| DOCKETED | |
|---|---|
| **Docket Number:** | 18-HYD-01 |
| **Project Title:** | Executive Order B-48-18 Workshops |
| **TN #:** | 223617 |
| **Document Title:** | Stacey Reineccius Comments Docket 18-HYD-01 and Executive Order B-48-18 Workshops -- EV infrastructure and business model success for Multi-Unit Dwellings |
| **Description:** | N/A |
| **Filer:** | System |
| **Organization:** | Stacey Reineccius |
| **Submitter Role:** | Public |
| **Submission Date:** | 5/30/2018 8:59:30 AM |
| **Docketed Date:** | 5/30/2018 |

*Comment Received From: Stacey Reineccius*
*Submitted On: 5/30/2018*
*Docket Number: 18-HYD-01*

## Docket 18-HYD-01 and Executive Order B-48-18 Workshops -- EV infrastructure and business model success for Multi-Unit Dwellings

Hello,
Please find attached some comments and suggestions for achieving a successful deployment of EV infrastructure fro the 42% of Californians, and the majority of urban residents, who are not single family home owners and who are currently denied access to the savings, credits, HOV and performance of electric vehicles yet are contributing to the subsidies for those who can have access.
These recommendations come from several years and several million dollars of efforts in deploying these systems into multi-family properties and learning lessons in that process.
I believe the attached can be the basis of effective directed funding effort to kick start a volume market that will bring in the rental population to the pool that can participate in and use EVs in California.

Please feel to contact me with any questions about the contents.
Thank you,
Stacey Reineccius

*Additional submitted attachment is included below.*

# Thoughts and Recommendations for the Improvement of Deployment Uptake in SCE EV Infrastructure programs in Multi-Tenant/Multi-Family Properties

DRAFT

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**Introduction:**

Multi-Family properties are a difficult segment for the delivery of EV Charging services and has to date proven very difficult for utilities and many others to successfully deploy and see actual utilization. Numerous failures to scale in Solar, Energy Efficiency, and low uptake in the recent EV infrastructure programs by utilities and semi-private players such as NRG/EVGO and product vendors such Chargepoint attest to this challenge.

Powertree Services specializes in multi-family energy services and holds numerous patents for the technology (hardware and software) and business models and procedures needed for successful multi family deployment (See https://patents.google.com/?assignee=Powertree&oq=Powertree and https://patents.google.com/?assignee=Powertree&status=GRANT )

Powertree's ownership and backers include a multi-billion property owner/management company, a 40 year old Construction/Solar contracting company, technology specialists and Panasonic Corporation -- makers of solar panels and batteries for leading EV auto OEMs.

Key factors affecting current utility (SCE) program adoption include:

- Split Business/Monetary Incentive between Drivers and Property Owners
- Lack of Value Positive Business model for Property Owners
- Infrastructural Insufficiency of Existing Properties and Line Drops
- Inefficient Cost Effectiveness Criteria
- Inappropriate Sizing of Utility EVSE Offerings
- Inappropriate Technology in Programs to Date
- Lack of Assurance for Drivers
- Lack of Site Development Support for Independent Marketers and Contractors

I discuss each of these points and make recommendations on how to improve the SCE EVSE infrastructure program to achieve a more cost effective and much more highly utilized deployment.

**Discussion:**

Split Business/Monetary Incentive between Drivers and Property Owners

Property Owners of concern here are in the business of property rental and property management. As such, they need to be approached as businesses and not lumped into programs reflecting a single family owner mindset and incentives. As in solar, this mindset tends to create programs that are attractive to single family homes which succeed in driving adoption in that sector, but fails in reaching the majority of urban populations, which are often lower income and residing in newer multi-family developments.

The Renter/Tenant is the end point cash customer for an EV. They are the driver and the bill payer. Any investment in any EV is based on their decisions and their cost effectiveness/convenience/feature attractiveness decisions when they purchase an auto and choose a place to reside.

The core split of incentives is that the Property Owner retains the power of control over any infrastructural modification to their properties yet gains or retains little or nothing for their efforts and expenditures. Concurrently, the Tenant/Driver who is paying the bill has no control over their ability to get anything but the most meager of charging capability (120vac L1 via extension cords is typical) and is most likely to suffer the consequences of inadequate charging access (time waste, cost). Because tenants tend to move in just a few years, they have no interest in footing the bill for a capability that will be left with the property when they move.

