, Wi-Fi, or phone lines.

  Depending on model and manufacturer, smart chargers offer a high degree of information for the user, often by computer or smart phone. Commonly available features are: verification of the user by means of a radio-frequency identification (RFID) card, point of sale using credit cards, display of fee rates, rate of charging, cell phone or email notification of a completed session, plug-out notification, Internet location of EVSE with rates, in-use status, and reservation capabilities. Reporting capabilities commonly include: date, location, electricity used for each charging session, monthly reports, and fee totals.

  The site host can also communicate with smart EVSE to establish rates, determine usage, verify user identity, trouble shoot errors, and gather kWh consumption.

  Depending on the business model being used by the manufacturer, smart EVSE usually involve on-going monthly or annual fees for the user, site host, or both.

Planning Phase

Site Assessment

The first step in planning is a thorough assessment of the quantity and type of vehicles to be charged at the site, rate of turnover, electrical service available, and space available for charging.

Fleet Requirements

According to page 17 of the CRG, Executive Order B-16-12 will require state agencies to purchase an increasing percentage of fleet vehicles as zero emission vehicles. Until fuel cell vehicles are commonly available, agencies will rely mainly on BEVs and PHEVs to fulfill this requirement. Facility and Fleet Managers should work together to determine the quantity, type and delivery schedule of ZEVs and plan to have EVSE available before delivery.

It should be noted that even if fleet vehicles are not housed at the site, other state EVs may be driven to the location and require charging on a regular basis.

Employee Parking Assessment

Executive Order B 18-12 and the accompanying Green Building Action Plan will require the following: "State agencies shall identify and pursue opportunities to provide electric vehicle charging stations, and accommodate future charging infrastructure demand, at employee parking facilities in new and existing buildings."

In many urban areas of California, EV sales are rapidly increasing, and building and lot managers are regularly asked about vehicle charging. Managers should send questionnaires to the lot and building users to assess both the number of existing electric based vehicles and the likelihood of EV purchases in the next two years.

Public Parking Assessment

No executive order exists at this time directing agencies to provide EVSE for public charging. However, planners should consider the state's overall goal of promoting rapid ZEV adoption and look for opportunities to share fleet or employee EVSE with the public when it is convenient and appropriate. In some cases, departments may consider installing EVSE for public use when it is part of their normal services to non-employees.

Electrical Service Assessment of the Site

Electrical assessment of the site and overall infrastructure design must be done by a qualified electrician or an electrical engineer.

At minimum, the following factors should be taken into account:

- Existing electrical panel distribution voltage – Does the existing voltage meet the requirement of the desired charging station? If not, can transformers be added to obtain the desired voltage?
- Existing panel capacity evaluation – The sum of the proposed EVSE full load amperage and existing loads may overload the existing electrical distribution equipment. Load testing can potentially determine if the panel will exceed the capacity.

- Distance between the electrical panel and EVSE location – Length of the conductors will affect installation design and material costs. Factors such as conduit size, conductor sizing, trenching, circuit voltage drop and other requirements will need to be assessed, especially if additional future EVSE is planned.
- Environmental conditions – EVSE should be properly specified for site conditions including: heavy-duty or light-duty, interior or exterior placement, wet or dry conditions, and extreme temperatures.
- Networking access – If "smart" chargers are planned, strong reception of cellular phone signals or wired phone lines are needed.
- Lighting – EVSE should have illumination levels that meet or exceed the minimum necessary for operation of the equipment.
- Security equipment – High risk areas may require safety and security for equipment and user.

In locations that lack adequate electrical power, it may be possible to reduce existing loads through energy efficiency upgrades of lighting and HVAC systems. Contact DGS to have an analysis done of the systems and determine the possible energy reductions.

Infrastructure Master Planning

ZEV implementation plans and EVSE installation timelines are required for fleet vehicles under Management Memo 13-04.

In addition, employee parking will be evaluated and master planned under Executive order B 18-12 as follows:

"The Department of General Services, in conjunction with other appropriate State agencies and outside entities, shall develop an electric vehicle charging station infrastructure plan including the following:

> 14.1. Evaluate existing state-owned parking structures and parking lots and install plug-in electric vehicle charging infrastructure where most cost-effective and appropriate.
>
> 14.2. Plan for and install appropriate cost-effective levels of plug-in electric vehicle charging infrastructure in the new construction of state-owned parking structures and parking lots."

