

Draft—Open for Public Comment
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Santa Monica Electric Vehicle Action Plan



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List of Terms

BEV: Battery electric vehicles use electric motors and motor controllers instead of internal combustion engines for propulsion.

Charge-ready (also known as EV-ready): The necessary electrical capacity has been installed in a garage or parking facility to support electric vehicle charging (typically 20-40 amps of available service for a level 2 station).

Cost-recovery: System capability to recover the costs associated with operating EV charging stations by charging a fee for the electricity provided (i.e. through an RFID or card reader attached to the charging station).

DC Fast Charging: Direct-current (DC) fast charging equipment, also called Level 3, requires 208/480 V AC three-phase input. It is the fastest charging option available. EVs equipped with either a CHAdeMo or SAEcombo DC fast charge receptacle can add 50 to 70 miles range in about 20 minutes.

EV: Electric vehicle, including plug-in hybrids and pure battery electric vehicles.

EVSE: Electric Vehicle Supply Equipment (also known as EV charging stations or EV chargers). This includes the charging station itself and all components required for the installation and use, such as: conductors, plugs, power outlets, wiring, ground connectors, etc.

Level 1: provides charging through a 120 volt (V) AC plug. Based on the battery type and vehicle, AC Level 1 charging requires 15-20 amps of service and adds about 2 to 5 miles of range per hour of charging time. Level 1 is the slowest and least-expensive charging option.

Level 2: provides charging through either a 240 V (typical in residential applications) or 208 V (typical in commercial applications) AC plug. Level 2 charging requires 20 to 100 amps of service (typically 20-40 amps) and adds about 10 to 20 miles of ranges per hour of charging time.

MUD: A multi-unit dwelling (also known as multi-family building), is a residential building consisting of three or more units.

OSE: City of Santa Monica Office of Sustainability & the Environment

PEV: Plug-in electric vehicle (includes pure battery electric and plug-in hybrid vehicles, known as PHEVs)

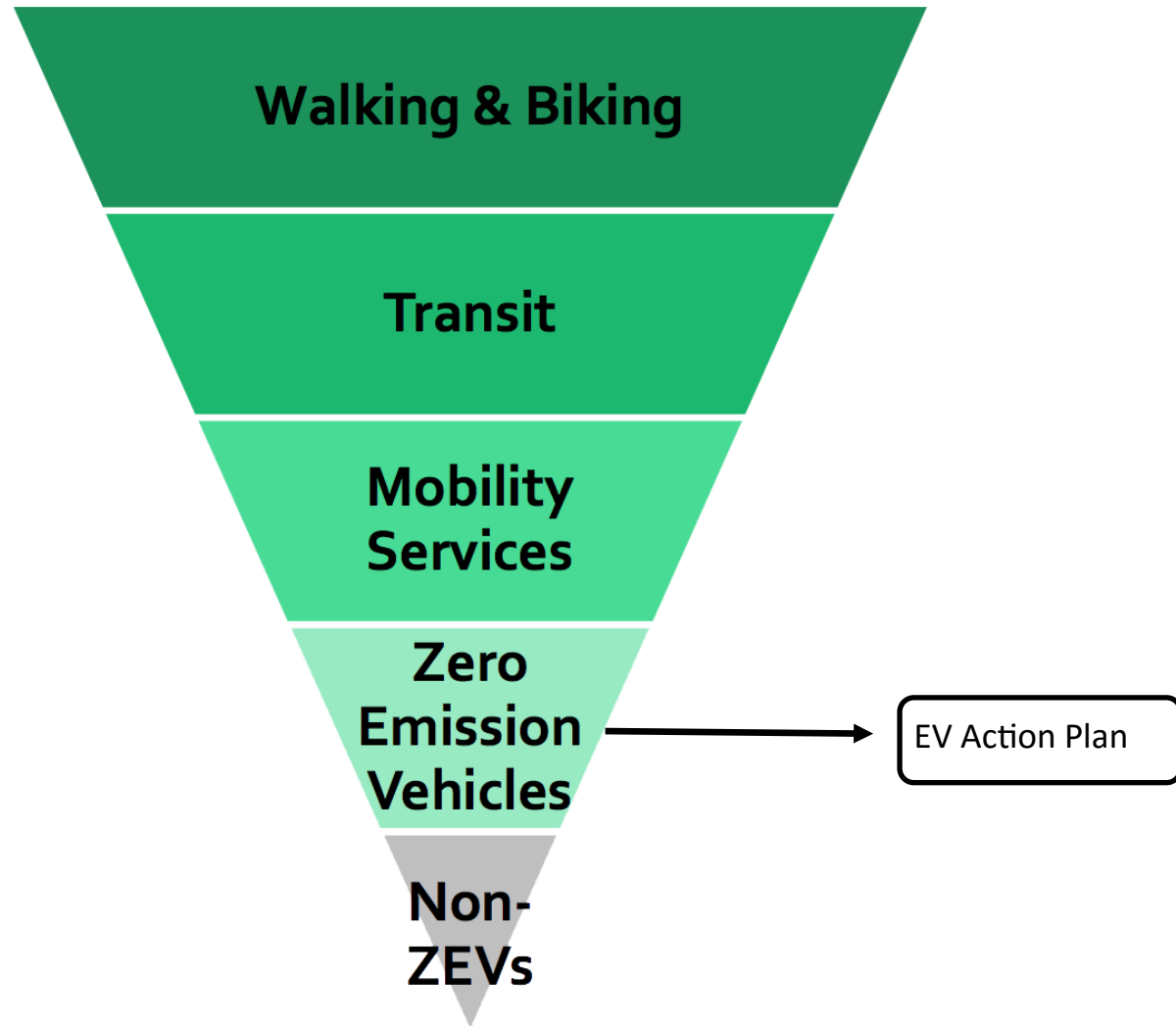
PHEV: A plug-in hybrid electric vehicle has both an electric motor that is battery powered and a gasoline engine

SCAG: Southern California Association of Governments.

SCE: Southern California Edison (Santa Monica's electric utility provider)

ZEV: Zero-emissions vehicle

Figure 1: Mobility Framework

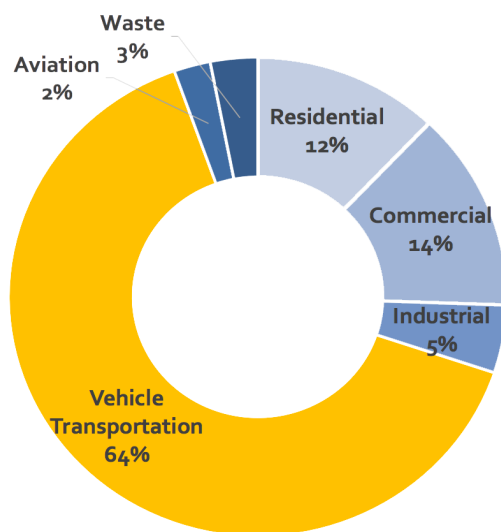


Executive Summary

Electric vehicles (EVs) are moving into the marketplace faster than ever before. With 64% of Santa Monica's carbon footprint produced from the transportation sector, vehicle electrification is essential to significant carbon reductions.

This will require an investment in charging infrastructure and policies to support the transition. The City can be a catalyst to increase EV use and can

Figure 2: Citywide Emissions by Sector (2015)



provide the essential components to reach those efforts.

Expanding EV charging facilities is a complex process involving many different players. With the anticipated increase in EV ownership, local governments have a call to action to support EV infrastructure expansion because they have jurisdiction over facilities that can be utilized for charging (e.g. public parking lots and on-street facilities). In addition, cities play a crucial role in providing essential infrastructure, coordinating stakeholders, and developing policies to support EV charging.

Santa Monica is well positioned to increase per capita electric vehicle ownership by making charging stations more readily available due to its environmentally progressive residents, business owners, and property owners.

Providing additional public charging and facilitating private charging can enable those who have delayed purchasing EVs to make the switch.

The Electric Vehicle Action Plan (EVAP) is part of a greater mobility framework (Figure 1) that prioritizes walking, biking, and transit before vehicles. The City is actively improving access to these alternative transportation modes through the Bicycle Action Plan, Pedestrian Action Plan, and Downtown Community Plan. These plans incorporate the newly-adopted Vision Zero, a strategy to eliminate all traffic fatalities and severe injuries.

For the trips that require vehicles, electric vehicles are the preferred option due to the immense air quality and greenhouse gas reduction benefits compared to fossil-fuel powered vehicles.

The EVAP includes a series of priorities, programs, and policy recommendations to make EV charging more accessible to existing and future EV drivers in Santa Monica. This plan was developed through a comprehensive review of existing municipal and state EV charging plans, academic studies, and industry collaboration and research.

The City commissioned the UCLA Luskin Center to analyze EV growth projections; demand for workplace, retail, and residential charging; curbside charging potential; and to provide recommendations for a pilot rebate program that targets residents of multi-unit dwellings (MUDs).

The EVAP seeks to expand the public charging infrastructure from 75 to approximately 300 charging ports within 5 years and to increase EV ownership from 3% to 15% by 2025.

EVAP priorities include: modernizing and expanding the existing network, providing incentives for property owners, siting public charging in residential neighborhoods, and creating outreach and incentive programs for EVs and charging.

By establishing a comprehensive and strategic approach, Santa Monica can

transform and sustain its role as a leader in sustainable technologies and carbon emissions reductions.

Disclaimer: Electrification of heavy-duty vehicles is an important part of wide scale emissions reductions, however the EVAP focuses primarily on light-duty passenger vehicles.



Background

Benefits of EVs

Santa Monica recognizes the important role EVs play in reducing carbon emissions and cleaning the air. According to the American Lung Association's (ALA) Clean Air Future study, health and climate costs caused by internal combustion engine vehicles totaled \$37 billion across ten states in 2015.

The ALA study estimates that combined health and climate benefits from a 100% EV scenario in California could reach \$13.5 billion by 2050. These benefits include:

- Fewer asthma attacks, lost work days, premature deaths, heart attacks and emergency room visits as the result of cleaner air
- Climate benefits linked to reduced costs to agriculture and the environment

- Reduced carbon emissions: EVs powered by electricity from the local grid produce 54% less lifetime carbon pollution than gasoline cars (Plug In America, 2016).
- Reduced emissions that generate ozone and particulate matter

In addition, there are significant economic benefits available to EV drivers, utility companies, and the local economy:

- Cheaper maintenance costs due to fewer parts (e.g. no engine or transmission)
- Estimated fuel savings of more than \$3,500 over the lifetime of the vehicle if gas prices fall to \$2.50/gallon; savings will be closer to \$9,000 if gas prices are \$3.50/gallon (Plug In America, 2016)
- Savings from fuel costs and maintenance can be invested back into the local economy

- Greater proportion of off-peak energy sold, which can reduce rates for utility customers
- Potential load control such as vehicle-to-grid integration

Supporting EV adoption through the strategies outlined in this plan will enable Santa Monica to take advantage of these benefits.

Another study found that electric vehicles emit only 19.8% of the total heat emitted by conventional vehicles per mile (Li et al, 2015). Replacing conventional vehicles with EVs reduces the urban heat island effect, which can lower energy consumption of air conditioners and reduce carbon emissions.

EV Charging Basics

EV owners typically charge at home and, if offered, the workplace. If only one or neither of these options are available, drivers must rely on public charging infrastructure. This is difficult with current public charger availability in Santa Monica.