**To succeed here EACH PARTY MUST HAVE A WIN.**

Lack of Value Positive Business model for Property Owners

Current programs place burdens (as seen by the Property Owner) on the property including:

- ➔ Disruption of parking due to construction or electrical service adjustments
- ➔ Constraints of remodeling ability for living spaces due to use of electrical capacity for EVs
- ➔ Restrictions on use of already scarce parking spaces and future flexibility due to Easements
- ➔ Loss of parking space rental revenue or amenity value
- ➔ Additional management costs and learning curves on a technology set (EVs and EVSE) for staff that are NOT technologically oriented or revenue incented
- ➔ Current SCE models and tech offerings restrict drivers to being tenants in the properties in question -- thereby restricting the number of potential customers for EVSE use
- ➔ Turnover of tenants disrupts in-building driver population with EVs. New tenants unlikely (based on EV % of cars) to have EVs -- leading to loss of any revenue from EVSE for owner
- ➔ Variable revenues for services are not able to be capitalized by Ownership
- ➔ Rent Control terms in many cities place restrictions on capitalization rates of returns and terms thereof. This is triggered by Ownership buy in to costs and acts as barrier
- ➔ Due to rent control constraints and variable income, the direct purchase of equipment places the Property Owner in a money losing position for most capital expenditures.

These challenges require a carefully constructed business model that provides owners with a steady , non rent control affected, net positive value with minimum management learning curve or management time requirement.

> **To succeed, a plan is needed whereby the Driver saves money over cost of gasoline and vehicle ownership while the Property Owner sees an effective increase in value for their property without risk of a stranded investment. As property owners at a recent MUD Ownership Investment Conference put it: "You have pay me to put EV charging in my properties, otherwise I'll go with the other opportunities that pay me for the same resource…"**

Infrastructural Insufficiency of Existing Properties and Line Drops

Most Multi-Tenant/Family properties have significant internal electrical services. Our experience in surveying dozens of MUD properties shows that in dozens of properties of 400Amp or larger existing main service panels (with matching main breaker size) that 100% of them were under-served by the local Utility line drop (rule 16) by between 65% and 75%.

When EVSE get placed in these properties they create a true risk of overload as the on the ground observation of the load capacity is up to the rated size of the panel and breaker. Installers will do a load survey and logging of the property reaching the conclusion that EVSE can be placed at up to 50% to 75% of the panels rated capability. When this is actually used at typical EVSE intervals of several hours they have a high coincidence with onsite property loads which can lead to overheating of the line drop and possibly fire. The recent GhostShip fire in Oakland was caused by just such an overloading scenario (NOT related to EVs however).

**This leads to opportunity in the SCE program to (a) speed the delivery of whole building data to Owners/Contractors and (b) to have the line drops (and associated distribution support) upgraded to provide the MUD property with sufficient service at its nameplate rated capacity at much lower costs and without easements or other cost obligations being put on the Property.**

Inefficient Cost Effectiveness criteria

Currently the industry and policy are all measuring "ports" as in charge cords -- BUT that is an improper measure and ultimately can lead to wasteful investments.

Measuring ports alone assumes a one car to one charger linkage, which does not reflect the real potential for sharing of scarce charging resources.

One port, if managed correctly, can serve multiple vehicles. A DC fast charger for example is inherently shared, a Powertree MUD station is inherently shared, a workplace public charger is inherently shared, etc.

This can have an impact on the anticipated costs and related infrastructure budget needed.

A better metric is "Vehicles Enabled" – which is based on the number of vehicles that could use a single port as their PRIMARY charging location (say for 75% of their charging or more). This would be adjusted by the % of the general fleet that can be supported by a given charger.

This assessment approach would make for a smarter investment allocation as the State and Environmental goals are defined as more electric VMT (at lower carbon intensity per mile) and thus reduced emissions overall. Providing charging more cost effectively gets better results in both cost efficiency and emissions reduction.

For example: A single family "port" supporting a single car would have a Cost Effectiveness of 1:1

A DC Fast Charger with CHAdeMO only might service 20 vehicles as primary and with an adjustment for vehicle reach as follows:

| DC | Mkt Share of DC** |
|---|---|
| 1 - CCS | 7.13% |
| 2- TSLA | 20.9% |
| 3- CHAdeMO | 2.4% |
| TOTAL DC MKT SHARE | 30.36% |

**Data here is based on CA EV population market share of vehicle capabilities per manufacturer monthly sales reports cumulative since 2011.