In early 2014, DGS will be requesting all agencies with fleet vehicles or employee parking lots to provide information and participate in EVSE master planning of their facilities and parking lots.

EVSE planning tips

Important considerations in planning EVSE are battery capacity and rate of vehicle turnover. Vehicle battery capacity is directly proportional to the length of time required to recharge. As battery capacity and technology grow, charging times are likely to increase, depending on the level of charging. Many light-duty fleet vehicles can fully charge overnight by simply charging at Level 1. However, if they need to be recharged more than once per day, Level 2 or even 3 should be strongly considered. With Level 3 DC fast charging, vehicles can be returned to service in 20 to 40 minutes. Note that most EV charging is done overnight when grid based power is plentiful and generally the lowest cost. Refer to the CRG, page 29 for a charge diagram of the three levels.

Placement and Installation of EVSE

Placement of EVSE will be a balance between convenience of users, site layout, access to persons with disabilities and proximity to electrical services. The further from electrical service panels, the more expensive the installation costs. In new buildings, garages and surface lots, architects and engineers can balance the system design and location for optimum cost control.

However, in the case of existing buildings, garages and surface lots, designers will be constrained to using existing electrical infrastructure and site layout, or installing new electrical improvements and modifying the site.

In parking garages, EVSE are generally located within 100 feet of electrical service panels. Further distances may increase conductor size which will add costs. Conduit is generally surface mounted as it runs to the EVSE location. Caution should be used to not create overhead obstructions, trip hazards or interference with accessible routes for persons with disabilities.

On surface lots of existing buildings, conduit is usually run from electrical panels, through exterior walls, and then routed underground to the EVSE location. Placement of EVSE close to the building's electrical service will minimize the disturbance and patching of landscape, sprinkler lines, sidewalk and paving. The size of the conduit should allow for future expansion and additional conductors.

At surface lots without buildings, EVSE should be located close to the electrical service entry and meter, which is generally on a pole or at a power panel.

Solar powered vehicle charging is increasingly available in either single or multiple vehicle configurations. In some cases, no connection to the electrical utility grid is necessary and some models contain storage batteries allowing for 24 hour charging.

The EVSE device itself is typically wall, pole, or pedestal mounted depending on site conditions and should be ordered with the appropriate installation accessories. EVSE should be protected from damage by vehicles and located in areas that will discourage vandalism. Substantial bollards or barriers are advised in addition to wheel stops.

Adequate lighting and security cameras should be considered as appropriate for the location.

The quantity of vehicle spaces should be in proportion to the charging needs of the site and the levels of EVSE planned. In general, assuming nearly depleted batteries, Level 1 will charge a vehicle in 8 to 10 hours. This may be adequate for overnight charging of fleet vehicles. Level 2 will charge one vehicle in 3 to 5 hours, which may allow for rotation of two to three vehicles during an 8 hour work shift. Level 3 DC fast charging can charge multiple vehicles with a 20 to 40 minute turnover rate.

In many cases, a combination of Levels 1, 2 and even 3 are recommended at the same site. Level 1 EVSE can usually be easily and economically installed for vehicles that have only partially depleted batteries and can remain parked for several hours. This is the case for many employee owned vehicles during an 8 hour shift. In the case of Level 2 charging, rotation should be mandatory with time limits to assure that multiple users have access to charging. However, frequent checking of status and rotation of vehicles can impact worker productivity and bring up issues of priority between users unless adequate EVSE are available. A Level 3 installation will maximize quick rotation if needed and can augment Levels 1 and 2.

EVSE planners should consider sharing units where practical between fleet, employee and public charging to minimize costs and maximize usage. Facility managers and fleet operators should make it a high priority to work together to repurpose EVSE between the three groups. Working out the logistics of vehicles at mutually optimal times will effectively serve all groups.

In the employee charging locations of Level 2, consider providing two or more vehicle spaces for each charger cord, where space permits. Two spaces will allow for one actively charging while the other is in the queue waiting. Informal communication between vehicle owners often arise that allow for transference of the coupler and minimize interference with worker productivity caused by rotating vehicles.