There are three levels of EV chargers, which charge at different rates depending on the voltage:

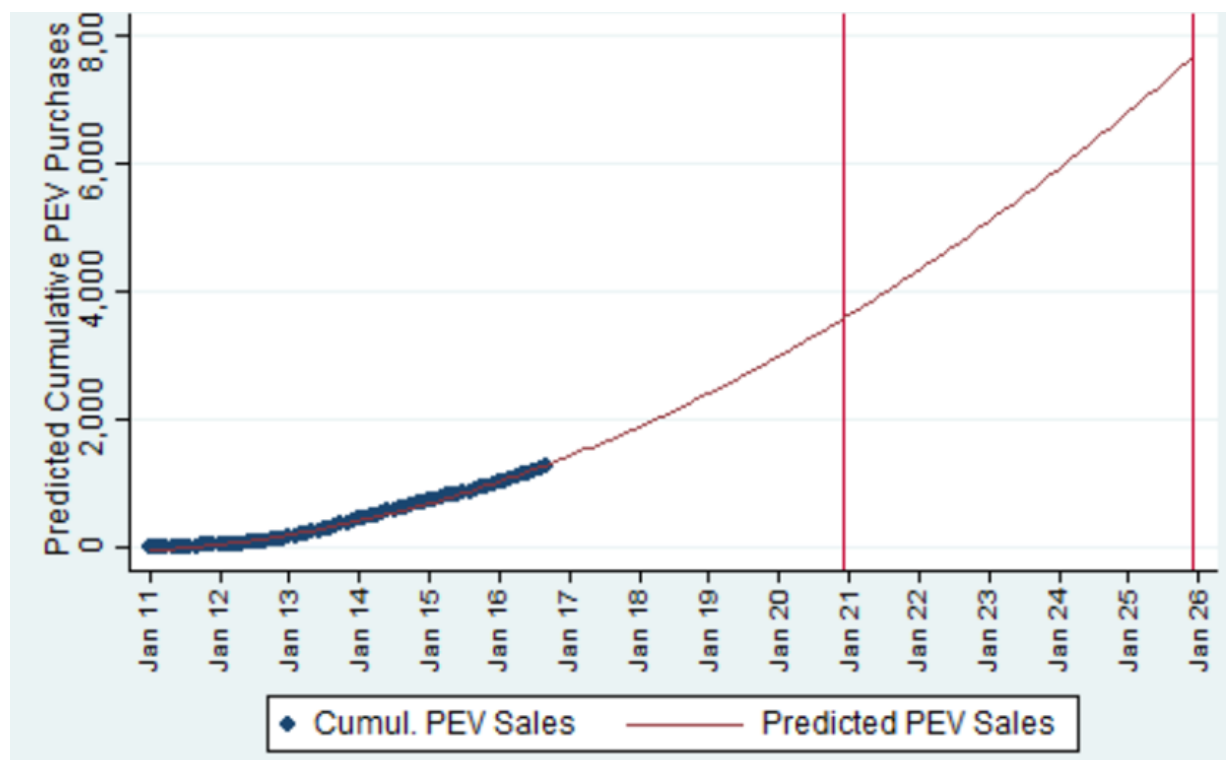
- Level 1 chargers (120V) are the slowest and least expensive option. They provide 2-5 miles of charge per hour of charging time.
- Level 2 chargers (240V) add about 10-20 miles of range per hour of charging time.
- DC Fast chargers or Level 3 chargers (480V) are the fastest charging option available and will add 50-70 miles of range in about 20-30 minutes.

The term “smart charger” refers to chargers with network connectivity.

Features include user notifications when charging is complete, payment collection through an RFID or credit card reader, demand management, and maintenance alerts for station hosts. All of the City’s public chargers are currently “dumb chargers”, which lack the above capabilities.

Demand management refers to the management of the electrical load. Most smart charging stations are capable of managing electrical loads to prevent strain on the grid and mitigate peak demand charges. Peak demands are typically met by using fossil fueled power plants, which increase greenhouse gas emissions.

Figure 3: 2011-2026 Predicted Cumulative EV Purchases in Santa Monica



Source: IHS Auto; Prepared by: UCLA Luskin Center for Innovation, May 2017

Santa Monica

History

Santa Monica first installed EV chargers in the mid-90s and purchased some of the original versions of electric vehicles for its City fleet. Santa Monica residents have also been early adopters of electric vehicles and have been strong advocates for expanded EV charging infrastructure. Many residents would like to purchase electric vehicles but lack charging options — particularly those living in MUDs.

In 2016, Santa Monica committed to becoming a carbon neutral city by 2050 or sooner. In order to achieve this, the community will need to drastically reduce its use of fossil fuels by electrifying vehicle transportation and encouraging active modes of transportation.

Walking and biking are the optimal forms of mobility, followed by transit and shared mobility services. Since many trips will continue to be made by vehicles, electrification is essential to achieving

greenhouse gas reduction targets and cleaner air.

The City's Role

Demand for electric vehicles is rising quickly in California cities due to a variety of factors:

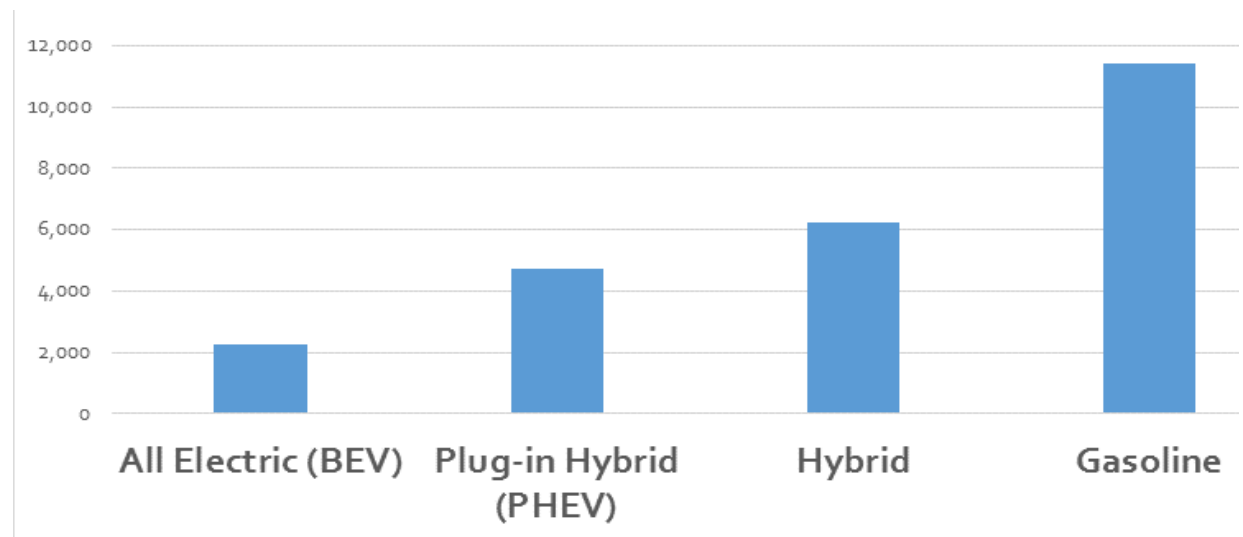
- Decreased cost of EVs
- Increased driving range of EV batteries
- Rebates and tax credits
- Volatility of gas prices
- Increased make and model options
- Increased environmental awareness
- Increased availability of public

chargers

- Increased installation of solar
- Additional benefits, i.e. HOV privileges, free metered parking

Santa Monica's goal to expand electric vehicle adoption aligns with state and regional goals to reduce fossil fuel combustion and greenhouse gases. A series of new and upcoming funding opportunities at the federal, state, local, and utility level provide unprecedented opportunities to expand the EV charging network in Santa Monica.

Figure 4: Average Annual Vehicle Emissions in California (Pounds of CO₂e)



Source: Department of Energy, Alternative Fuel Data Center

The City has several unique roles in facilitating EV infrastructure deployment and EV adoption:

- Procurement: Public charging stations and fleet vehicle purchases
- Regulatory: Permitting, building & zoning codes, electric utilities.
- Market Facilitation: Rebates & Incentives
- Ownership: Leveraging city owned property for public EV parking and charging, e.g. public parking lots and street parking
- Stakeholder engagement: residents, property owners, City staff, & utilities

The EV Challenge

As the City supported the proliferation of EVs within its own operations and throughout the community, Santa Monica has seen an increased demand for public charging stations and, in particular charging for residents who live in multi-unit dwellings (MUDs). Increasingly, competition for charging stations between City vehicles and resident

vehicles has generated tension in the electric vehicle community. Limited road way and curb space for the many users creates competition that will be amplified by the necessary actions of designating EV charging spaces.

EV owners typically use private chargers if offered, but if not, they utilize the limited public charging facilities. Challenges are greatest for residents in MUDs because they often lack dedicated parking or adequate electrical capacity to support EV charging. Unsupportive landlords and prohibitive installation costs can be additional barriers. Challenges vary based on the size and ownership models of different MUDs. (See Appendix II: MUD Case Studies and Best Practices for EV Charging.)

Santa Monica's existing public infrastructure is outdated and inadequate for the current and future demand of residents and City fleet vehicles. As EV charging develops, there is more demand on the grid, changing the overall power

demand profile. Thus, smart grid systems will be needed to modify behavior change.

EV ownership requires thoughtful planning and investment in order to support daily commuting patterns and charging needs. The electrical infrastructure of our buildings and our utility grid were not designed to handle additional electrical demand of EV charging today.

Supporting and maintaining the infrastructure also requires coordination amongst various City departments/divisions and other government entities responsible for providing energy. Upgrading infrastructure to support EV charging requires coordination with Southern California Edison and can incur significant hidden costs in addition to the equipment and installation fees (Figure 5).

Figure 5: Cost Ranges for EV Charger Installation

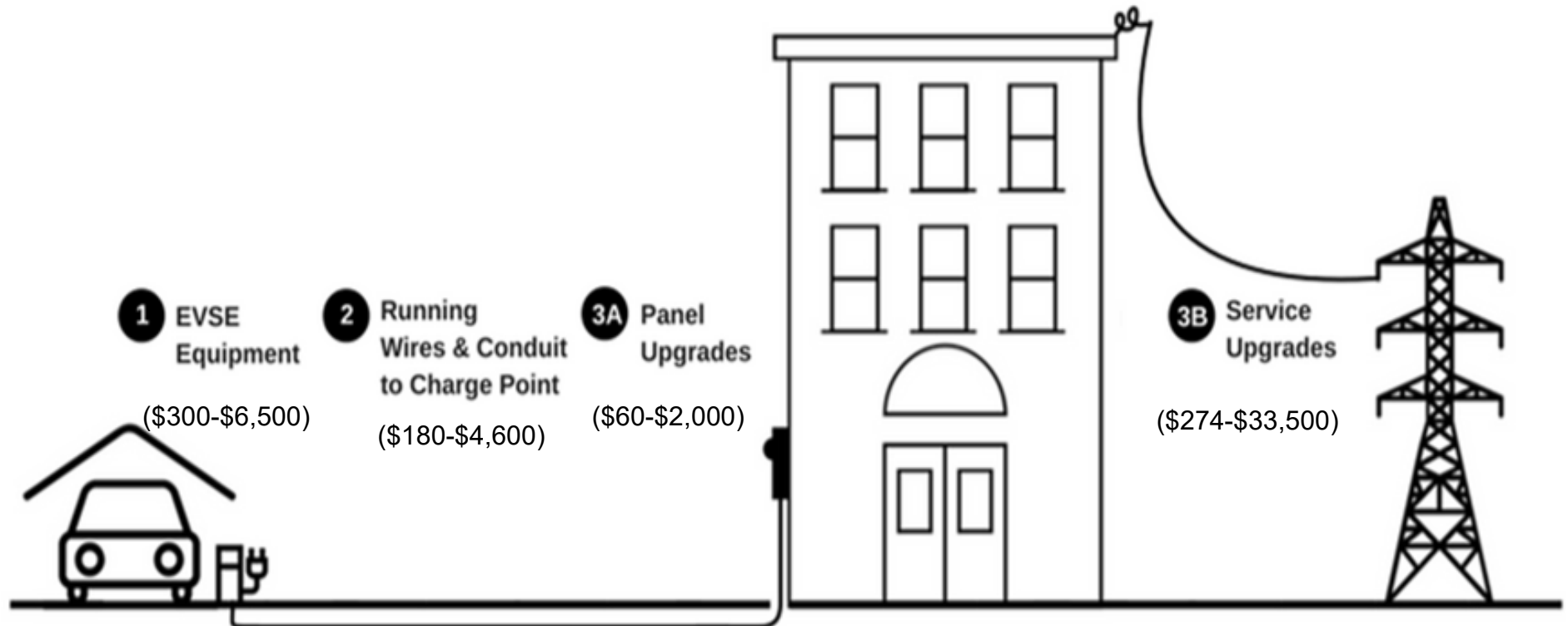


Image source: Noun Project; Car by Tracy Tam; Electric Equipment by Prosymbols; Building by Nicholas Menghini; Pylon by Arthur Shlain