The DCF would be 20 * 2.4% = 0.48 cost effective.

A dual format DCF (CCS + CHAdeMO) would be 20 * (7.13% +2.4%) = 1.906

As AC is present on EVERY vehicle this would have a market share adjustment of 100%.

A Shared access AC charger serving 6 vehicles would look like: 6 * 100% = 6.0 cost effectiveness rating. This could be enhanced by the speed rating of the vehicles capable of being served. An example being this table from current market data:

| KW | Mkt Share KW AC** |
|---|---|
| under 3.4 | 33% |
| 6.6 to 11.5 | 46% |
| Over 11.5 | 21% |

| |
|---|
| 100.00% |

For example a 3.4 KW would be a factor of 33%. A 9.6KW would be (46%+33%) = 79% and a over 11.5KW would be 100%.

So we might see a ranking as follows assuming max for AC.:

| Category | Cost effectiveness Ranking (higher is better) |
|---|---|
| DC CHAdeM | 0.47 |
| Single Family/Non-Shared MUD | 1.00 |
| DC CH+CCS | 1.90 |
| DC TSLA SC | 4.17 |
| MUD Shared | 6.00 |

**Investments should be guided toward locations that yield the *most vehicles enabled instead of just the most ports* – thereby achieving greater cost-effectiveness in terms of enabling EV utilization and eVMT.**

Inappropriate Sizing of Utility EVSE offering

Current Utility EVSE infrastructure programs, building on the intent of more ports vs. vehicles enabled have to date required minimum installations of 10 ore more EVSE in a location at 40Amps per location.

These requirements, being based on ports rather than vehicles enabled, create a negative incentive for Property Owners as each parking spot is precious and creates rental income value to the owner.

Further, many properties do not have many parking spaces and cannot allocate as many spaces as are being required. [Note it is feasible using traffic analysis techniques common in telecom to estimate the max # of vehicles supportable by a given EVSE unit.]

**A shift in strategy to supporting a given number of VEHICLES instead of stalls would be much more effective. This can be combined with load management, and site access management to enable sharing and infrastructure enhancement to bring added value to the Property owner.**

Inappropriate technology in offerings tried to date

Due to the predominance of Single Family home owner or DC Fast equipment, sales applications in Multi-Tenant/Family have been force fit to utilize the technology available. This has resulted in inappropriate equipment that does not take into account the unique technological and operational needs of Multi-tenant/Family properties.

Key technologies NOT addressed to date that are critical to enabling successful operation in MUDs include:

- Load Management technologies such as battery support to leverage current electrical panel capacity
- Access management for door and gate control to allow non-tenant sharing and access.
- Vehicle stall management to prevent ICE occupancy (aka ICE'ing)
- Resiliency support to ease driver anxiety and improve safety
- Alternate Subscription/Rental models to enable guaranteed Property Revenues and Risk reduction for owners
- Third Party relationship with owners allowing mitigation of negative impacts of rent control constraints

**Properly implemented we have seen that 6 to 10 vehicles can be supported in their primary at/near home use per single EVSE stall. Battery and load management systems as well as access control components need to be enabled as part of the EVSE installation as they can enable full rate service delivery on multiple EVSE without the time and cost of a service upgrade. Backfeed from the battery system is NOT a requirement but load support from the battery is.**

Lack of Assurance for Drivers

Outside of Home Ownership and College/Professional Education a vehicle is the largest financial decision a typical person makes in their life.

The shift to a new fueling style will impact the Driver in many ways. Drivers therefore need to know that their investment in a vehicle fueled by electricity is a safe one for their lifestyle and their economics.

Current EVSE investment have been backward looking (what's available already) rather than forward looking (what will they need in 3-5 years) in support for the rate of charge and locations that will be needed.

This manifests in the push for varied charging formats and adequate charger speeds for the more practical vehicles with 200+ mile range and 10KW+ rate of AC charging.

**Focusing on universally accessible, high-rate AC charging, near or at home, with shared access -- will address key driver concerns and spur EV sales and utilization. Additionally, a clear focus on remaining cost competitive with gasoline needs to be assured.**

Lack of Site Development Support for Independent Marketers and Contractors

Multi- Tenant/Family property ownership is highly concentrated due to the cost of these properties and the customs and rules of financing these properties. A simple example is banks will not typically lend to

a prospective owner who dos not already have 2+ years of experience in rental properties and also that properties typically need to be 5 units or higher to get the most favorable tax and investment treatments.