The cord length should be long enough to reach the front, side and rear quarter of each vehicle to be charged, since the inlet placement varies for each model. Select EVSE models that have cable management features to keep long cords retracted or wound up, to prevent trip hazards, freezing to the ground in cold areas or being run over by vehicles.

Sizing EVSE to the parking capacity

The overall quantity of charging spaces per site is still largely dependent on the number of EVs at the site plus the expected future demand. Locations in downtown Los Angeles for example, are likely to have much higher EV adoption rate than rural counties. However, as EV usage increases, all state parking locations should eventually consider EVSE access. For new state buildings and garages, the CalGreen code and LEED must

be used to determine the minimum number of spaces for fuel efficient vehicles. For existing buildings, garages and lots, CalGreen and LEED can be used as guidelines as well for gauging fuel efficient vehicle parking at the site.

For new non-residential buildings, the 2013 CalGreen code section A5.106.5.1 requires two levels of fuel efficient vehicle parking which includes ZEVs. Tier one specifies 10% of parking spaces above 10 spaces while tier two calls for 12% of all parking spaces. Not all spaces will require EVSE however. Section A5.106.5.3 is more specific regarding EVSE and requires planning and installation of electrical capacity and raceways to the location of future Level 2 EVSE, but doesn't require the EVSE device itself. Tier 1 requires "at least 3 percent of the total parking spaces, but not less than one, shall be capable of supporting installation of future electric vehicle supply equipment (EVSE)." Tier 2 requires "at least 5 percent of the total parking spaces, but not less than two, shall be capable of supporting installation of future EVSE." Refer to CRG pages 39 and 131 for further information.

Accessibility by persons with disabilities

Please refer to the CRG page 60 for a discussion of physical accessibility issues.

The issue of accessibility to EVSE by persons with disabilities can be rather challenging. The existing codes don't specifically address this new technology, but there are overarching requirements for public agencies to provide equal access to all programs. Therefore, EVSE planners must consider accessibility requirements for at least one vehicle stall at each facility where EVSE is provided.

The State's authority on accessibility by persons with disabilities, the Division of the State Architect, is currently working on Voluntary Guidelines as an interim step while the multi-year building code adoption process takes place. In the absence of the Guidelines, planners should consider a minimum of one EVSE at or adjacent to van accessible parking stalls with the equipment's operational components within the accessibility reach ranges. Equipment should be properly placed in order to provide at least the minimum code clearances and not present any barriers or obstructions within the accessible stall and path of travel to the building entry.

Leadership in Energy and Environmental Design (LEED)

According to Executive Order B-18-12 and the accompanying Green Building Action Plan, "New and major renovated state buildings and build-to-suit leases larger than 10,000 square feet shall obtain LEED "Silver" certification or higher, using the applicable version of LEED. Buildings smaller than 10,000 square feet authorized to begin design after January 1, 2013, shall meet applicable California Green Building Standard's Tier 1 measures".

Larger existing buildings also need to be certified under the same Executive Order: "All existing State buildings over 50,000 square feet shall complete LEED-EB certification by December 31, 2015 (including meeting an Energy Star rating of 75, or alternate energy standard established by the California Energy Commission), to the maximum extent cost-effective."

LEED points may be gained by including EVSE infrastructure in buildings. Specific requirements will vary depending on the LEED version used and the particular points under consideration. Consult with your agency LEED certifications personnel to determine the measures relating to EVs. Refer to the CRG page 22 for additional information regarding LEED.

Signage

Signage and charging space markings are critical components of a successful EVSE installation. Refer to the CRG page 81 and Traffic Operations Policy Directive 13-01 for a thorough discussion of the practices.

Signs and pavement markings at the facility should clearly inform the user that EVSE is available onsite, guide them to the location, and show which stalls are designated for vehicle charging. Time limits, parking restrictions and other information should be clearly posted according to the site's policies.

Budgeting, Procurement & Construction Phases

Budgeting - Projected Costs

Cost will vary greatly depending on the EVSE business model selected, level of charging, basic or smart EVSE devices, status of the supporting infrastructure, distance from the electrical panels or solar panels and the quantity of devices planned.