Cost estimates for EVSE equipment were obtained from the U.S. Department of Energy's 2015 report, *Costs Associated with Non-Residential Electric Vehicle Supply Equipment*. Cost estimates for all other stages of installation were obtained from the UCLA Luskin Center for Innovation's 2016 report, *Overcoming Barriers to Electric Vehicle Charging in Multi-unit Dwellings: A South Bay Case Study*.

Hierarchy of Mobility & Low-Carbon Living

Santa Monica is working to encourage people movement instead of car movement by creating a healthy connected city that enables safe and convenient walking, biking and transit use. The shift will also help reduce the number of traffic-related fatalities under Vision Zero.

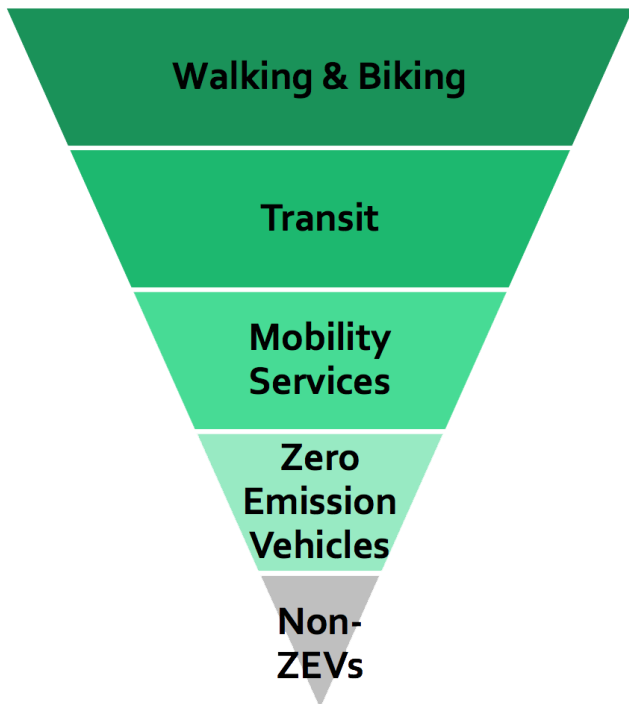
Walking and biking are the optimal forms of mobility, followed by transit and shared

mobility services, which can be powered by low-emission fuels or electric. Single-occupancy vehicles are the least preferred option as they contribute traffic and pollution.

Increasing active transportation and switching to electric vehicles from traditional fuel combustion vehicles benefits the environment by reducing “upstream emissions” and pollution. According to the American Lung Association, (ALA) “Passenger vehicles impact health through their tailpipe

emissions and their fuel production process, or ‘upstream’ emissions. Tailpipes emit harmful emissions that create ozone and particulate matter pollution, as well as greenhouse gases, which cause climate change” (ALA Clean Air Future 2016, pg. 8).

This EV Action Plan focuses on electrification of the personal vehicles that remain in use, which is one of many strategies the City is taking to reduce carbon emissions from the transportation sector.



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Goal
300 smart
charging
stations
by 2022

EV Action Plan Vision

We envision a wholly decarbonized transportation system in which people choose to walk, bicycle, and take transit, and when driving, choose electric vehicles. The City aims to support EV drivers—residents, visitors and City fleet—with a sophisticated network of public and private chargers that is financially sustainable, provides equitable access, and synergizes with modern technology.

The City aims to have a uniform public network of approximately 300 smart chargers by 2022. These stations will be strategically located throughout the city in residential neighborhoods, commercial areas, parks, libraries, and beach lots, among other facilities.

Comprehensive policy support, local

promotional programs, and adequate charging infrastructure are three essential components of a robust EV network.

The purpose of this document is to provide a strategic vision and action plan that will implement policies, projects and programs accelerating the adoption of electric vehicles.



EV Action Plan Priorities

Public Infrastructure: Modernize and expand public EV infrastructure to improve user experience and sustain operations.

Private Charging: Increase EV Charging for Multi-Unit Dwellings (MUDs) and Workplaces.

Public Policy: Update parking policies and practices for efficient charging station use.

Community Outreach: Develop EV outreach programs and resources for residents and businesses.

**California EV
charging
infrastructure
increased by
more than 50%
from 2015-2016.**

The EV Landscape

Global EV sales more than doubled between 2014 to 2016. Countries including India, the U.K, and France have pledged to phase out fossil-fuel powered vehicles in the coming decades. Volkswagen plans to invest \$84 billion in electric cars and batteries and aims to bring 300 EV models to the global market by 2030.

Nationally, EV sales rose 37% in 2016 from the previous year (Raiper, 2017); however, as of November 2016, EVs accounted for less than 1% of all cars on the road (Sierra Club, 2016). More than 50% of all EV sales in the U.S. occurred in California (Raiper, 2017).

In July 2016, the White House released a set of federal and private section actions to accelerate electric vehicle adoption in the U.S. As part of these federal actions, the Department of Energy (DOE) Loan

Program Office (LPO) issued a supplement to its Title XVII Renewable Energy and Efficient Energy (REEE) Projects Solicitation, clarifying that certain electric vehicle (EV) charging facilities—including associated hardware and software—are now eligible to receive funds. The solicitation can provide up to \$4.5 billion in loan guarantees to support innovative renewable energy and energy efficiency projects.

State legislation signed in recent years is supporting EV drivers through incentives, priority parking, and mandatory charge-ready requirements in new buildings.

Local programs such as AltCar are raising awareness and educating the community on EV policies, technologies, and the status of the EV industry.

Statewide EV charging has increased by



Congressman Ted Lieu, 2016 AltCar

more than 50% (California Energy Commission, 2016). As battery ranges increase and vehicle prices drop, more drivers are choosing plug-in hybrids or pure battery electric vehicles compared to non-plug-in hybrids. As of June 2017, EVs (PHEVs and BEVs) represented 4.8% of the State market share.

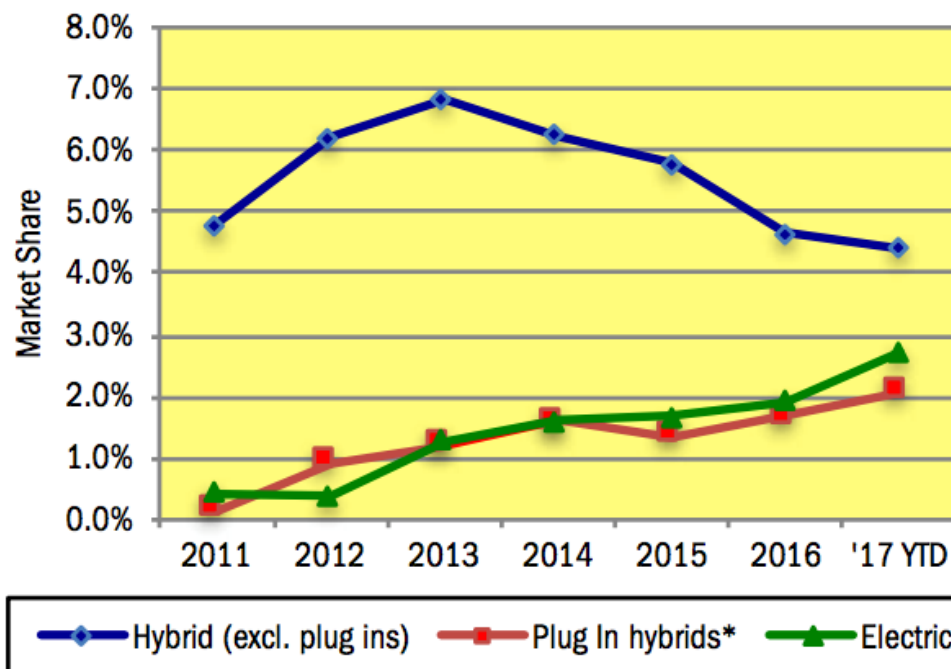
The introduction of lower cost, long-range EVs such as the Tesla Model 3 and 2018 Nissan Leaf are expected to have a considerable impact on EV charging demand in Santa Monica. In California, there are around 20 models of locally available EVs (including both PHEVs and BEVs), which is significantly higher than most states in the U.S. (Clean Technica, 2016).

Prices range from approximately \$24,000 for a Mitsubishi i-MiEV to \$140,000 for a Tesla Model X. Battery range starts at 59 miles per charge for the Mitsubishi i-MiEV and reaches 289 miles for a Tesla Model X (Green Car Reports, 2016).

The State of California has several goals and supporting legislation that will continue to incentivize EV adoption:

- Reduce carbon intensity of vehicle fuels by 10% by 2020
- Increase EV ownership to 1.5M by 2025
- Increase EV sales to 15% of all vehicles sales by 2025
- Reduce greenhouse gas emissions 40% below 1990 levels by 2030

Fig 6: California Hybrid and Electric Vehicle Market Share



Source: California Auto Outlook, May 2017

Local EV Policies, Plans & Programs

Policies

Rent Control (2013): Amendment to Regulation 3201

In order to allow EV charging in rent-controlled apartment buildings, the Rent Control Board amended Regulation 3201 to create separate agreements for EV charging in long-term controlled or vacancy-controlled tenancies.

Municipal Code 8.106.100 (2016): Residential Electric Vehicle Charging

Additions to Chapter 8.106 of the Green Building Standards Code include requirements for multi-family dwellings and buildings of mixed-use occupancies to prepare for future EV charging. New electrical service panels installed in multi-family dwellings with parking facilities must include a load of ten kilowatts per five percent of the

parking spaces provided.

Zoning Update (2015): New Development, Remodel or Expansion

Under the updated Zoning Code, all new development, including remodels or expansions, must have one charging station for every 25-49 parking spaces and two charging stations for 50-99 parking spaces. One additional charger is required for each additional 50 spaces. The update specifies location, design, and signage guidelines as follows:

- Signage shall be installed designating spaces with charging stations for electric vehicles only.
- If the parking spaces are not being used, a written request may be made to the Director for parking spaces for general usage for a specific time period.
- Charging stations and associated equipment or materials may not encroach on the minimum required

clear areas from driveways, parking spaces, garages or maneuvering areas.