As a result, the relationships with, and access to, property owners is absolutely key in being able to educate and engage the ownership in deploying EV infrastructure.

To accomplish this, the EVSE site acquisition development phase (incorporating marketing, sales, site survey, engineering and contracting) needs to be funded and assured of the ability for follow up installation and operation. To date, this investment need has not been met.

The cost for the successful identification, inspection, engineering, and contracting for an MUD is about $10,000+ per final property in our experience in 2015-2017 timeframe. This cost is only achieved with scaled groups of 50 properties or more committing to a project -- and this site acquisition support needs to be coupled with the actual capital for installation and construction.

**Support must be provided to organizations with the relationships and ability to reach appropriate scale – and this support should be coordinated with SCE's proposed construction investments. SCE should collaborate with third party EVSPs who can serve the market effectively. Ownership needs to be structured in such a fashion that the property owner is incented to deploy EVSEs via guaranteed income and minimal risks.**

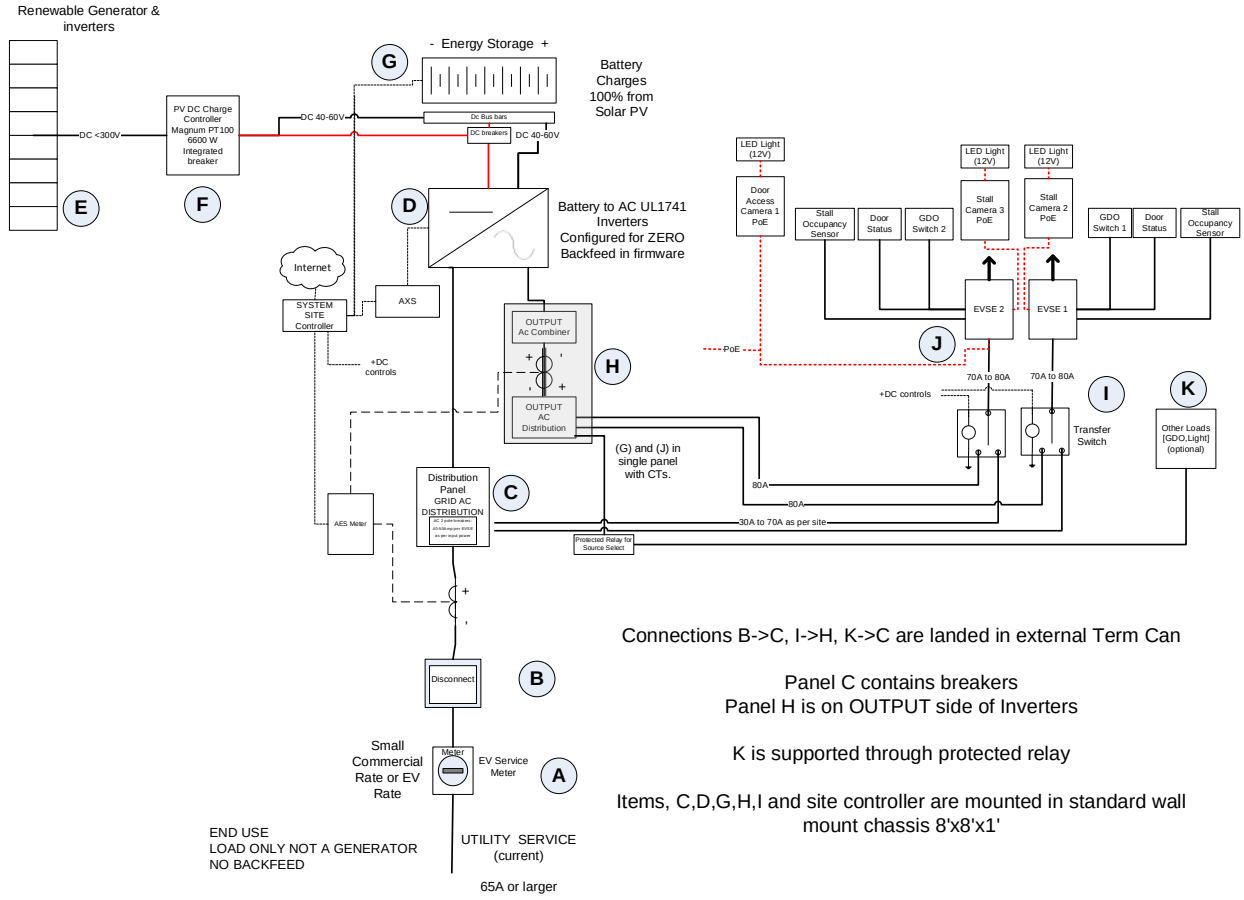
## Summary Recommendations for MUD success:

- **Adjust target to number of vehicles supported (as primary charging location) vs number of Ports deployed (6 vehicle capability as minimum)**
  - **Use market adjusted data to determine vehicles supported and priority thereof**
- **Continue to promote non-Utility owned EVSE model(s)**
- **Promote business models that reward all parties and incent property owners**
- **Require shared use of stalls. Do not include dedicated use stalls as these are subject to stranding as tenants turnover.**
- **Include load management and load support technologies as eligible for financial support. This will speed deployment, avoid need for new line drops, and mitigate excess parking consumption:**
  - **Load management mitigates upgrades and speeds deployments**
  - **Battery support w/o backfeed (resiliency and safety, speed deployment)**
  - **Provide, as priority, data on WHOLE BUILDING load history during analysis**
  - **Allow use of existing panels but perform drop and distribution upgrades to match panel capacity maximum**
- **Include Access control technology in $$ support to enable sharing**
- **Include Site development costs in support ($10K per building) but limit to parties capable of delivering in volume (500 vehicles+ enabled).**
- **Reimburse based on Apartments enabled (e.g., $300/Apt) based on number of apartments within a 1 block radius of the proposed location.**

CONFIDENTIAL – Work Product –

Simplified SLD for Powertree Station Installation with DC Coupled Solar, No Backfeed, EVSE Support

S. Reineccius, 3-1-2018 Single Meter no backfeed. Solar + EVSE for Interconnection




Connections B->C, I->H, K->C are landed in external Term Can

Panel C contains breakers
Panel H is on OUTPUT side of Inverters

K is supported through protected relay

Items, C,D,G,H,I and site controller are mounted in standard wall mount chassis 8'x8'x1'

## Key Challenges preventing Powertree participation in SCE Charge Ready Program with suggestions to resolve

Several Issues combined to prevent Powertree from being able to feasibly participate in the SCE Charge Ready 1.0 program. Please note that these comments come from the perspective of achieving successful penetration into Multi-Family residential properties and drivers.

1) Overall program did not show positive cost-benefit for participating MUDs
2) Program did not provide reimbursement for costs associated with Site Development.
3) Program required focus on EVSE count rather than vehicles enabled
4) Equipment design focused on a fixed configuration of 10 EVSE per site with no modifications
5) Prior items lead to burdens on project sites that made projects infeasible.
6) Powertree system design is more than just a EVSE unit connected to AC power and needs SCE qualification to see existing systems in place rather than be shipped to SCE.

1) **Unclear/Negative Cost benefit:** Net costs associated with adjusting system design and operational approaches for participation in SCE Charge Ready did not pencil to a positive cost-benefit within the Multi-Family property owner business operational cycle. While MUCH better than the other IOU programs (PG&E and SDG&E) the costs and risks of liability as well as ongoing management costs and potential for reduction in property value due to the program made the program not pencil out for MUD owners.

2) **Site Development Costs:** Powertree's experience is that it takes appx. 4-6 months and $12,000 to $15,000 per building to identify and secure the contracted participation, site survey, data logging, and engineering design for a project site to proceed. No coverage or milestone payments for this cost were provided. (See separate "Thoughts" paper)

3) **Program focus on EVSE count rather than vehicles served.** The common goal of the State programs, GHG reduction and monetary operations benefit are all keyed to VEHICLES but the Charge Ready was focused on EVSE ports. Powertree designs are focused on maximizing the number of vehicles supported and enabled by available EVSE -- while minimizing equipment cost. Therefore, the SCE focus of reimbursements on EVSE count did not adequately address the costs of our vehicles enabled focused approach. The focus on vehicles makes for a much more accurate cost-benefit investment analysis. For example:

   A 10 EVSE site under the prior CR program requires appx. 400 Amps of electrical capacity, a new drop, and the dedication of 10 parking stalls to EV owning customers who reside in the property. With the current population of EVs being under 2%, this means that the only property likely to obtain usage levels of one vehicle per EVSE has to be 500 units or larger. This reduces the likely population of sites to very few locations AND carries a very high risk of stranding in just a few years as large properties have high tenant churn. (Properties of 50 units and larger have an industry average churn of over 50% per year.)