For the EVSE device alone without infrastructure improvements, the approximate current range of list prices are:

Level 1 basic: $500 to $1,000
Level 2 basic: $500 to $2,600
Level 2 smart: $ 4,500 to $17,000
Level 3: $ 19,000 to $40,000

The cost of infrastructure improvement is highly dependent on what is available onsite. It could be as simple as replacement of the older legacy EVSE where wiring is already installed and could cost only a few hundred dollars for a simple connection of the new equipment. For large installations of up to 30 new Level 2 devices, estimates range up

to $150,000 for installation of a new meter, panels, devices, site improvements and various utility expenses.

To accurately estimate infrastructure costs, an experienced electrician or electrical engineer should be contacted, a design established, and the costs estimated. However, for budgeting purposes, the following could be used as a starting point which is in addition to the device itself listed above.

Parking Garages:
Level 1 basic, simple installation at existing wiring: $200 to $400 each
Level 1 basic, moderately complex installation: $4,000 to $8,000 each
Level 2 basic, simple installation at existing wiring: $300 to $500 each
Level 2 basic, moderately complex installation: $5,000 to $10,000 each
Level 2 smart, simple installation at existing wiring: $400 to $600 each
Level 2 smart, moderately complex installation: $6,000 to $10,000 each

Surface Parking Lots:
Level 2 basic and smart: $10,000 to $15,000 each
Level 3: $100,000 to $200,000 each

Note that any non-electrical site improvements such as signage, striping or accessibility modifications would be in addition to the above.

Procurement of EVSE

DGS is planning to have a state-wide EVSE contract in place for basic equipment by the first quarter of 2014 and for smart equipment by summer of 2014. Contracts will have a wide selection of equipment in the three charging levels and both basic and smart formats.

Until the state contract is awarded, DGS, Procurement Division has entered into a Cooperative Purchasing Agreement with the County of Los Angeles which is available for all state agencies to use. The state contract numbers are:

- 7-13-61-04 EV Connect, Inc.;
- 7-13-61-06 OpConnect, LLC; and
- 7-13-61-11 Steven Engineering Associated of Los Angeles

These contracts are currently available to procure EVSE devices, but do not allow for extensive infrastructure improvements.

User Instructions for these contracts are located at:

https://www.bidsync.com/DPX?ac=agencycontview&contid=104794

Design and Construction of EVSE Installations

DGS offers architectural and electrical design services for EVSE installations to state agencies under the Executive Branch. DGS can assess the facility and electrical capacity, design the electrical systems and charging stalls, prepare technical plans, specifications, and project estimates.

A DGS Project Manager can then bid the work to private sector contractors. DGS Construction Services Branch will inspect the work done by private sector contractors or have the DGS Direct Construction Unit install the improvements if appropriate.

Contact your agency's DGS Customer Service Representative in the Asset Management Branch for further information about services offered. http://www.dgs.ca.gov/resd/Programs/AssetManagement.aspx

If your agency is already registered in the DGS CRUISE service request system, a service request can be submitted directly at:
http://www.globalcruise.dgs.ca.gov/login.aspx

Funding of EVSE and Electric Fuel Costs

State agencies will need to appropriately budget for EVSE installation and on-going costs, subject to the business model chosen. Various incentive and grant programs are available from time to time to help defray the initial installation and purchase costs.

The California Energy Commission (CEC), Transportation Division, occasionally has competitive grants and may assist state agencies in locating other funding options. Individuals can register for automatic e-mail notification of transportation related funding, including EVSE, by subscribing at http://www.energy.ca.gov/transportation/.

On November 8, 2013, the CEC released a Program Opportunity Notice PON-13-606 for electric vehicle charging infrastructure. Six million dollars of funding is available in four categories:

- $4 million for destination charging, major transportation corridors and workplace charging with public access
- $1 million for workplace charging without public access
- $100,000 for rental multiple unit dwellings
- $900,000 for occupant owned multiple unit dwellings

While the funding is available to both public and private sector entities on a competitive basis, state agencies are encouraged to submit proposals. Pending amendments, the deadline for applications is 3:00 PM, February 4, 2014.

Note that in the past, the CEC has funded EVSE directly with State departments outside of the competitive Program Opportunity Notices. For example, DGS received grants for 64 EVSE and an Interagency Agreement to install charging stations at most of the DGS managed parking lots and structures state wide. State agencies that have compelling justification for installing EVSE should discuss their needs with the CEC.

Fleet managers should coordinate with site/building managers to formulate a method of payment of electrical fuel costs since this unconventional fuel expense will be mixed in with conventional electrical energy bills.