- Charging stations shall be installed adjacent to standard size parking spaces.
- Charging stations shall be adjacent to a designated parking space. In a Single-Unit dwelling project, the station may be in the rear half of the parcel if evidence is presented to the Director that the usage of the charging station will not block access to any additional parking spaces.

Other policies supporting EVs in Santa Monica

- Free charging at all parking structures and public EV charging stations
- Free metered parking
- Access to HOV lanes (State law)
- Lower electric rates for EV charging (utility – Southern California Edison)

- Free permits for EV charging stations
- Fleet procurement goals for alternative-fueled vehicles (including compressed and liquefied natural gas)

Plans

Adding EV charging infrastructure in Santa Monica supports existing goals outlined in the **Sustainable City Plan, 15x15 Climate Action Plan, Downtown Community Plan,** and the **Land Use Circulation Element.**

The **Sustainable City Plan** has goals to increase clean air vehicles as a percentage of total vehicle ownership annually and to increase the percentage of fleet vehicles operating on alternative fuels to 80% by 2020.

Santa Monica adopted a short-term **15x15 Climate Action Plan** in 2013 with a goal to reduce citywide greenhouse gas emissions 15% below 1990 levels by 2015. Significant reductions in energy usage in the building and transportation sectors helped surpass this goal with a 20% reduction of emissions below 1990 levels.

Since 64% of city-wide emissions are still generated by the transportation sector, this represents a large opportunity to further reduce emissions through greater adoption of electric vehicles. The City is working with community and expert stakeholders to develop a new Climate Action and Adaptation Plan that will outline steps to create a carbon neutral city by 2050. EV adoption is secondary to increasing active transportation.

The Land Use Circulation Element (LUCE)

identified the need for managing the number of new vehicle trips, proactively pursuing greenhouse gas reductions through fuel shift and active transportation. The LUCE is a key component of the City’s overarching Mobility Strategy, which aims to shift how people move around Santa Monica by making sustainable options more convenient and accessible.

The **Downtown Community Plan (DCP)** is guided by the LUCE vision for a thriving,

mixed-use urban environment. The DCP prioritizes the pedestrian experience and a well-connected, efficient transportation network. The DCP implementation will help reach **Vision Zero**, a strategy to eliminate all traffic fatalities and severe injuries.

Programs

Santa Monica’s annual AltCar Conference and Expo began in 2005 and has grown each year, bringing together industry professionals and the public to discover new alternatives to energy and transportation. Conference participants can attend panel discussions with industry leaders and all Expo visitors have the opportunity to test drive a range of EV and fuel cell models.

Offering test drives has proven to be particularly effective at rising interest in purchasing EVs. A pre/post fair survey found that test ride participants were 76% “more likely” to consider buying an EV after the test drive (CA PEVC, 2016). A few month later, 15% had purchased one (55% saying the test drive was a “very

important” part of the decision) and 94% had spread the word (Plug In America, 2016).

Funding & Resources

State Funding Opportunities

Cities and utility providers throughout California have developed programs to facilitate EV adoption through rebate programs, free charging station installations, time-of-use rates, and outreach.

In October 2016, the U.S. government granted final approval of a \$14.7B settlement against Volkswagen (VW) for equipping more than 500,000 diesel vehicles to cheat U.S. vehicle emissions tests in violation of the Clean Air Act. Volkswagen will spend \$10 billion on vehicle buybacks and \$4.7B to mitigate the pollution from these cars and invest in green vehicle technology.

California will receive \$800M from the VW settlement to dedicate to EV investment plans, which will be approved by the California Air Resources Board. \$200M will be allocated within 30 months of the settlement effective date (October 25, 2017). Volkswagen is required to invest in EV infrastructure to promote and advance the use of EVs; eligible activities also include outreach, education and investment in fleet vehicles. The Southern California region is expected to be eligible for a significant portion of this funding due to its large population, however specific regional funding amounts have yet to be determined.

The California Energy Commission (CEC) has also approved up to \$200M for statewide charging installations as part of the Alternative and Renewable Fuel and Vehicle Technology Program, which supports sustainable transportation and greenhouse gas reductions goals. In April 2017, the CEC awarded a \$15M grant to

San Diego-based Center for Sustainable Energy to develop and implement an initiative to install EV charging stations statewide by creating financial incentive projects.

In May 2017, the California Air Resources Board (CARB) announced \$6M in funding to implement a Financing Assistance Pilot Project for FY 2016-2017. The project is funded by the Low Carbon Transportation program and is intended to accelerate EV adoption among lower-income consumers.

The goal is to help improve access to affordable financing mechanisms, including a vehicle price buy-down coupled with a low interest loan to qualified lower-income consumers to purchase advanced technology clean vehicles. The solicitation was open to federal, state, and local government entities through July 2017.

Utility Funding Opportunities

Southern California Edison (SCE), Santa Monica's electrical utility provider, is supporting transportation electrification by offering programs like Charge Ready to increase charging infrastructure, making electric fueling more affordable through special EV charging rates, and increasing awareness of the benefits of electric transportation.

In January 2017, SCE submitted a proposal for a \$570M program to help grow the transportation electrification market over a five-year period and to help reach statewide greenhouse gas reduction goals. The proposal includes rate designs to incentivize EV adoption, a customer rebate for residential charging station installations, and monetary

rewards for ride service and taxi drivers who drive EVs. The proposed capital investment is subject to approval by the California Public Utilities Commission in 2017.

There are a number of funding resources for EV ownership and EVSE installation from the federal level down to the local utility. However, many of these resources are not well known and can be daunting for property owners and first-time EV buyers. Santa Monica aims to help guide residents through this process by creating a clearinghouse of information and resources (priority #4).

In the likely event that the City implements a Community Choice Aggregation (CCA) program, which allows

Santa Monica to buy electricity generated by more renewables for the residents and businesses, there will additional opportunity to incentivize EVs.

For example, the Sonoma Clean Power CCA partner with EV and EV charger manufacturers to provide substantial incentives for their customers. Sonoma Clean Power is offering an additional \$2,500 incentive to purchase Nissan Leafs and BMW i3s while funding lasts. Low-income customers can receive incentives up to \$5,000 in addition to state and federal rebates.

Many of the existing resources are oriented toward property owners with adequate resources to deploy their own EV infrastructure. To date, there are minimal options for commercial and residential tenants who wish to install EVSE, but cannot due to insufficient electrical service capacity or dedicated spaces to charge. Lack of funding only makes matters more challenging.

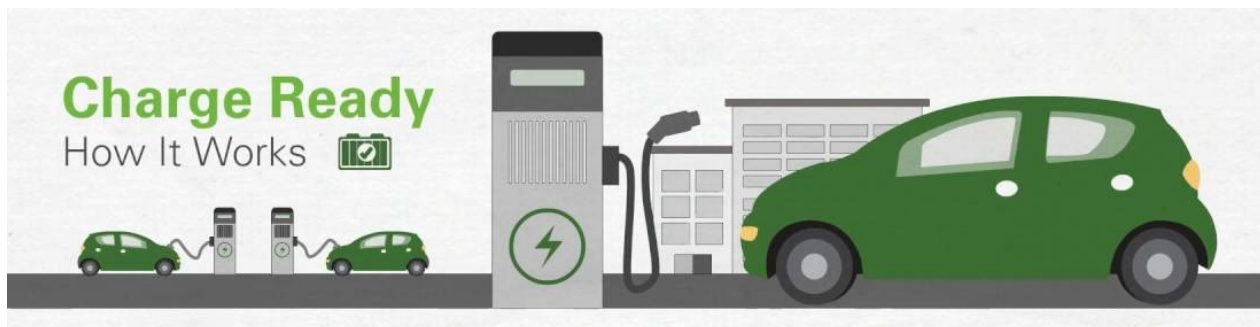


Table 1: EV and EVSE Programs and Funding Opportunities

Administrator	Program	Description
California Air Resources Board	Clean Vehicle Rebate Project	Offers rebates of \$1,500-\$2,500 for purchasing or leasing zero-emission vehicles
South Coast Air Quality Management District	Replace Your Ride Program	Offers incentives ranging from \$2,500 up to \$4,500 to replace old, polluting vehicles with cleaner vehicles, depending on income level and type of vehicle purchased
	Residential EV Charging Incentive Pilot Program	Provides up to \$250 for the cost of hardware for Level 2 residential chargers. An additional incentive of up to \$250 is available for low-income residents.
Southern California Edison	Charge Ready Program	Installs a minimum of 10 EV charging stations at workplaces, recreational facilities, and multi-unit dwellings. Ten percent must be located in disadvantaged communities.
	Clean Fuel Rewards Program	SCE offers a \$450 purchase rebate for battery-electric vehicles and plug-in hybrid vehicles to all utility customers in its service territory. The rebate applies to new purchases and up to the third owner of a particular car. Funds come from the state's Low Carbon Fuel Standard Program.
City and State Government	PACE Financing	A property tax assessment creates a loan to pay for EVSE equipment and installation costs that can be repaid over a fixed term. The EVSE and PACE loan becomes tied to the property.
California Energy Commission	California Capital Access Program (CalCAP) EV Charging Station Program	Offers EV infrastructure loans (up to \$500,000) with up to 15% rebates for small business owners and commercial landlords who install electric vehicle charging stations for employees, clients or tenants.
	Alternative and Renewable Fuel and Vehicle Technology Program	The CEC awarded a \$15 million grant to the Center for Sustainable Energy to develop and implement an initiative to install more electric vehicle charging stations statewide by creating financial incentive projects. (2017)
Environmental Protection Agency	EV Charging & Solar Initiative	Provides free technical assistance to assess and secure EV charging stations and/or solar PV systems at workplaces, including non-profits, colleges, government, and private sector companies
Volkswagen	Electrify America	\$800M over 10 yr investment in California covering 4 areas: (1) Installing charging infrastructure (approximately \$120 million), (2) Building a Green City to showcase the benefits of ZEVs and promote increased ZEV usage (approximately \$44 million), (3) Public Education initiatives (approximately \$20 million), and (4) Access initiatives like ride-and- drive events

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Case Studies: Utility Programs to Accelerate EV Adoption in California

Southern California Edison Charge Ready Program

In 2016, Southern California Edison (SCE) launched a pilot program to fund 1,500 charging stations within its service territory for multi-family, work, and destination charging. The \$22 million program aims to help California reach its goal of 1.5 million zero-emission vehicles on the road by 2025 and meet state and regional clean air standards. SCE is offering rebates between 25% to 100% of the charging station installation costs.

The pilot requires the ability to install 10 stations (5 dual-port) to maximize investment. The program also requires property owners to grant an easement in the property where the charging infrastructure will be deployed. Due to these program requirements, this program prohibits many small- to medium-sized

multi-family buildings and workplaces from participating.

The City is seeking to take advantage of this program and other utility resources to expand public and fleet charging.

