SCAG EV Charging Station Study

EV Charging Station Guide For Small Cities

Revised and Approved

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INNOVATING FOR A BETTER TOMORROW

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ABOUT SCAG

SCAG is the nation's largest metropolitan planning organization (MPO), representing six counties, 191 cities and more than 19 million residents. SCAG undertakes a variety of planning and policy initiatives to encourage a more sustainable Southern California now and in the future.

VISION

Southern California's Catalyst for a Brighter Future

MISSION

To foster innovative regional solutions that improve the lives of Southern Californians through inclusive collaboration, visionary planning, regional advocacy, information sharing, and promoting best practices.

EXECUTIVE SUMMARY

This guide was developed to assist the small cities in the SCAG region that are early in their EV journey better understand the broader EV landscape. It includes an overview of general electric vehicle (EV) charging basics, funding EV infrastructure, state requirements and design considerations, coordinating with utilities, local EV policy and procedures, and guidelines for successfully implementing electric vehicle charging stations (EVCS). This guide was developed for the following cities in the SCAG EV Study: Artesia, Pico Rivera, and Redlands, but may also be applicable for other cities in the SCAG region that have limited EV infrastructure installed. Cities have multiple roles they can play in fostering EV adoption including educating the public, coordinating with the private sector, and converting city-owned fleets to demonstrate EV capabilities.

EVCS Project Considerations for Cities

- Pick an appropriate site
- Determine ideal charger quantity, type, and placement
- Plan for ongoing operation and maintenance
- Determine ownership structure
- Apply for available funding

City staff should make themselves familiar with EV charging basics, including the types of chargers, their appropriate use cases, and typical costs so the correct charging solution can be identified early in the planning process. Site design will vary on a case-by-case basis, but projects should consider a few key variables such as access to electrical power, ADA requirements, and visibility of stations to drivers. As EVCS infrastructure grows, Cities may need to consider enforcing applicable parking requirements, so chargers remain accessible to drivers. Cities can also work closely with the private sector to facilitate installing EVCS at commercial and MUD properties by connecting them to resources, pre-approved contractors, and posting clear permitting and design requirements to minimize permit processing times.

Cities can help kickstart EV adoption by implementing their own projects for City-owned infrastructure at highly trafficked public sites including City Hall, libraries, parks, and city-owned parking lots. Cities can demonstrate EVs are viable options by starting to convert their own fleets. While California has multiple funding programs, it remains highly competitive. When funding is limited, Cities can explore alternate ownership structures to reduce upfront costs to project implementation. This hands-on project experience will help Cities better educate the public and coordinate with private sector partners.

PUBLIC AWARENESS

Overall public awareness around EV charging stations is still low including the different types, use cases, costs, and best practices around installation. While 71% of drivers overall expect to charge at home, a majority of residents in multiunit dwellings expect to charge mostly with publicly available charging stations if they were to own an EV[1]. This presents a clear need for potential site hosts to understand the different types of charging stations, which type is appropriate for their site, how much they may cost, installation best practices, and the overall business case and other potential benefits. Cities have a role to play in educating stakeholders in their community on this subject.

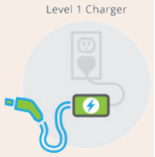
EV CHARGING BASICS

CHARGER TYPES AND TYPICAL COSTS

EV chargers are categorized into three different levels depending on the amount of power they can output to an EV. Product and installation costs generally increase as power output increases because increased loads are more likely to trigger electrical upgrades. Product costs for chargers may decrease over time as manufacturers realize economies of scale, particularly for Level 3 DC Fast Chargers (DCFC); however, installation costs are not likely to decrease over time as electrical equipment is a mature industry and labor costs are expected to increase over time.

After charging stations are installed, there are two primary ongoing costs: networking costs and maintenance/repair costs. Most Level 2 EVCS and DCFCs are networked charging stations; they connect to a cloud platform and allow the charging stations owner to monitor utilization and set charging rates. EVCS may have a cloud platform hosted by the charging manufacturer (i.e ChargePoint) or a 3rd party (i.e Shell RechargePlus). Charger maintenance responsibility, while typically minimal, generally falls on the charging station owner. Most charger issues are software related and can be resolved by rebooting the charging station. Typical hardware maintenance items include worn out or broken ports, damaged or removed cables, and cracked screens. It is recommended to conduct inspections of charging stations 1-2 times per year. Charging station owners can choose to maintain the stations in-house or contracted this service out to the charging manufacturer or other 3rd party through a service level agreement (SLA). Table 1 summarizes the key differences, use cases, and typical costs per port.