Fees, Data Collection and Reporting

Fees for Electric Vehicle Charging

In the opinion of this administration, charging fees for energizing employee owned electric vehicles is optional and free charging is not a "gift of public funds." Each agency can establish their own policy and fee rate regarding the use of EVSE. DGS will release parking policy guidance in early 2014 that can serve as good guidelines for agency parking facilities should they want to charge fees.

Data Collection - Tracking Electric Vehicle Energy Usage

Under Executive Order B-18-12, agencies are required to annually report the electrical energy usage for each meter under the benchmarking program. This is primarily accomplished through the Energy Star Portfolio Manager (ESPM) and is automatically entered by the utility. The Executive Order also directs agencies to greatly reduce electrical energy consumed from the retail grid, but yet add electrical load for EVs, which seems contradictory.

Agencies installing EVSE are encouraged to track energy usage for EVs so they may deduct vehicle consumption from the building or site usage. Agencies will be allowed to deduct the electrical vehicle energy usage from that used by the building or site. This deduction may need to occur manually since ESPM doesn't differentiate the two. Building/site managers may need to coordinate with fleet managers to accurately account for this deduction.

Under Management Memo 13-04 and other directives, state agencies are also required to annually report the amount of electric fuel used by their fleet.

To accomplish the date collection, basic chargers can be equipped with small sub-meters or devices known as data loggers for tracking the energy consumed. Smart chargers generally track usage automatically and the energy consumed is part of the reporting formats.

Business Models and Other EVSE Considerations

EVSE is fairly new to most site managers and there are several issues to consider in managing the business aspects of EV charging.

Basic chargers generally require very little on-going maintenance, but may malfunction or be vandalized from time to time. The owning agency should have options to trouble shoot and return equipment back to service promptly. Service orders or service contracts with local vendors or electricians are advised. The EVSE master service agreements currently being drafted at DGS will include service contract options.

Some basic chargers are equipped with small key pads that allow for controlled access. There are also business models that provide access codes to the user by phone, smart phone or cashier which makes fee collection an option. On-going monthly fees are generally charged for this additional level of service.

Smart chargers allow for a substantial number of sophisticated amenities for the user and site host but will likely incur on-going network fees. Networking services may not be transferrable between the different brands of EVSE devices and can be thought of as similar to cell phones and the proprietary network services they operate on. The topic of interoperability is briefly discussed in the CRG page 31. Care must be taken to coordinate the networking services with the particular brand and operating system of the EVSE.

Smart chargers operate with basically two different types of software; open source and proprietary. Interoperability between the different brands of hardware and software is still being sorted out by the fledgling industry and has been a difficult issue for public entities. Proprietary hardware/software tends to make a particular vendor a sole-source for future procurement and contracting purposes. Open source software is available, but may lack many desirable features as compared with the proprietary types and does not run on all brands of hardware.

Open Charge Point Protocol (OCPP) open source software allows some flexibility for interoperability between multiple vendors of hardware and software. While it is not a universal solution, it does offer public agencies some choice. This protocol may be of interest to departments that wish to change servicing companies from time to time. The

DGS contract for EVSE will include this provision, so that chargers purchased off of the drafted Master Service Agreement will be able to be serviced by multiple vendors.

Currently, many EVSE companies require a user to be a member of an EVSE network or acquire membership, causing the user to carry multiple RFID cards or pay multiple fees. This situation is addressed in Chapter 413, Statutes of 2013 (SB 454) which will alleviate some of the concerns when the requirements take effect. Site managers should be aware of this future requirement and procure equipment that can be adapted to the new law. This bill covers only public charging and doesn't address employee or fleet EVSE, but the employee charging may encounter issues similar to the public locations.

Business Models

There are three dominant business models being used by the industry at this time; free charging, pay per charge, and pay by subscription. These and other numerous business models will evolve as the industry matures and competition increases.

With the pay per charge model, the site host purchases the smart EVSE equipment, installs it, and then maintains on-going network and service through the proprietary vendor agreements. The vendor's network verifies the user's RFID membership card or allows for a credit card point of sale before the charging session begins. The vendor would also perform any necessary repairs or operating system upgrades. The site host pays for annual networking and maintenance fees plus a small percentage of each transaction. The site host can set charging fees, if any, and has the responsibility of paying energy consumption costs. This model is well suited for the private sector, but several problems have been encountered when used within state government. DGS is working to overcome these obstacles and will inform other agencies of potential solutions.