San Francisco Bay Area Charge! Program

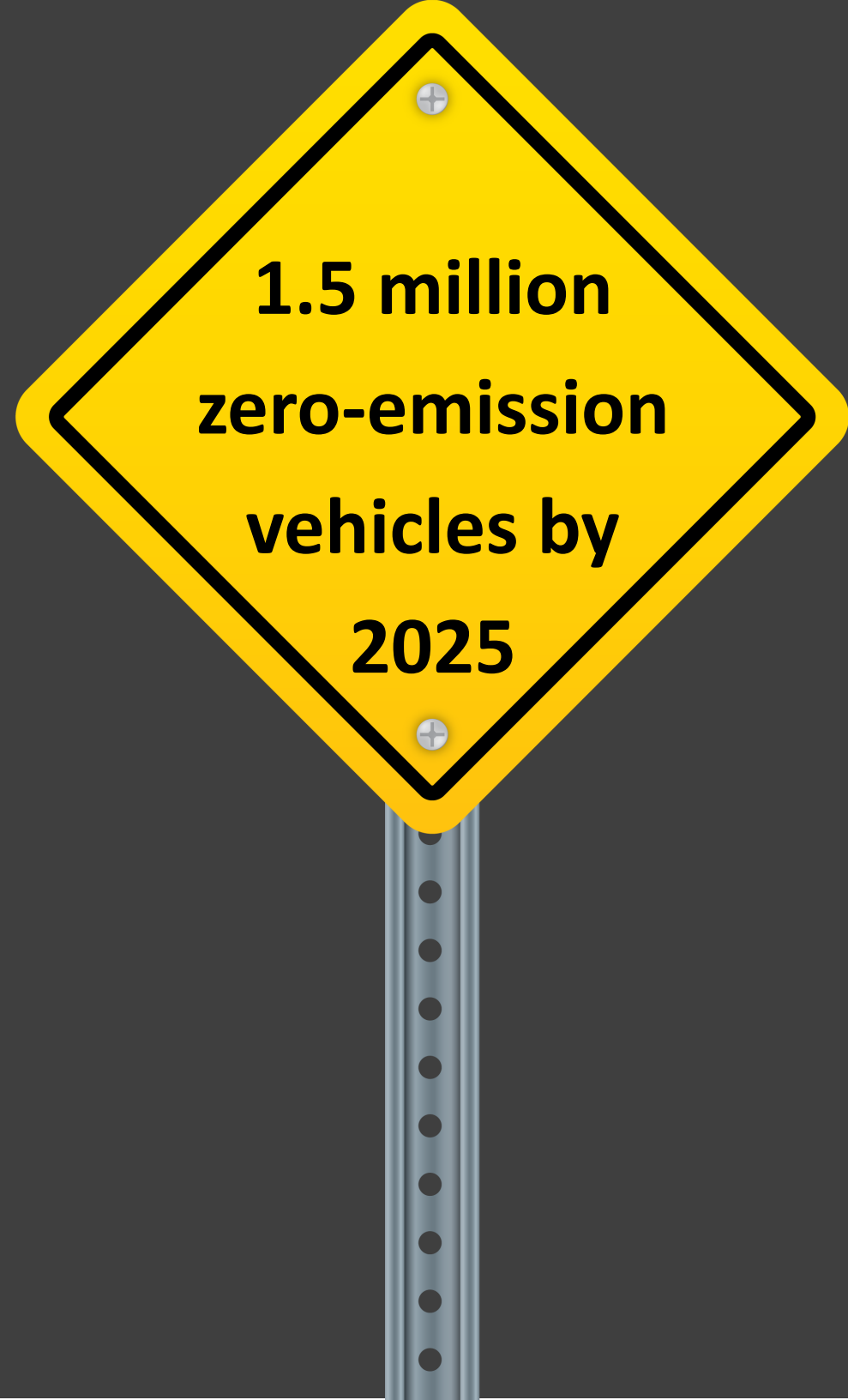
San Francisco's Bay Area Air Quality Management District (BAAQMD) Charge! Program offered \$5 million in grant funding for the installation of electric vehicle charging stations at Bay Area transportation corridors, workplaces, MUDs, and trip destination locations. The Transportation Fund for Clean Air funded this program and applications closed in January, 2016. The program was created to help meet the regional EV deployment goals of 110,000 EVs by 2020 and 247,000 EVs by 2025.

San Diego Gas & Electric Power Your Drive Program

A new pilot program launched by San Diego Gas & Electric (SDG&E), one of the largest utilities in California, with a service area of 3.4 million people, launched its Power Your Drive Program in early 2016. The California Public Utilities Commissions (PUC) authorized SDG&E to install up to 3,500 EV charging stations in MUDs and businesses throughout its service area. A minimum of 10% of the stations will be located in disadvantaged communities.

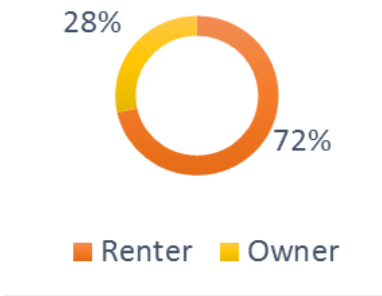
Under this program, all chargers are individually metered, allowing SDG&E to offers two billing options to pay for EV charging: the customer (driver) pays or the property manager pays. Under the first option, metered data is billed directly to the customer's home. The second option requires the property manager to pay the full use bill and to create a load

management plan to ensure grid compatibility. The rate is an hourly day-ahead rate designed to encourage off-peak charging. The rate design integrates renewable energy into the grid and mitigates the need for additional peaker plants. The program requires a minimum of 10 stations to be installed, similar to the SCE ChargeReady program. This minimum requirement may not be as large of a barrier in San Diego due to a lower population density and smaller percentage of MUDs compared to Santa Monica.



Who Has Access?

Santa Monica Renter vs. Owner Population



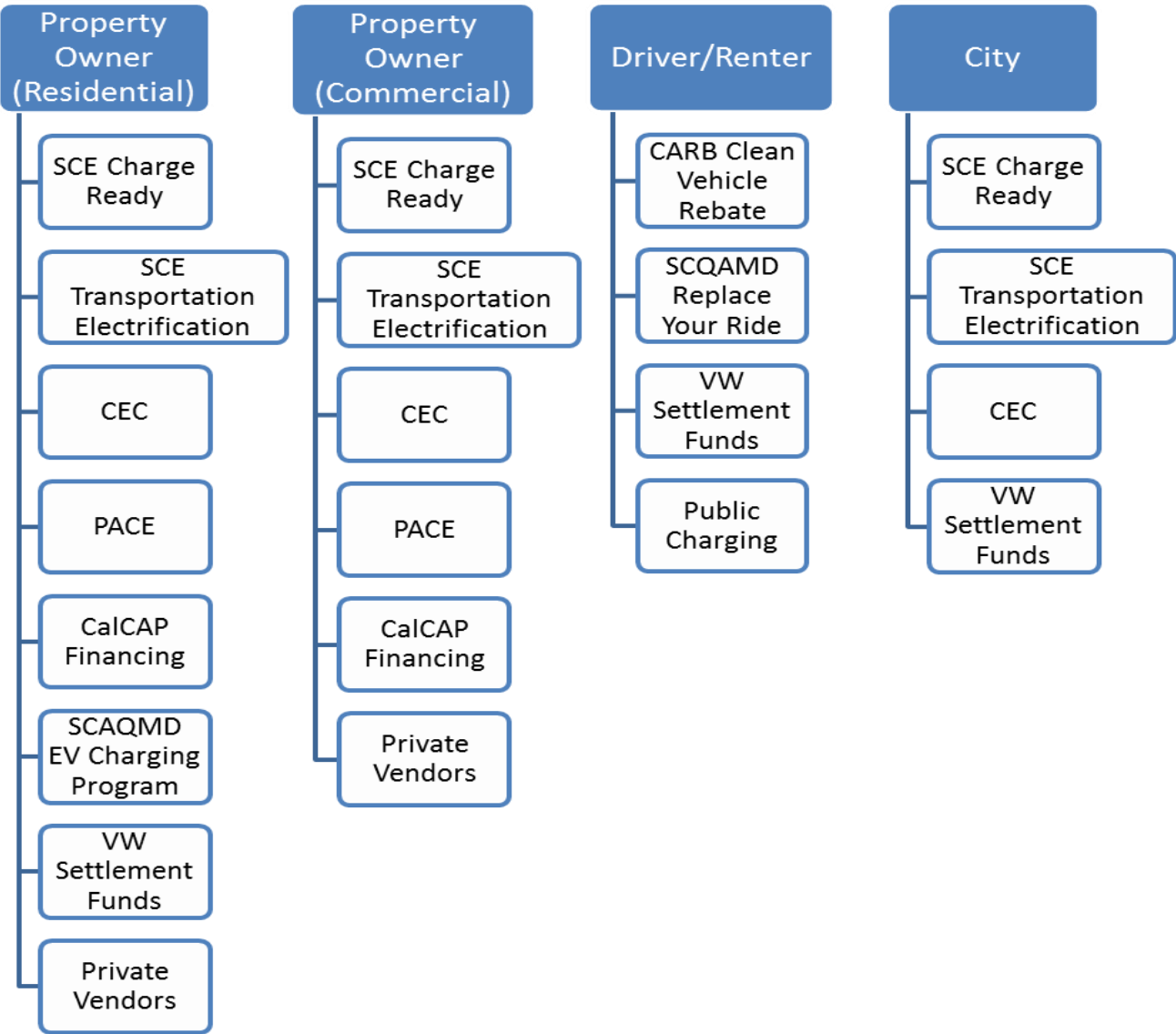
Almost three-quarters of Santa Monicans are renters, according to the 2010 Census.

Access to resources and information are paramount if EV charging is to become an option for renters.

The following diagrams outlines which programs are available to residential and commercial property owners, EV drivers who rent their properties, and municipal funding options.

Targeted incentives and resources are necessary in order to reach the renter population.

Figure 7: EVSE Resources and Programs



Charging in Santa Monica: Today and Tomorrow

EV Ownership

EV ownership has increased steadily throughout the U.S., and particularly in California since 2010. California cities and towns represented approximately 65% of national EV sales in 2015, and this rate is expected to grow (ICCT, 2016).

In Santa Monica, there were 1,428 registered clean air vehicles in 2016 (including fleet vehicles), a drastic increase from the 63 clean air vehicles registered in 2003. Resident purchases of BEV and PHEVs in Santa Monica have increased 136% since 2012. Similar to the state level trends, BEV purchases in Santa Monica are growing at a faster rate than PHEVs (Figure 8). Cumulative PEV sales in Santa Monica are predicted to reach nearly 4,000 by 2021. With more than double the number of PEVs on the road expected by 2021, it is imperative

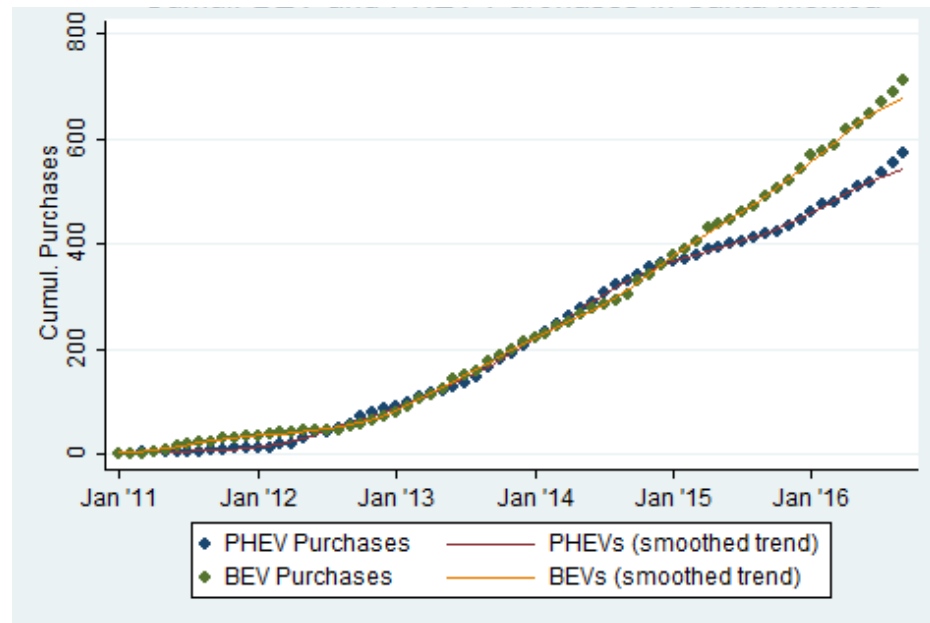
for the City to provide more public charging stations.