TABLE 1: OVERVIEW OF CHARGING TYPES AND TYPICAL COSTS

CHARGER LEVEL	Plug Type and Power Output	Recommended Use Case	Typical Installation Costs ($/port)	Typical Ongoing Costs ($/port/yr)	Image
Level 1	Standard household outlet, 1.9kW @ 110V	Overnight residential charging. Optional low-cost charging option in MUDs. Can use pre-existing outlets. Recharges 3.5-6.5 miles per hour.	$1,000-$2,000	Networking: N/A. Maintenance: minimal	

[1] Consumer Reports. December 2020. Consumer Interest and Knowledge of Electric Vehicles, 2020 Survey Results.

CHARGER LEVEL	Plug Type and Power Output	Recommended Use Case	Typical Installation Costs ($/port)	Typical Ongoing Costs ($/port/yr)	Image
Level 2	Standard SAE J1722; 1.9kW-19.2kW. Typical 7.2kW @ 240V.	Overnight residential, workplace, and commercial charging (2-4+hrs). Recharges 14-35 miles of range per hour.	$10,000-$50,000	Networking: $120-$360. Maintenance: $150-$1,000	
Level 3 (DCFC)	Multiple types CCS1, CHAdeMO, Tesla; 25kW-350kW+ @ 480V 3 Phase	Short stops along major corridors and commercial charging (<1hr). The typical EV can expect to recharge from 20% up to 80% in under 30 minutes with a DCFC.	$50,000-100,000+	Networking: $120-$360. Maintenance: $1,000+	

SITE SELECTION & INSTALLATION GUIDELINES

Developing an EVCS project requires thought and planning to be cost effective and beneficial to EV drivers. In the earliest deployments vendors and other third parties dictated site selection and charger placement. While that may have worked reasonably well to date with the limited number of charging stations installed, a lack of knowledge about where to site charger stations is still a significant barrier to expansion of an EV charging network within cities that have thus far been overlooked by the private sector. Furthermore, without a guiding criterion in place, cities may not be able to direct the expansion of their EV Charging network in a way which meets their specific goals such as equitable access to EV Charging or as a key component of economic development. Additionally, sites need guidance on how to choose what type of charging (Level 2, Level 3/DCFC) to install at various locations. SCAG hosts a PEV ATLAS which includes a variety of suitability results throughout the region. Cities and project developers can use the tool to help identify areas charging stations are most needed in an area. Other resources related to EV charging can be found online at SCAG's Alternative Fuels & Vehicles Projects.

SITE TYPE CONSIDERATIONS

Cities with limited publicly available charging infrastructure can start by evaluating their own properties for EVCS for city staff or the public as these sites may be highly visible within the community, have high foot or vehicle traffic, and show the community that EVs can be a viable option for them. Examples of publicly owned sites can include: City Hall, police departments, libraries, court houses, parks, transit hubs, and city-owned parking garages. Cities can also work with community stakeholders and property managers of private locations for other highly visible and trafficed areas such as large employment centers, commercial plazas, schools and colleges, hotels, and other popular destinations. Lastly, identifying sites near major travel corridors or sites with high parking turnover may be appropriate for DCFC.

EVCS Site Selection Best Practices

- High vehicle traffic
- Easy for drivers to see
- Close to power source
- ADA compliant
- Near amenities

As sites are being considered, the site host should think about where the EVCS are located in reference to the site as a whole. Placing EVCs closer to site amenities can act as a perk for EV drivers, though that needs to be balanced with the ADA and access to power considerations. Some cities in Southern

California have additional aesthetic requirements for EVCS installation, which may need to be factored into the final design. In some cases, these design considerations line up well with each other and result in a cost-effective project. In other cases, the final design may need to balance between opposing considerations if for example utility power is far away from a building entrance. Site hosts may need to decide how to prioritize different factors in the final design.

