California Energy Commission
DOCKETED
13-ALT-02
TN 72644
FEB 14 2014

**From:** Russell
**To:** Energy - Docket Optical System;
**Subject:** 13-ALT-02
**Date:** Friday, February 14, 2014 10:30:39 AM

Dear Energy Commission Staff:

This is to support the funding allocations for electric vehicle (EV) infrastructure and vehicle incentives in the allocation plan for 2014-2015.

The priorities from the EV driver side focus on two things. One is to have the most cost effective fueling options and the other is to have the charging stations located in the most suitable and accessible locations.

The work shop discussed the importance of the fuel cost concern in relation to natural gas and propane. The concern is every bit as important to the long term success of EV adoption. This is of particular concern when it comes to DC fast charging. Please consider using the cost of fuel delivered to the EV driver as one criterion in evaluating competing funding requests.

The need for accessible locations calls for standard ways of evaluating the potential of any proposed EV charging station. Many stations are being installed in places that are the easiest place to put them. This frequently does not include locations that will help the EV community. The stations sit unused as a result. A standard system for evaluating a site would help with the current development and lay the ground work for encouraging private sector investment in chargers. Please consider ways to establish an evaluation system for the potential usage of each charging location and incorporate that into any project requests.

Please also consider making it a requirement to be able to track the electric usage of any government subsidized installation. That usage would then be reported to state and local planners as part of the grants requirements. That seems to be happening with some but not all programs.

In addition, it would be helpful to get specific technological challenges met. These tie directly into the cost concerns. The main concerns are to get technology standards in place to support two elements of the charging systems. One element is to have universal standards for communicating usage to the various billing systems, specifically the number of kilowatt hours used by each charge. The second element is to have open source standards for billing systems that work with both network billing and with local billing methods.

There is a detailed discussion below that addresses the details of these concerns. Please feel free to contact me for further discussion and details.

Sincerely Yours

--

Russell Sydney

805-652-1482

Author: Energy and EV Secrets
www.energyandevsecrets.com
www.newenergyanswers.com
Principle Organizer and Newsletter Editor
www.sustainableclub.org
The Sustainable Transport Club is a network of EV drivers, advocates and enthusiasts centered in Southern California with contacts nationwide.

## Detailed Information Relating to the Input Summarized Above

### Cost Effective Charging

The cost of the electricity delivered is a key to successful EV adoption. The least cost solution is home charging, particularly when combined with time of use billing and solar PV installations. There are reasonable public charging options that range from free charging to paying up to three times the cost of electricity at home. Three times the cost of home charging puts the expense on par with paying for gasoline for an economic vehicle. Some public charging rates go as high as ten times the cost of home charging with double and triple the cost of a gallon of gas. That is the case for many DC fast charge systems. That undermines EV adoption.

Please consider requirements that any subsidized charging project minimize the cost of fuel (electricity) to the EV driver. There are three interrelated groups of activities that minimizing fuel costs. Here are some of the specific details that relate to that.

### Transaction Costs and Billing Methods

There are many billing options to allow EV drivers to pay for their charge. There are times when alternatives to the network charging systems reduce the cost of a charge. These become very cost effective if the billing methods are already being used by the owners of the charging locations. Here is a list of some of these methods:

- <!--[if !supportLists]-->• <!--[endif]-->Monthly or daily parking permits that add fees to cover specific charging needs

<!--[if !supportLists]-->• <!--[endif]-->Parking meters that charge a higher rate to cover the EV charge
<!--[if !supportLists]-->• <!--[endif]-->Parking garage systems that use the parking ticket to activate a charger and the payment system adds the fee to the final amount paid.
<!--[if !supportLists]-->• <!--[endif]-->Parking garage billing systems that dispense parking permits to authorize the use of charging stations. These can authorize specific rates of charger use (1.5 kW up to 20 kW or even fast charging) depending on the mix of vehicles and stations involved.
<!--[if !supportLists]-->• <!--[endif]-->Employee Parking permits that give access to specific types of chargers
<!--[if !supportLists]-->• <!--[endif]-->Student Parking permits that give access to specific types of chargers
<!--[if !supportLists]-->• <!--[endif]-->Coin operated systems
<!--[if !supportLists]-->• <!--[endif]-->Credit card operated systems
<!--[if !supportLists]-->• <!--[endif]-->Chargers on individual kWh meters billed on a regular cycle for workplace, multifamily and similar situations

Please provide funding for projects to develop, test and demonstrate the cost savings of these approaches. Developing open source solutions might be preferred.