The following numbers and charts reflect existing and predicted EV ownership and charging station inventory in Santa Monica.

Table 2: Registered EVs in Santa Monica (2016)

Type	Qty
Plug-In Hybrid Electric Vehicle	601
Battery Electric Vehicle	708
City-Owned Electric Vehicle	119
Total registered EVs	1,428

Figure 8: 2011-2016 EV Purchases in Santa Monica



Source: UCLA Luskin Center for Innovation, May 2017

Public EV Charging Stations

The City currently has 75 charging ports available at 64 charging stations (53 single-ports and 11 dual-ports). The majority of charging stations are located in City-owned parking structures and surface lots, and two charging stations are located on-street on Montana Ave. The dual-port chargers at the Civic Center Structure were provided by UCLA through a research project. All stations see a high amount of usage and staff regularly receives requests to add more charging stations.

All charging is currently provided to the public free of charge. Varying brands, models and vintages of EV charging equipment have been deployed, providing no consistency nor establishing any standard for maintenance. None of the existing EVSE have communications, remote monitoring/control or cost recovery capabilities. Due to the technology, staff does not have any metrics on usage,

outages or cost, nor any means of enforcing turnover when parking or charging limits have been reached.

As of fall 2017, 34 new charging ports were pending at various parking lots and structures across Santa Monica at various stages of development. These chargers should be operational before the end of 2017. If all pending and requested stations are approved and installed, the City will operate a network of 133 charging ports by the end of 2017.

Programs like the Southern California Edison's (SCE) Charge Ready pilot provide opportunities for the City to expand public infrastructure. Through this program, SCE covers all electrical costs to install the stations.

The new chargers procured under the Charge Ready program must comply with SCE's requirements for networked communication systems ("smart"

chargers). This implication will be discussed in a later section.

Table 3: Citywide EV Charging Station Inventory

Station Ownership	Total port connections
City-Owned Public	75
City Fleet-Use only	14
Commercial & Residential	227
Total	316

2017 Nissan Leaf



Source: Nissan USA

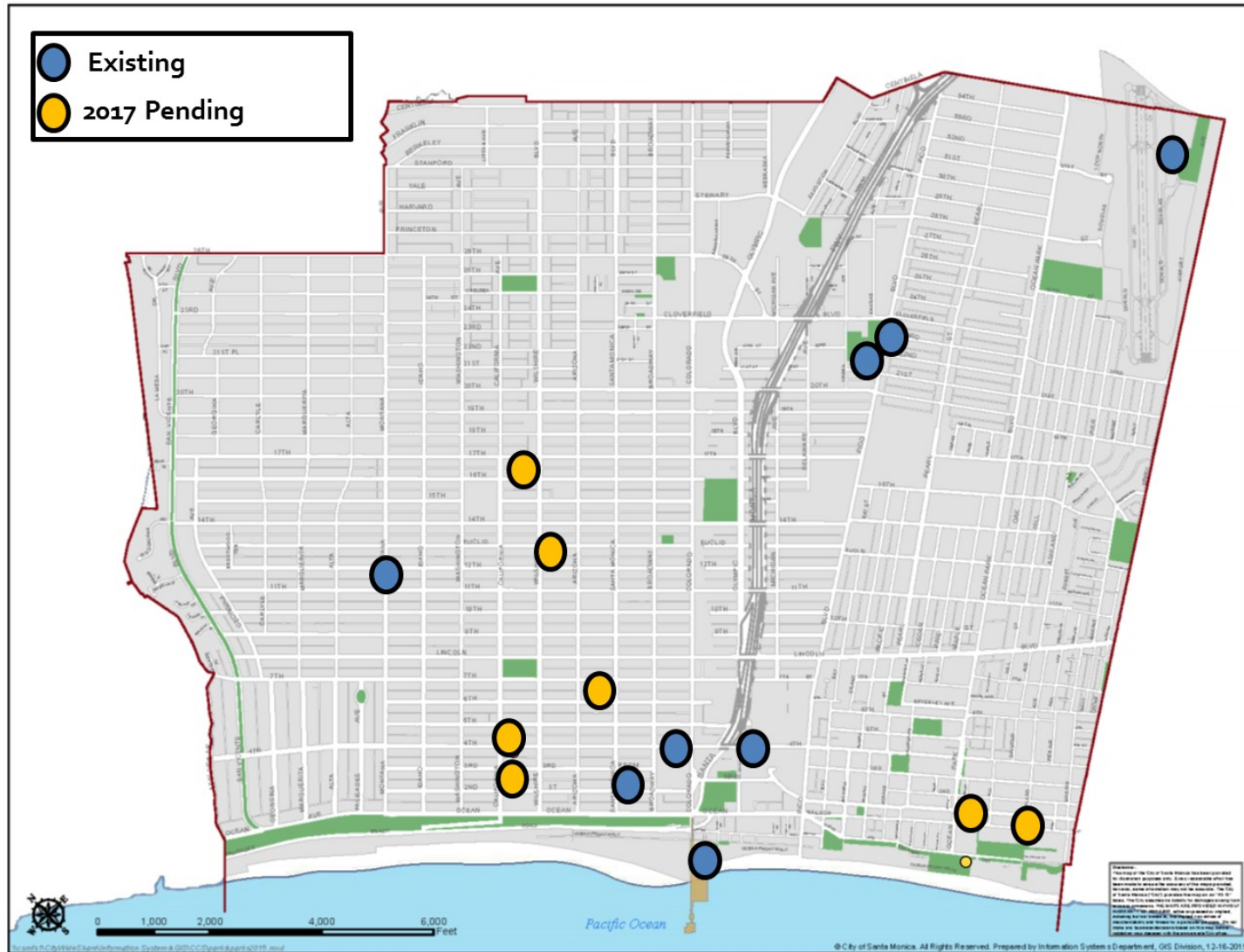
Table 4: Existing Public Charging Stations

Location	Street Address	Multi-port Stations	Single-port Stations	Total Available Ports
Civic Solar Port	1685 Main St	-	12	12
Civic Parking Structure	333 Civic Center Dr	7	-	14
Santa Monica Pier	200 Santa Monica Pier	-	4	4
Santa Monica Place Parking Structure 7	395 S Santa Monica Place	-	6	6
11th & Montana (curbside)	1101 Montana Blvd	-	2	2
Virginia Avenue Park	2200 Virginia Ave (Pico Blvd side)	-	3	3
Virginia Avenue Park	2200 Virginia Ave (Virginia Ave side)	-	2	2
Santa Monica Airport	3223 Donald Douglas Loop South	-	2	2
Parking Structure 6	1431 2nd St	4	22	30
	Total	11	53	75

Table 5: 2017 Pending Installations of New Charging Stations

Location	Address	Dual-port Stations	Total Available Ports	Responsible Division	Status
2501 Nielson Way Parking Lot	2501 Nielson Way	1	2	Streets	Operational
2901 Neilson Way Parking Lot	2901 Neilson Way	2	4	Streets	Installed, pending City action
Parking Lot 7	1217 Euclid St	2	4	Streets	In design
Parking Lot 8	1146 16th St	1	2	Streets	In design
Parking Structure 9	1136 4th St	2	4	Streets	In design
Parking Structure 10	1125 3rd St	2	4	Streets	In design
Main Library	601 Santa Monica Blvd	6	12	Arch Svcs	In design
5 th Street Lot	5 th & Santa Monica	1	2	Arch Svcs	Operational
Annenberg Beach House	415 Pacific Coast Hwy	1	2	Arch Svcs	In design
	Total	18	36		

Figure 9: Existing and Pending Charging Stations



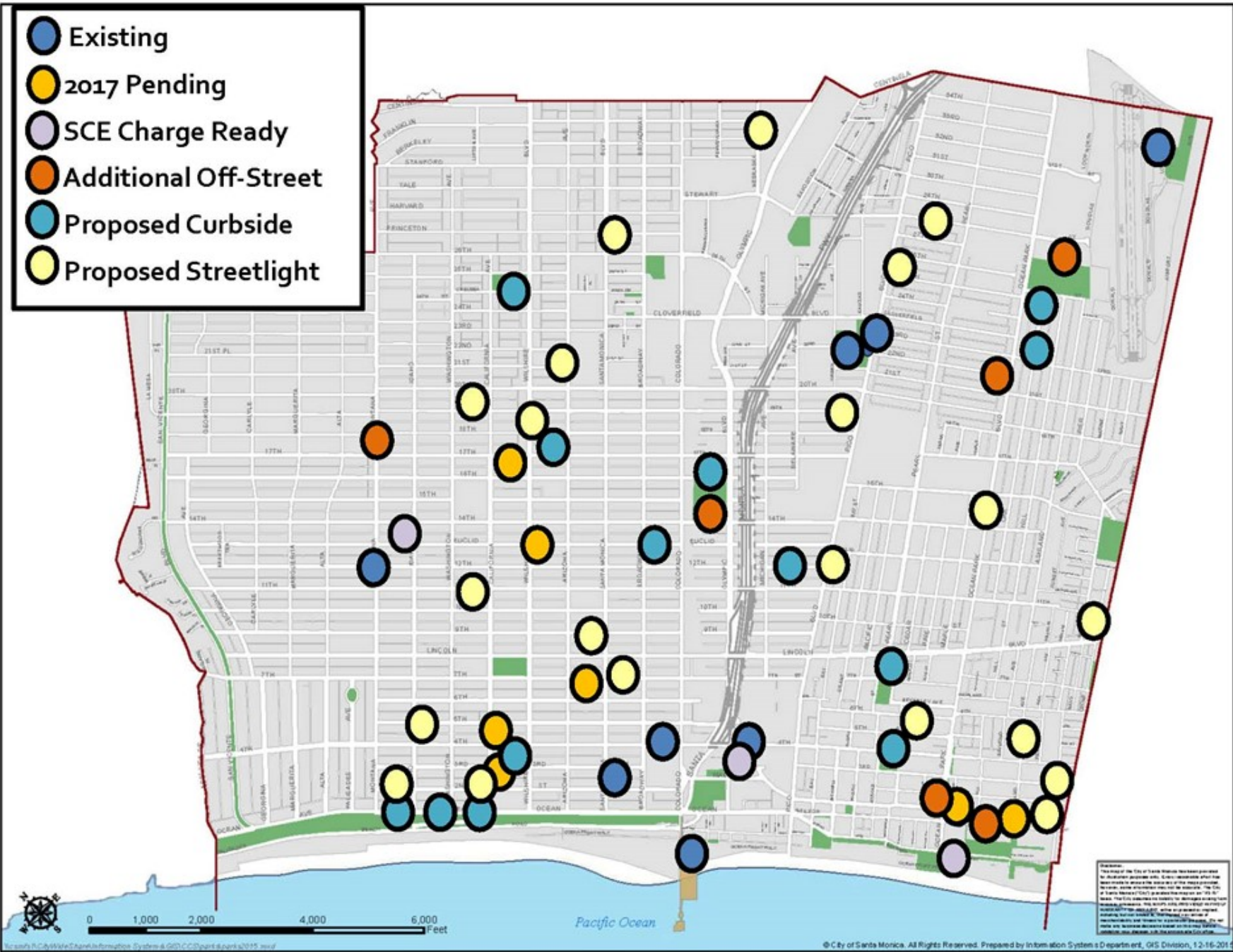
City Fleet Charging

The City currently owns 119 fleet EVs and nine dedicated charging stations (14 total connections). All fleet-only charging stations are located at the City Yards. Based on existing and anticipated fleet parking demand, charging stations for fleet vehicles are planned at the following municipal locations shown in Table 6.