DETERMINING QUANTITY OF STANDARD AND ADA EVCS

Once a site had been selected for an EVCS project, the site host or project developer must determine how many charging stations to install and where to place then within the site. California Building Code (CBC) has minimum requirements for EVCS infrastructure for new construction or major modification projects. Adding EVCS to existing sites typically does not trigger CBC requirements; but these minimum requirements can be a useful reference for determining how many EVCS to install at a site. 2019 and 2022 Non-Residential mandatory measures are summarized in Table 2.

TABLE 2: CALIFORNIA BUILDING CODE NON-RESIDENTIAL MANDATORY MEASURES

Total number of Actual Parking Spaces	Number of Required EV Charging Spaces (2019 Code)	Number of Required EV Charging Spaces (2022 Code)
0-9	0	0
10-25	2	4
26-50	4	8
51-75	7	13
76-100	9	17
101-150	13	25
151-200	18	35
201 and over	10% of total	20% of total

Additionally, any time EVCS are installed at a publicly accessible location, California requires a certain minimum number of chargers to be ADA compliant. Specific requirements are summarized in Table 3. ADA compliance can introduce design constraints as these standard and van accessible stalls must have access aisles with truncated domes at the curb, paths of travel, and be graded less than 2%. Sample ADA compliant layouts are shown in Figure 2 and Figure 1.

TABLE 3: EVCS ADA REQUIREMENTS

Number of EVCS at a Facility	Van Accessible	Standard Accessible	Ambulatory
1-4	1	0	0
4-25	1	1	0
26-50	1	1	1
51-75	1	2	2
76-100	1	3	3
101+	1, Plus 1 for each 300 or fraction thereof, over 100	3, Plus 1 for each 60 or fraction thereof, over 100	3, Plus 1 for each 50 or fraction thereof, over 100

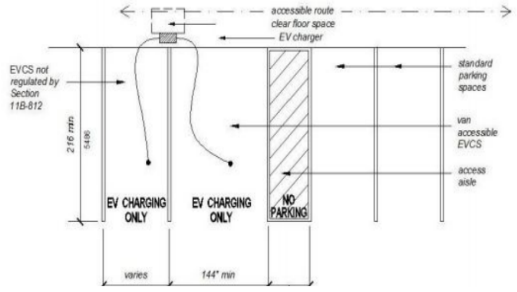


Figure 2. Sample layout with 2 EV Chargers and 1 Van Accessible Stall

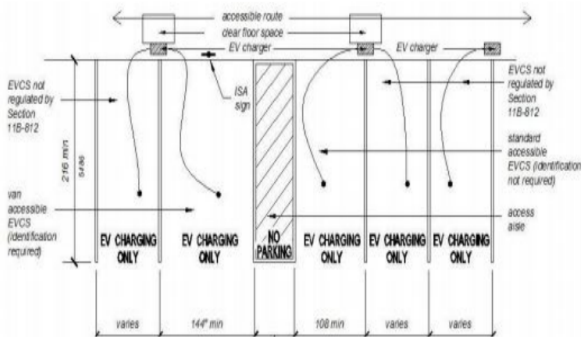


Figure 1. Sample layout with 5 EV Chargers, 1 Van Accessible Stall, and 1 Standard Accessible Stall

OTHER FACTORS TO CONSIDER

After ADA considerations, access to electrical power should be considered. It is common for EVCS projects to require a new electrical service, so locating EVCS near utility transformers, power poles, or vaults can reduce trenching, conduit, and overall installation costs. In some cases, buildings may have spare electrical capacity the EVCS can tie into. In these situations, EVCS can be located closer to the buildings. Networked EVCS require access to the internet or cellular signal. If signal is weak at a site such as an underground parking garage, cellular repeaters may be needed, or the project may need to consider product options that have integrated cellular or Wi-Fi capabilities.