   By contrast, in a shared use site approach such as Powertree, just 2 stalls can be placed in a much larger pool of buildings without disrupting the current tenant base. Each stall can

serve as many as 10 vehicles in a shared configuration (with a fast AC L2 charger). Thus, the chargers can draw upon not only the residents of the building where installed but the larger (10X to 12X) population of drivers within a convenient 1-2 block walk of the location.

4) **Inflexible 10 EVSE focus.** The SCE design of a simple new drop plus 10 EVSE is inflexible and creates many issues for MUD owners/managers. This lack of flexibility to shift focus to vehicle support limits the number of feasible sites (many MUD sites do not have 10 parking stalls and if they do, they cannot devote or restrict that many to the easement and use restrictions of the CR program.)

5) **Site costs imposed.** The SCE program lacked investment support for other program strategies that can resolve property owner concerns pertaining to cost, disruption, and revenue requirements. Areas that need to be addressed include: 1) appropriately valuing stalls as rental income for property, 2) providing access control equipment, 3) enabling adequate revenues to incent property owners to install EVSE, 4) deployment of storage and solar or other load management techniques to mitigate need for new service panels and reduce time to operational permission, 5) addressing liability of ownership and risk of stranded investment if SCE or ownership stop providing EVSE access due to poor economics or other issues during term of agreement.

6) **Requirements for shipping a unit to SCE for certification** assumes vendors to be an EVSE maker rather than an integrator/operator, as in the case of Powertree. While Powertree does manufacture certain elements (battery bank, electronics, software, controls) its key value is the design and integration focus on multi-family. Operators and integration providers need to be enabled in the Charge ready program, and utility staff should make visits to integrated sites such as those Powertree currently operates in San Francisco in order to understand the configuration flexibility and performance attributes desired by MUD owners and managers.

## Program Specific Suggestions for SCE Charge Ready 2.0 for MUD penetration:

1) Adjust Metrics and Investment to focus on Vehicles and Apartments Enabled and/or Vehicles and Apartments Served.

   Drivers typically need to see infrastructure that is local, convenient and available to them before they start the process of buying a new vehicle. The average CA fleet turnover is 6 years for personal vehicles. Accordingly, the California market needs adequate charging-enabled locations COUPLED with educational outreach and sustaining financial support to the enabled locations to facilitate those vehicle purchases while the vehicle population grows.

2) Provide qualified providers with financial support for Site Recruitment, Survey and Qualification.

   Specialized understanding, experience, relationships, and knowledge of the Multi-Family industry operating norms are key to successful site recruitment. The CR program should provide

qualified operators with MUD experience and proven performance to be supported with the CR program. Reimbursement should be provided for the expense of recruitment as measured by the achievement of specific milestones (contract, data logging, survey & engineering, etc.)

3) Provide equipment incentive/reimbursement based on apartments/vehicles enabled basis.

   Instead of paying a fixed reimbursement/incentive/rebate per EVSE unit, SCE should provide a capitalizable amount per apartment/vehicle enabled within a defined distance. Make this amount sufficient to allow installation of enhanced systems such as shared, battery supported, controlled access systems (no PV as that is outside this program). For example: $350 per enabled apartment based on neighborhood census. This encourages more efficient and accurate siting to serve the maximal number of vehicles. As with current program guidelines, the transformer/drop/wire upgrades to match current service panel rating should be part of the reimbursable budget.

4) Include coverage for site optimization components as allowed elements of the EVSE installation

   Devices and tech necessary to allow entry to a location, share and control access, and to optimize the performance of the EVSE should be part of the covered equipment in the program. This will not only cost optimize the program but will also extend its reach and encourage innovation.

5) Ramp Support / Promotion to encourage local adoption.

   Where the program currently includes a market education budget, a critical portion of the ramp process is not currently supported: Maintaining operational status while local vehicle traffic builds to the point of self-sufficiency.

   We suggest a mechanism to provide operational costs support that ramps down as vehicle use of a location ramps up. This is comparable to the approach that CEC uses currently for its Hydrogen fueling station program. In this way, the infrastructure is promoted and maintained as drivers work their way through the conversion process to EVs. A monthly support to cover internet costs, land cost, etc. that gets reduced by ~20% of the revenue derived from vehicle service support fees (ie charges for power or subscriptions) would ensure that systems once built remain active.