The subscription model is similar to cell phone contracts. The EVSE company charges the user a monthly fee, who has specific limits or unlimited use of the company's network. Depending on level of subscription selected, the company installs EVSE at the subscriber's home and at their workplace for the price of the subscription. The site host then would not be a party to the monetary transaction, have little or no up-front costs and would be reimbursed for the electrical energy at a negotiated rate. While this method has yet to be used in state government, a few agencies are negotiating with vendors regarding terms and conditions. In this model, the site hosts' infrastructure costs are substantially lower, but in exchange, the vendor has exclusivity to the site for a specified length of time; limiting the options for the users.

EV users often search for EVSE locations from their computers or smart phones using numerous EVSE vendor company websites or public websites at

http://www.plugshare.com/ or http://www.afdc.energy.gov/locator/stations/route/. State site hosts should decide if they want their locations shown on these websites, depending on what level of access will be made available to the public.

Utility Assistance with EVSE

Your local utility may have EVSE planning assistance, incentives, subject matter experts, and special rates as shown below. Additional information is described on pages 57 through 59 in the CRG.

Southern California Edison

1. **EVSE planning services**
   If your facility is in Southern California Edison (SCE) territory, SCE provides tools and resources to help you to ensure safe, reliable, and cost-effective EV charging and to assist you in managing your electric load. SCE can help you to meet your EV charging objectives including assistance with needs identification, planning the purchase, installation and maintenance of charging stations, and preparation for questions from your charging station manufacturer and installer. While SCE does not offer specific company or product recommendations, for an introduction to EV charging you can visit sce.com/EV4Business or call 1-800-990-7788 to locate your assigned SCE Account Manager.

   To further assist with EVSE planning, SCE can provide advise on proper metering equipment needed, along with any upgraded electrical service work necessary to accommodate charging requirements. SCE can also review charging plans for compliance with electrical service requirements to seamlessly integrate charging into daily operations. SCE also offers customized rate analysis to help determine the most cost–effective rate plan and minimize the impact of onsite electric car charging systems.

2. **Utility Incentives**
   You may qualify for several available federal, state and local funding opportunities or incentives that support adoption of electric vehicles. However, SCE does not offer rebates or incentives for electric cars and/or infrastructure.

3. **Specialized rates, metering or tariff structures specific for EVSE**
   When you decide to install charging equipment, contact SCE to discuss your charging equipment and rate options which may identify any necessary electrical upgrades required at your facility. You'll need an Electric Vehicle Supply Equipment (EVSE) installer or qualified electrician to inspect your business, obtain required city permits and inspections, upgrade your wiring as needed and install your new equipment. There are 3 different charging levels, or voltages, for you to consider; Level I, Level II and DC Fast Charging. Higher voltage allows for a faster charge.

SCE currently offers multiple rate plans to our business customers for Electric Vehicle (EV) charging. Whenever possible, SCE encourages off-peak (generally night time and morning hours) charging, when electricity costs are lower.

SCE's electric vehicle charging rate options for non-residential customers include TOU-EV-3 and TOU-EV-4 rate structures applicable solely to the charging of electric vehicles and are separately metered for this application. These two Time-of-Use rate structures are for Electric Vehicles with maximum load of 1kW – 19kW for TOU-EV-3 and 20kW – 499kW for TOU-EV-4. All sites with a load of 500kW or greater will be supported under the SCE TOU-8 rate structure.

4. **Other EVSE information**

Please note that business interested in setting up EV-charging services need to understand the legal, regulatory, and other requirements that may be involved. SCE cannot advise customers on pricing or other aspects of a business involving sale of electric vehicle charging services, but we can provide assistance to those interested in service upgrades, metering, and rates associated with EV charging.

Once a customer has determined that providing electric vehicle charging stations at their site you may want to consider creating an EV Charging Policy to guide short- and long-term charging station installations.