UTILITY COORDINATION

Coordination with utilities is critical for larger EVCS buildouts, or for projects that include DCFC, as it is likely that significant site and utility infrastructure upgrades may be required. Site owners should contact their utility representative early in the planning process to check if there is sufficient electrical capacity to accommodate the new loads. If significant utility upgrades are needed, it can take 12-18 months in some cases before there is sufficient electrical capacity available. If there is a need for chargers sooner utility representatives may support the site design, providing recommendations on charger placement, and connecting the site to available incentives or programs. Cities that reside in SCE can leverage the Charge Ready program launched on July 12, 2021. Under this program, SCE will complete the engineering design and pay for utility side infrastructure and behind the meter infrastructure for EV charger installations that have at least four level 2 charging ports. This program has internal cost per port effectiveness criteria so not all sites may qualify. Increasing the number of charging stations to 10 or more is a strategy to increase the likelihood of being selected into the program as infrastructure upgrade costs can be spreads among more charging ports. The program has a focus on MUDs and sites located within disadvantaged communities, so fewer chargers may be needed to qualify at those sites. The program fast-tracts any needed infrastructure upgrades and offers rebates on qualified charging stations.

PARKING AND SIGNAGE CONSIDERATIONS

EVs still require at least 30 minutes to charge, even with DCFCs; therefore, clear signage that directs EV drivers where to park and charge will help ensure a positive and safe user experience. It is generally considered best practice that an EV can only park in an EV charging stall if the vehicle is actively charging to increase availability for other EV drivers. Other best practices include placing time limits for vehicle charging, generally up to 4 hours for Level 2 EVCS. One strategy to encourage drivers to not charge beyond stated time limits is to increase the cost of charging past established time limits. Occasionally, non-EVs have been noted to park in EV charging stalls. As EV ownership increases, the need for consistent

signage and enforcement of parking policies may increase. Cities reserve the right to issue warnings, ticket or tow vehicles that do not abide by EVCS parking rules. This should be considered as a last resort for repeat offenders or reserved until electric vehicles are widely adopted and drivers are aware of EVCS etiquette. The City can reference the California Plug in Vehicle Collaborative which provides sample EV parking and charging signage[2]. The California Manual of Uniform Traffic Control Devices contains updated directions and guidance for EV related signage placed on public streets[3].

PAYMENT MECHANISMS

In many cases EV drivers will need to pay for the electricity dispensed to their vehicle. Traditionally each charging vendor had its own payment mechanism through a mobile application, or RFID card for workplace charging. This requires users to have multiple apps given the variety of charging station vendors. This is cumbersome for users and limits access to those with a smartphone. California now requires new Level 2 EVCS to include credit card readers as of January 2021, and the same for new DCFCs in January 2023[4]. The intent is to increase access to charging stations to EV drivers that may not have a mobile phone and to simplify payment mechanisms. Lastly, the EV industry is currently working on new "plug and charge" protocols, where the charging station automatically identifies the vehicle plugged in and bills the owner at the end of the charging session[5]. This is similar to how the Tesla network already operates, but in an open ecosystem. Cities should continue to track the development of this protocol and coordinate with manufactures to update City-owned EVCS when the protocol has been finalized.

SUPPORTING THE PRIVATE SECTOR AND INFLUENCING EV ADOPTION

Cities can go beyond educating the public on EVCSs and support the private sector to rapidly deploy EVCS. Cities can help educate commercial property and multifamily property owners on benefits to installing EVCS, connect site hosts to resources, and streamline permitting processes. In traditional energy efficiency programs, some municipalities have been known to pre-vet qualified contractors to build trust in the community. Cities can take similar approaches with EVCS vendors, either building their own list of contractors or directing interested site hosts with other reputable sources such as SCE's Trade Pro list[6].

BUSINESS OPPORTUNITY FOR EVCS

Commercial property and multifamily property owners have multiple ways to benefit from installing EVCS at their sites. Networked EVCS owners can set rates and charge users for the electricity dispensed and can markup electricity costs to generate a profit. In California, EVCS owners can generate additional revenue

[2] https://www.calbo.org/sites/main/files/file-attachments/ca_accessibility_for_ev_charging.pdf

[3] https://dot.ca.gov/-/media/dot-media/programs/traffic-operations/documents/f0018447-13-01-a11y.pdf

[4] https://calevip.org/sites/default/files/docs/calevip/California_EVCS_Regulations_Guide.pdf

[5] https://www.caranddriver.com/news/a35044132/plug-and-charge-ev-charging-mustang-mach-e/

[6] https://sce-chargeready.force.com/s/trade-professional-resources

by generating and selling low carbon fuel standard credits, though this may only be viable with larger buildouts or aggregated among multiple properties. Some charging stations have large displays which can be used for advertisement space, providing a secondary revenue stream. There are indirect benefits to installing's EVCS including increasing the dwell time of business patrons, and thus increase retail sales, and promoting corporate branding to attract new customers, tenants, or employees[7]. Sites can realize these benefits, even if they decide not to charge users for the cost the electricity.