Currently, City fleet vehicles share public charging infrastructure. This has created increased demand and tension for EV drivers who rely on the chargers for their private vehicles. Providing dedicated charging for City fleet vehicles will help to alleviate this conflict.

Table 6: Municipal EV Fleet and Charging Stations

Office/Parking Location	Existing		EVs to be Procured by Fiscal Year					
	Chargers	EVs	15/16	16/17	17/18	18/19	19/20	Total EVs by 2020
1212 5 th St	0						1	1
1437 4 th St	1	3		5				8
Airport	2	3						3
Arcadia		1		1				2
Cemetery	0	2						2
City Yards	14	21	7	9	5		1	43
Civic Parking Lot	12	10				1	1	12
Civic Parking Structure	17	25	13	6				44
Clover Park		1	1					2
Colorado Yards	4	15	1					16
Main Library		1						1
Structure #1		7						7
Structure #3								0
Structure #6	28	1						1
Pier	4	4						4
Public Safety Facility		34	1	14			1	50
Totals:	81	119	23	35	5	1	4	187



EV Action Plan Recommendations

Santa Monica's success at early adoption has catalyzed a demand for electric vehicles so much that it has become difficult to sustain without a structured program or policy in place.

Frequent requests are made for more public charging stations and existing stations are often full. Renters in multi-unit dwellings (MUDs), struggle to convince landlords to install charging stations and often lack off-street parking, limiting the ability of many to go electric.

Faced with a lack of infrastructure, people are choosing not to go electric. In order to support wide scale EV adoption, Santa Monica must address these barriers and provide resources to facilitate access to charging facilities.

This plan was developed with research, field data and expertise in the EV

charging industry. It is aimed to provide specific actions that can be accomplished within a short amount of time and yield measurable results.

Demand for EV charging has surpassed the supply of charging stations and will continue to grow. Santa Monica's current EV infrastructure lacks the capability to manage usage, promote turnover, track electricity consumption, monitor system performance, communicate with administrators and users, and sustain itself financially. This inhibits the City's ability to adequately catalyze a large network of charging infrastructure.

This plan is organized into four priorities with recommended actions to overcome barriers to EV adoption:

Public Infrastructure: Modernize and expand public EV infrastructure to improve user experience and sustain operations.

Private Charging: Increase EV Charging for Multi-Unit Dwellings (MUDs) and workplaces.

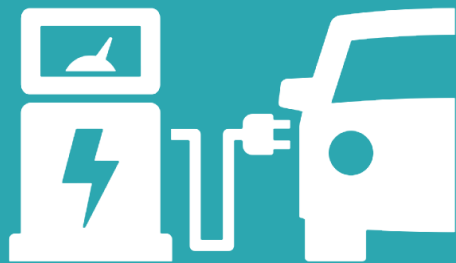
Public Policy: Update parking policies and practices for efficient charging station use.

Community Outreach: Develop EV outreach programs and resources for residents and businesses.

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Public Infrastructure:

Modernize and expand public EV infrastructure to improve user experience and sustain operations



- a** Retrofit or replace legacy chargers with “smart” chargers; add new smart chargers to the network.
- b** Consider a time-of-use (TOU) fee structure that covers operations and maintenance costs and supports community EV programs.
- c** Earn credit revenue by participating in the state Low Carbon Fuel Standard program.
- d** Add charging stations for City fleet facilities.
- e** Explore innovative EV charging technologies to integrate into Santa Monica’s EV charging network.
- f** Explore DC fast charging options where appropriate and feasible.
- g** Develop guidelines and standards to support charging for e-bicycles and neighborhood electric vehicles.

a) Retrofit or replace legacy chargers with “smart” chargers; add new smart chargers to the network.

Plug In America projects that a 10% increase in EV sales results in 6% more public charging, creating a virtuous cycle of demand. A similar report found that installing infrastructure can be three times as cost effective as providing financial incentives for EV purchases (Plug In America, 2016).

Santa Monica has installed over 60 level 2 publicly available EV charging stations to date, with a total of 75 available connections. This early leadership has also brought growing pains. Over 10 years later, most of the existing public and fleet chargers are outdated and “dumb” – without any communications, monitoring, controls or cost recovery capabilities. Several chargers in the City’s portfolio are obsolete. There are various brands and models of chargers, offering no consistency for the user or maintenance staff.

This lack of consistency hampers the City’s ability to expand charging citywide. Upgrading the existing public charging network with smart stations would enable Santa Monica to address these issues and establish a uniform technology for managing the existing system and future growth.

Evolving charging technologies and services provide a new level of customer service and management capabilities for both operators and users. Tracking energy usage is necessary to analyze electricity usage and costs, observe charging behavior, and collect payment. Monitoring capabilities allow station managers to quickly identify operations and maintenance requirements, and monetize the emissions-reduction benefit through the State’s Low Carbon Fuel Standard program, which can reduce costs. Some smart charging technologies can determine when stations are not in use and divert the power to occupied

stations, rather than blocking the amperage when not in use.

Table 7 shows the recommended project phases to add and upgrade EV chargers. Most new stations will be level 2 stations, which are the most common type of stations. Level 2 chargers typically charge through 208-240 volt electrical service and require a dedicated circuit of 30-40 amps. Depending on the battery size, level 2 charging adds around 10-20 miles of range per hour of charging time. In addition, installing Level 1 110-volt outlets is a low-cost option to provide charging for electric bikes and neighborhood electric vehicles.

System Upgrade and Replacement Costs

The costs to replace the existing EVSE and add new stations are largely dependent on the extent of electrical services needed. Dual-port charging units are preferred to single-port units due to lower installation and maintenance costs and smaller space requirements.

Table 7: Proposed 5-Year Infrastructure Plan

Project Phase	Proposed Chargers
Phase IA: 2017-2018 Retrofit existing stations	75
Phase IB: 2017 Installations	34
Phase II: 2018 Off-street (Libraries, Parks, Lots)	41
Phase IIIA: 2018-2022 Curbside Stations	69
Phase IIIB: 2018-2022 Streetlight Stations	25
Phase IIIC: 2018-2022 Public/Private Partnerships	25
Phase IIID: 2018-2022 DC Fast Charging Stations	2
TOTAL Public Chargers	271
Civic Center Fleet Charging	31
TOTAL Chargers	302

Dual-port EVSE smart charging units typically cost between \$2,500-\$4,500. Previous installation costs for existing public chargers in the City's parking structures and surface lots ranged from \$5,000-\$15,000 per unit (Table 8). These costs vary widely depending on the distance to the electrical service panel

and the difficulty of the electrical run. The installation costs to replace existing stations will be significantly lower than at new sites without the electrical wiring and conduit already in place.

Total costs and funding estimates to expand the EV charging network are outlined in the Implementation section. Upgrade options may also include equipment lease, alternative financing, and advertising/sponsorships to offset costs. Grant funds will be sought when available.

b) Consider a time-of-use (TOU) fee structure that covers operations and maintenance costs and supports community EV programs.

Free EV charging incentivized early EV adoption. As the State and City aim to reach California's 2025 goal for wide scale EV deployment, cost recovery (charging a fee) will be an essential tool to adequately maintain a limited resource for drivers as well as recoup operational costs. It is estimated that the City's electricity costs for public charging are approximately \$275 per charger per year, or \$20,625 total for all 75 chargers currently available.

A time-of-use fee per kWh is the recommended model for Santa Monica because it is the most equitable. Within a

Table 8: EV Charging Station Installation Costs for Existing Stations

Location Type	Price Range	Average Installation Cost
Parking Lot	\$5,000-\$15,000	\$10,492
Parking Structure	\$10,000-\$13,000	\$11,693
Parks	\$8,500-\$15,000	\$11,707

given hour, vehicles can consume anywhere from 3 kW to 7 kW. This variation is due to different battery sizes, which can be most accurately reflected by a kWh fee. Fees can be set to vary by users, with different rates programmed into the smart charging stations (e.g. fleet vehicles, resident rates, etc.).

Cost recovery supports the expenses related to:

- Electricity consumption (kWh)
- Electricity demand (kW)
- Leasing or purchase of equipment
- Installation labor
- Maintenance & repair
- Networking & communication service
- Financial transactions
- Tracking & reporting data
- Expansion of infrastructure

Cost recovery also provides a means of ensuring turnover so that there can be adequate charging access for all drivers. Charging a nominal fee for electricity, time or some combination thereof,

disincentivizes “accessory charging”, or charging vehicles simply because the service is available, rather than a necessity.

Managing the length of stay at charging stations can also be achieved through signage, parking enforcement, and/or an additional per-hour occupancy fee for vehicles connected beyond the allotted time. This will open up charging stations to drivers who have a greater need to charge and are willing to pay for the electricity.

Cost recovery models can be summarized in the following categories:

The **Prepaid Model** allows EV owners to prepay a fixed amount for unlimited access to EVSE within the network.

The **Cell Phone Model** offers EV drivers a combined home and public charging option. In this model, the site hosts’ infrastructure costs are substantially lower, but the vendor has exclusive access to the site for a specified length of

time, limiting the options for the users.

The **Gas Station Model** allows EV owners who are not in a network to be charged a per session fee – e.g. \$2 per hour or \$0.25/kWh per session.

The **Hybrid Model** entails a partnership between network operators and site owners. Network operators lease parking spaces from the site owner and incur operating costs. The operator also retains the revenue collected (similar to a vending machine operator).

Of these various methods, staff has identified the Gas Station Model as the most appropriate and convenient option for use in Santa Monica. There is no network membership required. Users simply pay via credit card at the station.

Pricing Structure

The next component of cost recovery is the pricing structure. Pricing structure options applicable to the Gas Station

Model include:

- flat fee per hour
- fee per kWh
- differential fee per hour
- fee per session

The flat fee per hour and the fee per kWh are the most common pricing structures for EV charging. A flat fee per hour most common among private charging stations and municipalities because it is simple, provides stronger incentives against overstaying, and is more profitable. The following data provide an overview of statewide and regional EV charging rates at public facilities:

- Almost 70% of all California public agencies that provide EV charging charge a fee.
- Out of the 142 CA public entities that charge a fee, almost 40% charge by electricity consumption (kWh).
- Out of the 27 public agencies in the LA region that charge a fee, the majority charge either an hourly rate between \$1-\$2 (30%) or a per kWh rate of

\$0.20-\$0.40/kWh (22%) or \$0.59/kWh (19%). (See Table 10)

Time-of-Use Rates

SCE has dedicated time-of use (TOU) EV charging rate schedules for residential and non-residential properties. Time-of-use rates incentivize charging during off-peak hours to help manage demand on the electric grid. Designing fees for public charging that reflect peak and demand charges can incentivize drivers to do most of their non-essential charging at home.

Fee Collection

Fees collected by an EV service provider can be remitted to the City on a monthly basis. Various fee schedules can be developed for regular users such as residents and City fleet vehicles. Variable pricing can also be developed to account for demand charges and length of stay. The fee structure will need to be approved by City Council.