Network charging systems add an overhead cost to a charging station. There are times when that cost reduces the cost of a charge and times when it adds to the cost. These costs can be analyzed and compared to the other options listed. It might be helpful to have a model for evaluating these tradeoffs.

The method for billing used by charging stations can also impact the costs depending on the vehicle being charged. Vehicles with high rates of charge benefit with fixed charging rates while vehicles with low rates of charge are penalized and pay more per unit of fuel (per kWh). There are three basic ways to bill and only one of these allows for equitable rates. This list will make that clear:

<!--[if !supportLists]-->**1.** <!--[endif]-->Billing by the kWh, which is comparable to buying gasoline by the gallon.
<!--[if !supportLists]-->**2.** <!--[endif]-->Billing by the hour, which is comparable to buying gasoline by the time spent at the gas station.
<!--[if !supportLists]-->**3.** <!--[endif]-->Billing by a flat rate per charge, which is comparable to paying a fixed amount to drive into a gas station. The same rate is paid no matter how much fuel you put in your motorcycle, car or sixteen-wheeler.

It is possible to combine these, as is being tried. Some networks have tried having membership dues and most have dropped them as EV drivers do not tolerate that

well. Who would pay to belong to a gas station network?

The need for low cost EVs may well result in an increased demand for low rates of charge. Those low cost EVs are more likely to be used by low income drivers so this becomes a social justice issue. There is already a need for charging mobility scooters in some communities.

This shows a clear need to encourage billing by the kWh. All other forms of fuel or energy are billed by the unit, why would EV charging be any different? It will come down to that in the long run. Getting to that point would be facilitated by having universal standards for tracking and communicating the number of kWh used in a charge. Such a standard would allow all the billing options listed above to incorporate billing by the kWh. There are indications from highly placed people that there are technical problems in that area.

Equipment Costs

The cost of providing charging stations has come down considerably. Keeping those costs down will help spread the EV adoption. Level 2 chargers for home and workplace charging cost less than $800 each and weatherproof 120 volt J1772 connectors are even less. These do not come with network charging capabilities but the other billing options listed above can be used for little to no extra cost.

Having low power systems also helps keep the cost down on the power panel side as well. A 16 amp level 2 charging station can provide 100 miles worth of charge overnight and over the course of a work day. A 12 amp 120 volt charger can provide 40 miles or more. Emphasizing these charging levels will help people see how cost effective these vehicles truly are.

The cost of DC fast charge equipment is one substantial reason the fuel cost for using them is so high. Finding ways to reduce that cost before installing them too far and wide might be a prudent consideration.

Electrical Supply Options

The DC fast chargers have high fixed costs tied to the power supply. This is based on most chargers needing at least a 60 kW supply and as much as 125 kW if more than one charger is present. Various reports, including ones from the EV Project, indicate one use a month for each charger can trigger costs as high as $800 for one charge and up to $1500 on systems with a larger power supply. These costs are largely due to the demand charges on these bills. It shows the need to get maximum use out of any high capacity charger and to find ways to cut the fixed costs.

Please incorporate the need to reduce these costs into the next cycle of

development. That would mean planning the charger locations carefully and exploring various ways to cut such costs. Here is a list of the various ways that have been identified to help cut fixed demand charge and related costs.

Solutions

- <!--[if !supportLists]-->• <!--[endif]-->Use 25 kW chargers instead of 50 kW, the 25 kW units charge 80 mile range EVs in 45 minutes instead of half an hour
- <!--[if !supportLists]-->• <!--[endif]-->Battery storage systems
- <!--[if !supportLists]-->• <!--[endif]-->Use Solar PV systems to offset peak period demand charges
- <!--[if !supportLists]-->• <!--[endif]-->Install Chargers on high voltage industrial electricity supplies like those found on large university, corporate and government campuses
- <!--[if !supportLists]-->• <!--[endif]-->Add energy management components to large installations in order to provide demand response capability
- <!--[if !supportLists]-->• <!--[endif]-->Install energy management systems specifically to manage the charge rates on banks of chargers to control cumulative peak charging rates (commercially available equipment would need to be identified)
- <!--[if !supportLists]-->• <!--[endif]-->Use one large account to handle as many charging stations as possible to spread the demand charge over as many charge cycles as possible. This may cause stations to be concentrated in one area which can work against the convenience of the charging and reduce demand.
- <!--[if !supportLists]-->• <!--[endif]-->Make sure the ownership of the charger passes to the site owner so the charger integrates fully with the high capacity electrical supply and with existing billing systems to reduce operating expenses.