Overall profitability and return on investment of EVCS will depend on how the site chooses to monetize the station. Sites may elect to not charge users for the electricity and derive value strictly through increased retail sales, rents, or branding. For sites that do want to charge for electricity, public charging rates generally fall between $0.20/kWh and $0.60/kWh, with the lower range generally resulting breaking even and the higher range resulting in net profit over the life of the charger.

PERMITTING AND INSPECTIONS

One area that Cities can directly support the private sector deploy EVCS is to streamline EVCS permitting , particularly for non-residential applications. While specific permitting requirements vary by City, a plan check is typically required for commercial EVCS which can result in lengthy review periods and multiple iterations of corrections. Cities can reduce the overall permitting time by having clear plan requirement checklists or pre-approved design plans posted to the City website, so project developers can provide a complete set of drawings on the first submission and minimize corrections. Template checklists can be found on GOBIZ's website and can be tailored to a City's specific needs or adjusted based on project type. For Cities that have not converted to electronic permit submittal, it is recommended they do that as soon as practicable. At times commercial projects may be subject to the approval of the engineer, building official, and planning department. If multiple departments need to approve the permit, these efforts should be coordinated to minimize processing time. AB 970 will impose maximum permitting processing review and approval times for cities with a population less than 200,000 starting January 1, 2023. Inspections are typically required after permits are issued and the equipment has been installed. Some municipalities offer an online appointment system, while others coordinate their appointments by contacting the jurisdictions building & safety department.

VOLUNTARY BUILDING CODE REQUIREMENTS

As previously mentioned, California's 2019 Green Building Code has requirements for EV Infrastructure as part of new construction projects. The 2022 Building code, effective January 1, 2023, significantly increases minimum EV infrastructure requirements. Cities can adopt voluntary Tier I and Tier II measures during their tri-annual building code update to further increase minimum requirements for new construction projects. Cities can adopt Tier II measures as a method to significantly increase available EV charging infrastructure.

While building codes address new construction and major modifications, CEC's assessment of EV charging infrastructure finds that new construction building codes alone may not be enough to meet EV demand in 2030[8]. It may be cost prohibitive to include EV infrastructure in building retrofits; therefore, technology o

Figure 3. Sample Curbside EVCS

[7] https://atlaspolicy.com/wp-content/uploads/2020/04/Public-EV-Charging-Business-Mo

[8] Crisostomo, Noel, Wendell Krell, Jeffrey Lu, and Raja Ramesh. January 2021. Assembly B Infrastructure Assessment: Analyzing Charging Needs to Support Zero-Emission Vehicles in 2030. California Energy Commission. Publication Number: CEC-600-2021-001

ptions such as mobile charging or sharing multiple chargers on a circuit should be allowed as options to meet local requirements. Cities may also consider curbside charging options. While curbside chargers can be more challenging and expensive to install, they can help supplement more traditional EVCS locations, as shown in Figure 3.

CITY OWNED INFRASTRUCTURE AND FLEETS

Cities can participate directly in the EV sector by providing charging infrastructure to the public and developing infrastructure for their own fleets. Cities can therefore increase the visibility and demonstrate the viability of electric vehicles. This will provide additional benefits of improving the local air quality. Installing EVCS infrastructure and fleet conversions can be capital intensive, and outside funding or creative ownership structures may be needed to scale.

STATE FLEET CONVERSION REQUIREMENTS

Specific CARB requirements applicable to City-owned fleets includes include the Innovative Clean Transit (ITC), Advanced Clean Trucks (ACT), Advanced Clean Fleets (ACF), and executive order N-79-20. The ICT requires all transit vehicles to be zero emission by 2040; starting in 2029 only zero emission transit buses may be purchased. The ACT does not directly impact fleets, as this imposes purchasing requirements from vehicles manufactures to sell minimum percentages of medium and heavy duty zero emission vehicles. It is expected that vehicle manufacturers will rely on fleet sales to meet these requirements. The ACF is the compliment to the ACT. While still being finalized and barring certain vehicle exemptions, for public fleets it is expected to require 50% of new medium and heavy-duty vehicle purchases to be zero emission in 2024 and 100% of new medium and heavy-duty vehicle purchases to be zero emission in 2027. Lastly California is requiring all new light duty vehicle sales to be zero emission by 2035.