Additional factors to consider in the planning process include:

- Number of daily users, visit times and length of stay
- Number of parking spaces currently available
- Charging equipment levels you plan to offer
- Number of charging units you plan to install
- Location of the charging stations
- Equipment and installation costs
- Anticipated charging hours and possible control of charging times using smart chargers
- Management and control of charging station use
- Policies for charging station use
- Expectation of future expansion including the facility's electrical capacity

When you are ready, your SCE electrical service planner can advise you about the proper metering equipment and upgraded electrical service work, if necessary, to accommodate your charging requirements.

Businesses interested in setting up EV charging services need to understand the legal, regulatory and other requirements that may be involved. More details can be found at www.**sce.com/EV4Business**

Pacific Gas & Electric

1. **EVSE planning services**

PG&E currently offers service planning services, as it does with any service upgrade. Service planning is done by a dedicated team for EV issues and is designed for facility managers that have multiple sites across PG&E's region. However, PG&E does not currently provide any guidance on how to design and build EV charging infrastructure on the customer's property, and concentrates instead on ensuring that PG&E's service will handle the extra load without problems.

2. **Utility incentives**
   PG&E is currently prohibited by its regulator from providing any incentives for EVSE installation.

3. **Specialized rates for EVSE**
   Yes for residential customers, No for commercial customers. PG&E was authorized to provide a special time-of-use EV rate for residential customers and also is required to extend line extension rules for residential customers. No specific EV commercial rate is available for commercial customers and the line extension rules are identical for EVSE installations compared to normal commercial line extension rules.

4. **Other EVSE Information**
   PG&E has a dedicated commercial EV team to handle service planning for facility managers with multiple sites. This begins with an application to PG&E at: http://www.pge.com/myhome/customerservice/other/newconstruction/pgeconnect/ and choose the "TELCO" option when selecting project type. This will be updated in the near future to "TELCO and EVs". Selecting this option will allow a facility manager to work with one PG&E service representative on multiple EVSE installations across PG&E's service territory.

Sacramento Municipal Utility District

1. **EVSE planning services**
   SMUD Key Accounts will be the initial contact for any planning assistance requests you would have. Mark Jagodzinski is the Key Account Manager for the state and will be your initial point of contact, who will then work internally to provide the necessary support and expertise for the site and project in question.

   Additional Engineering Support information for larger projects is also available. The link to this information is here:

   https://www.smud.org/en/business/customer-service/support-and-services/documents/2785a-Non-Residential-Development-Process.pdf

2. **EVSE Incentives**

None at the current time.

3. **Specialized EV rates**
   SMUD has special EV Charging rates for residential installations but does not have any special rates for commercial accounts.

4. **Additional EVSE Information**

   Through analysis SMUD has determined that lower charging levels will have less impact on the grid than the time of day that people charge. Therefore SMUD recommends that the EVSE be installed with the lowest charging level that is practical for the site and vehicle mix. Secondarily, SMUD will be installing DC Fast Charging Stations in the greater Sacramento area that will provide a safety net for EV users that were unable to access an EVSE unit at the workplace during the work hours.

San Diego Gas & Electric

1. **EVSE planning services**
   SDG&E offers service planning services for EVSEs and has a dedicated team to do so. SDG&E also has a dedicated member of their Clean Transportation team to help commercial customers and electric vehicle service providers decide where on their property to install their charging stations at the lowest cost with the most reliability. The utility advises customers on wiring, use of a contractor, metering and rates.

   SDG&E offers quarterly workshops to multi-unit dwelling property managers and owners, as well as those interested in learning about their workplace charging options. These workshops provide best practices for EVSE installations.

2. **EVSE Incentives**
   SDG&E does not provide incentives for installation, but does work with local EVSPs to do education and outreach to multi-unit dwelling property managers and owners, as well as workplaces, about incentives being offered by third parties.

3. **Specialized rates, metering or tariff structures specific for EVSE**
   SDG&E does not have any EVSE-specific rates, metering or tariff structures. SDG&E does offer special residential EV rates for customers to incentivize them to charge in the super off-peak hours. The utility does not offer specialized rates, metering or tariffs for commercial customers. SDG&E is required to do the EVSE line extensions for residential customers and not commercial customers.

4. **Additional EVSE Information**

   All customers should use SDG&E as a resource when it comes to their car charging needs. Residential customers can find information at http://www.sdge.com/electric-vehicles. Commercial customers should contact SDG&E first when deciding to install charging on their property and the utility will provide them best practices when installing charging.