There is a discussion of this issue in the *EV Project* report on *DC Fast Charge - Demand Charge Reduction*. It provides good context information. It would help if the next round of funds included some way to test the cost benefits of each of these options or even combinations of these options.

Maximizing Usage to Reduce Per Charge Costs

The other way to deal with these concerns is to make sure each charger is used as frequently as possible. This is particularly important for DC Fast chargers. This comes down to location planning and keeping the number of chargers in one area in alignment with driver needs. This means doing the following sorts of planning:

<!--[if !supportLists]-->• <!--[endif]-->Install the charger at key locations with access to as much corridor traffic as possible
<!--[if !supportLists]-->• <!--[endif]-->Position the charger at distances far enough from corridor destinations that vehicles will need a large charge for their journey
<!--[if !supportLists]-->• <!--[endif]-->Use locations that maximize the charging potential for local destination and workplace charging as well as locations at the center of areas with lots of adjacent multifamily units.
<!--[if !supportLists]-->• <!--[endif]-->Position the chargers to provide the get home safely charging needs of communities within ten to twenty mile range
<!--[if !supportLists]-->• <!--[endif]-->Install in places that have predictable baseline demand from adjacent light duty fleets with either existing or near term anticipated usage.
<!--[if !supportLists]-->• <!--[endif]-->Avoid installing too many competing chargers in one area

Using existing power panels and transformers helps to keep the cost down. Finding the extra capacity on these components is one of the big challenges for infrastructure development. A closer analysis of EV driver needs and driving patterns would show that most charging needs can be satisfied with low rates of charge. Higher rates of charge are desirable under specific, identifiable conditions and those can be planned for and accommodated.

Please help by providing models that allow a site to match the needed charging capacity for the highest number of vehicles. One high capacity charger may not help as much as several lower capacity units.

Having stations distributed around a destination area has many advantages. One advantage is it allows chargers to use different power supplies. The other advantage is that it increases the options for easy access to more destinations.

Accessible Locations

There are charging stations being installed in locations that will seldom if ever be of any real use to the greater EV community. Many of them are being installed where there is space and power to make installation easy. The ones that are seldom used are a waste of resources and detract from the EV adoption effort. The location is the key to the benefit gained from a charging station.

Can you please take steps to ensure that the chargers are in the right locations to be effective? That means within convenient distances from the destination or workplace. The next wave of users will expect to park in the same places they currently do and still be able to charge when needed.

Family safety is an important part of this. Would you want your children or grandparents to visit the charging location any time of the day or night?

This situation can be corrected with basic evaluation criteria that focus on the utility of the location for EV drivers. This can be a complex analysis involving all types of charging needs. It can also be as simple as having a clear and significant need for one type of charging such as workplace of destination charging. A parking lot with hundreds of spaces and stay times of over one hour is a pretty good bet for a couple of chargers. It would really help if evaluation criteria could be developed, standardized and tested.

Accessible Installation Guidelines

There is a developing problem that involves having vehicles block the ability to use a charger. This happens with internal combustion engine vehicles ICEing the charger and with fully charger vehicles lingering beyond the charging time. Non EV drivers think that limiting the time spent at the charger is the solution. That would mean EV drivers would have to stop what they are doing and move their car when everyone else at that parking location does not have to do that. That is a disincentive to EV adoption.

A more reasonable option is to update the installation guidelines so that every charger can access more than one parking space. The guidelines developed three and more years ago do not handle this well. Is there some way we can update that as part of this next round of funding?

The simplest step is to install chargers in every second parking space. The ideal is to install them in islands between two rows of parking and give four spaces access to the charger. Multi story garages can increase this level of access by installing chargers on several levels above the main power supply location. This adds a small cost for wires and conduit while potentially doubling and tripling the use rates for each charger. It also eliminates the need for disadvantageous parking restrictions and enforcement.

This touches on the need to minimize parking requirements that add extra work and effort to charging EVs. This includes things like limiting the parking times and using cumbersome charger activation methods like using cell phones.

It would help if the next round of funding can support these and other ideas to help make charging easy and cost effective in terms of both time and money invested. The people doing the work at the potential charging locations do not have the knowledge or experience to figure these things. The charging station providers may or may not care if the charger is used as long as they make the sale and install the charger profitably. They may think that higher charging fees are

preferable to improving EV adoption.