FUNDING OPPORTUNITIES

The following funding opportunities may be used by the public sector to reduce the cost of EV infrastructure or electric vehicles for municipal fleets. Several of these funding sources are available to the private sector. The City should consider providing information related to available incentives towards electric vehicle purchases, electric vehicle charger purchases, and EVSE infrastructure on an EV landing page on the City' website. In several instances funding is prioritized for Disadvantaged Communities (DACs) and should be highlighted on the City's website. The City of Santa Monica provides a useful example of this.

DIRECT INCENTIVES AND REBATES

There are currently multiple funding sources available to offset the upfront and ongoing costs of EV charging stations. **Error! Not a valid bookmark self-reference.** summarizes common incentives and rebate programs available in within the SCAG region (as of July 2022). An up-to date list of EVCS funding and incentive programs can be viewed at AFDC Laws and Incentives webpage. Some funding programs may be in high demand and funds can be exhausted quicky. It is recommended to identify available funding sources, eligibility, and availability requirements early in the planning process to increase the chance of securing funds.

TABLE 4: EVCS REBATE PROGRAMS – JULY 2022

Entity	Program Name	Summary	Other Notes
Southern California Edison	Charge Ready	No-cost infrastructure up to charger stub out and incentives on eligible charging stations.	4 charging port minimum (10+ recommended). Preference for multifamily and DACs
California Energy Commission	CAleVIP	Rebates on qualifying L2 and DCFCs for qualifying site types	Funding must be reserved before installation. Funding allocated by region and may be exhausted quickly.
California Air Resources Board	Clean Vehicle Rebate Project	Rebates for qualifying low or zero emission light duty vehicle purchases.	Rebates vary on technology type and are limited to vehicles under certain price thresholds
California Air Resources Board	Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project	Voucher for qualifying low or zero emission medium and heavy duty vehicle purchases.	Voucher issued at point of sale through qualified vendors and manufacturers. Value vary by vehicle and technology type

LOW CARBON FUEL STANDARD

Under AB32, in 2009 California created the low carbon fuel standard (LCFS) to reduce GHG emissions from the transportation sector. The goal is to decrease the carbon intensity of the CA transportation fuel pool, 20% by 2030, and provide incentives for low carbon alternative fuel sources[9]. Fuel providers can generate credits for producing low carbon fuels, including dispensed electricity from EVCS. After charging stations are installed, the site host should reach out to brokerages that specialize in the sale of LCFS credits. Fuel data and metered energy usage must be reported quarterly to CARB. Site hosts should coordinate with the EVCS manufacturer so that energy usage is automatically sent to brokers who can facilitate the sale of credits generated each quarter. The total number of and value credits generated will be impacted by the carbon intensity of the electricity used, the amount of electricity dispensed from the chargers, and the overall supply and demand of credits in the market. Credit values have fluctuated over time, at one point peaking at $200/credit. As of July 2022, credit prices have fallen to under $100/credit[10]. Site hosts can use this LCFS revenue to offset EVS infrastructure costs, hardware costs, and other ongoing costs (maintenance, networking fees, etc.) not recovered by selling electricity.

OTHER SOURCES

Over $1 billion in Carl Moyer Funds has been allocated since 1998 to reduce air pollution in the state. Typically issued by local air quality management districts, these funds can be used for various projects that reduce nitrogen Oxides (NOx), particulate matter (PM10) and reactive organic gases (ROG) from heavy-duty vehicles. The South Coast Air Quality Management District (SCAQMD) runs a new solicitation

[9] https://ww2.arb.ca.gov/our-work/programs/low-carbon-fuel-standard/about

[10] https://www.neste.com/investors/market-data/lcfs-credit-price

for projects each year and intends to award funds for infrastructure projects, on-road heavy duty vehicles, and off-road equipment[11]. Public and private sector entities may apply to this program.

The Mobile Source Air Pollution Reduction Review Committee (MSRC) has invested more than $400 million in clean transportation projects in Southern California since 1990. The organization includes most of Southern California and contains South Coast Air Quality Management District (SCAQMD), Southern California Association of Governments (SCAG), San Bernardino County Transportation Authority (SBCTA), Los Angeles County Metropolitan Transportation Authority (Metro), Orange County Transportation Authority (OCTA), Riverside County Transportation Commission (RCTC), and California Air Resource Board (CARB) as member agencies. Recently MSRC has funded new EV purchases and EVCS installation projects at Costa Mesa, Brea, Los Angeles, Rialto, Hemet, and Highland. MSRC regularly posts requests for proposals for cities or the private sector to apply for funding for specific clean transportation projects[12].

SUPPORTING PUBLIC PRIVATE PARNTERSHIPS

EV INFRASTRUCTURE OWNERSHIP MODELS

While California will likely continue to provide funding for EV infrastructure, it remains highly competitive. Forming public-private partnerships and exploring alternative financing models can help reduce financial barriers. Cities or site hosts can purchase, own, and operate the chargers themselves but that typically comes with networking fees and the responsibility of maintaining the chargers. For this reason, its generally recommended to charge users for the electricity to recover ongoing costs. For highly utilized sites, Cities may be able to provide an easement or lease parking spaces to third parties where the vendor retains sole ownership of the charging stations and is responsible for maintaining them. Other successful ownership models include charging as a service (CaaS), where the site host pays little to no money upfront and pays the vendor over time via a subscription model, typically on a per kWh basis. Lastly, shared ownership and revenue models may be possible. These ownership models, summarized in Table 5, may not be viable for all projects, so site hosts should with closely with project developers and the charging vendors to determine the best ownership model for the specific project. For third party ownership models, Cities should work closely with project partners to ensure sites meet local design requirements and goals such as multiple payment mechanisms and open-access plug types.

TABLE 5: SAMPLE EV OWNERSHIP MODELS

Line Item	Host Owned	Charging as a Service (CaaS)	Hybrid Host-Vendor Owned	Vendor Owned
Service Model	Host own and operate	Vendor own and operate via subscription	Shared ownership	Vendor own and operate
Ideal for:	Pilot projects, site desire to control charging revenue	Large fleet electrification projects	When sites want limited control on charger O&M	Sites with very high expected utilization
Equipment Ownership	Host	Vendor	Host or Vendor	Vendor
Installation Costs	Host	Vendor	Host or Vendor	Vendor

[11] http://www.aqmd.gov/home/programs/business/business-detail?title=heavy-duty-engines

[12] http://www.cleantransportationfunding.org/current-rfps-solicitations

Line Item	Host Owned	Charging as a Service (CaaS)	Hybrid Host-Vendor Owned	Vendor Owned
Electricity Costs	Host	Vendor	Vendor	Vendor
Support & Maintenance Costs	Host	Vendor	Vendor	Vendor
Charging Revenue	Goes to Host	Varies	Split with Vendor	Majority Percentage to Vendor
Pricing Controls	Host	Vendor	Vendor	Vendor
Contract Term	Contract Typically Not Required	Contract Typically Required	Contract Typically Required	Contract Typically Required
Network Fees	Yes	No	Yes	Yes
Monthly Subscription Fee	No	Yes	No	No

CONCLUSION

The public sector has multiple roles to play in fostering EV adoption including educating the general public, partnering with the private sector and converting city-owned fleets to demonstrate EV capabilities. Cities can follow the lead of other smaller cities in Southern California like Santa Monica to support EV adoption through multiple pathways. In 2017, the City set a goal to have 1,000 EV publicly available EVCS by 2025[13]. Based on their current installation pace, they are on-track to hit their goal. The City's success can be attributed to forming relationships with charging station vendors to help develop sites, and offering rebates for targeted markets including small business, multiunit dwellings, and low-income residents. The City has also created a dedicated webpage outlining City and third-party resources to provide information about transitioning to electric vehicles. Cities may not have the resources to offer their own incentives, Cities can start by first educating themselves on EV technology and deploy city-owned public infrastructure at highly trafficked sites and piloting EVs within City fleets. This will help build a strong foundation and knowledge base for the City increase awareness of EVs in the community and be able to better coordinate with the private sector to scale with the infrastructure buildout.

[13] https://www.smgov.net/uploadedFiles/Departments/OSE/Categories/Energy/EVAP_Final_Draft_WEB.pdf

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