Table 9: Analysis of Publicly Available EV Charging Rates

Public Agencies		California		Los Angeles region	
Providing EV charging		210		42	
Percentage that charge a fee		69%		64%	
Most common fee breakdown	Per hour	\$1-2	24.6%	\$1-2	29.6%
	Per kWh	\$0.20-0.30	10.6%	\$0.20-0.30	22.2%
		\$0.32-0.49	8.5%		
		\$0.59	20%	\$0.59	18.5%
Total captured*			64.1%		70.4%

**Fees not captured were higher or lower than what is shown, but were less common*

Source: Alternative Fuel Data Center, Department of Energy

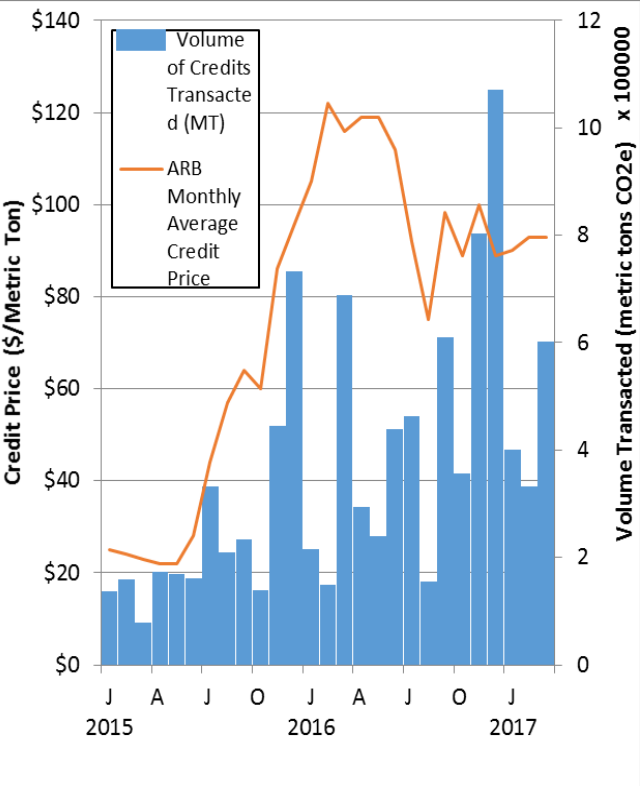
Table 10: Examples of Public EV Charging Rates in Los Angeles County and Ventura County

Flat Fee per Hour or Session		Fee per kWh	
City	Fee	City	Fee
City of Manhattan Beach	\$0.75/hr	City Huntington Beach	\$0.22/kWh
City of West Hollywood	\$1.50/hr	City of Westminster	\$0.25/kWh
City of Hermosa Beach	\$2/hr	City of Downey	\$0.25/kWh
City Culver City	\$2/hr	City of Long Beach	\$0.59/kWh
Playa Vista Community Center	\$2/hr	City of Thousand Oaks	\$0.59/kWh
City of Los Angeles	\$2/hr		
City of Ventura	\$1/session		

**Note: Municipal charging fees may vary by facility*

Source: Alternative Fuel Data Center, Department of Energy

Figure 11: Low Carbon Fuel Standard Credit Prices



Source: California Air Resources Board, 2017

Table 11: Average Charging Station Usage

Metric	Average
# Sessions/day/station	1.82
Connect time	207 min
Charging Time	2 hours
Energy Consumed	9 kWh

c) Earn credit revenue by participating in the California Low Carbon Fuel Standard program.

The Low Carbon Fuel Standard (LCFS) is a regulation designed by the California Air Resources Board (CARB) to reduce greenhouse gas emissions from transportation fuels used in California. By 2020, the LCFS will be responsible for achieving a 10% decrease in carbon intensity of vehicle fuels (CARB, 2016).

The LCFS provides a credit trading system similar to cap-and-trade for vehicle fuels. Low carbon fuels like hydrogen, renewable diesel or natural gas and electricity generate a monetary value for the fuel provider or station host. Station hosts offering electricity for EV charging are eligible to receive credits by opting into the LCFS program. The credits may be sold to fuel producers who must offset an exceedance of the LCFS standards. Santa Monica can receive LCFS revenue by tracking electricity consumption for EV charging.

Projected revenues are dependent on the fluctuating credit price and the rate of station use; a modest estimate is \$0.08/kWh. Considering current usage trends (Table 11) and the existing network of 79 EV charging ports, the city can earn between \$16,000-\$35,000 per year in LCFS credit revenue, but only if all chargers are converted to smart stations.

This revenue will drop to \$6,400-\$14,000 if an EV Service Provider (EVSP) handles the reporting requirements for the City (EVSPs typically keep 60% of the LCFS revenue and remit 40% back to the City). The City could use this revenue to help subsidize user costs, build or maintain additional stations, or to help fund outreach and education efforts.

d) Add charging stations for City fleet facilities.

The City aims to have a comprehensive integration of EVs across departments. In 2016, 119 out of the City’s 580 fleet vehicles, or roughly 20%, were electric. This number will increase as Fleet

Management continues to pursue a goal of 80% alternatively fueled fleet vehicles by 2020.

Currently, most City fleet vehicles share public charging infrastructure, with the highest demand located at the Civic Center Parking Lot and Structure. The Civic Parking Structure has 17 connections (16 level 2 and one DC fast charging station) available on the first floor.

These stations were previously utilized primarily by city fleet vehicles, but as of May 2017, the city designated seven Level 1 connections on the second floor for City Fleet only in order to make the first floor level 2 connections more available to the public. An additional 31 fleet-only charging stations will be installed on the roof of the Civic Center Parking Structure through the Charge Ready program. The Civic Solar Port has twelve Level 2 connections that are shared by City fleet and the public.

Future electrification of larger vehicles such as the Big Blue Buses and Waste Management trucks would require high-capacity charging and load management, in addition to strategic site planning.

e) Explore new and emerging EV charging and storage technologies.

Advancements in EV charging technologies, energy storage, and charger-sharing applications are offering more efficient and reliable ways for EV drivers to charge their vehicles.

Web/Smartphone Applications

Web based applications such as PlugShare, EV Match, and Pavemint help EV drivers locate nearby charging stations on the go. PlugShare shows both public and private charging stations, fees, and service providers. Ten Santa Monica residents have listed their private residential chargers on PlugShare for public use.

EV Match (currently in pilot phase) focuses exclusively on pairing private

residential EVSE owners with EV drivers looking for a place to charge. This allows EVSE owners to recoup some of their costs while offering a solution to drivers in need of a nearby charging station.

Pavemint is a new app that allows individuals to rent out their private parking spaces, with the potential to rent spaces with charging station access as well.

These services should be reviewed further as there may be zoning code implications to consider. The growth of the sharing economy may help supplement public stations in residential neighborhoods.

Solar & Energy Storage

The advent of battery energy storage has created a new opportunity for EV charging. While EV charging may increase a building's electricity demand, battery energy storage can help mitigate the high costs associated with peak hours, avoiding the need for expensive,

inefficient fossil-fuel plants to meet high electricity demands. Integrating solar PV with energy storage is one of the cleanest ways to provide backup electricity for charging.

Large parking structures are the best locations to pilot integrated storage due to the large building loads. UCLA Smart Grid Energy Research Center (SMERC) has installed several proprietary EVSmartPlugs and one DC-fast charger within the Civic Center Parking Structure in order to demonstrate the benefits of smart charging and batteries. The plug-in devices collect energy consumption data and perform remote monitoring and control of EV charging.

Load Management/Demand Response

Charging EVs increases electrical demand, which places a strain on the electrical grid and increases costs for the site host. When the utility grid experiences peak demand, utilities turn to fossil fueled power plants to provide additional

power, which causes more greenhouse gas emissions.

Smart chargers can alleviate this by reducing or limiting their rate of charge. This function provides a benefit to the utility, which can incentivize the site host to provide this service through time-of-use rates.

Installing EV charging stations can be cost-prohibitive and unfeasible if the existing electrical infrastructure cannot support the electrical load. Load sharing technology offered by several EV service providers can help to avoid expensive electrical upgrades by enabling more vehicles to charge on the same 30-40 amp circuit.

Charging rates decrease when multiple vehicles are plugged in at the same time, however smart systems can detect when a battery is fully charged and will begin delivering full power to another vehicle. Station owners can monitor the building's electrical capacity and efficiently manage

the power across several charging stations so as not to exceed the total electrical capacity.

Mobile Charging

Solar carports, which offer an alternative to the standard grid-connected EVSE, do not require expensive trenching and wiring, and can be relocated if necessary. These units, though typically more expensive than traditional charges, can provide an array of services, like cell-phone charging, emergency power and field-surveys for charging demand. The City has purchased one solar carport called the EVARC, produced by Envision Solar. Envision Solar utilizes a solar tracking system to maximize solar production.

The City of San Francisco is receiving three EV ARCs through grant funding. San Francisco plans to track usage patterns and move the stations every few months to assess usage.

Wireless Charging

Wireless charging is another option that offers aesthetic and convenience benefits, but is not yet commercially available. Charging equipment is either surface-mounted or embedded in the ground and connects to grid-supplied power through a wireless receiver. A mobile app provides communication between the hardware, serving as the sole interface with the driver.

Wireless charging stations are estimated to be 12% less efficient than corded Level two 30amp 240-volt charging systems and 7% less efficient than corded Level 1 charging systems. One of the key restraints for the wireless car charging industry is the lack of a unified standard of products from the manufacturers.

f) Explore DC fast charging options where appropriate and feasible.

DC fast chargers (DCFCs) offer a convenient option by providing a full charge in less than 30 minutes, compared to four to six hours for level 2 chargers.

The City currently has one public DC fast Charger(480 volt) available in the Civic Center Parking Structure. DCFCs can serve 2-3 times as many vehicles per day compared to level 2 charging stations; however, there are challenges to installing and operating them.

Barriers to adopting fast charging stations include expensive equipment and installation costs, large space requirements and high electrical demand. In addition, charging exclusively through fast charging can lead to imbalanced battery cells, which may reduce vehicle range by about 10-15%.

Installation costs for DCFCs can range

Envision Solar EV ARC 4 Charging Station



Source: Envision Solar

from \$4,000 to up to \$51,000 per unit (New West Technologies LLC, 2015), largely due to complicated electrical upgrades for the higher voltage requirements. Fast charging options will be explored throughout the city through public private partnerships.

Cities such as Vancouver and Sacramento have made investments in fast charging as a way to compensate for a lack of access to home and workplace charging.

g) Develop guidelines and standards to support charging for e-bicycles and neighborhood electric vehicles.

The City has seen an uptick in the use of neighborhood electric vehicles (NEV) and electric bicycles, which provide additional options for local trips. Over 50% of vehicle trips in Santa Monica are less than 3 miles, and one in 10 trips are to Downtown.

The Santa Monica Free Ride currently offers free rides within Downtown Santa Monica and connecting to Venice, offering a critical first-last mile

service and enabling greater mobility without a car.

Personal NEVs and e-bikes support the City's goals to increase cleaner, greener transportation. They are relatively easy to charge because they almost exclusively use the common 110AC outlet. As more e-mobility options become more popular and prevalent, more public charging will need to be offered for these types of modes.

The existing municipal Bicycle Parking code 9.28.140 requires at least one electric outlet in each long-term bicycle

parking area (at least four hours), however it does not address short-term e-bike parking. Developing strategies for public e-bike charging at parking structures, lots, and other designated locations will support the growing number of e-bike users throughout the city.

Adding 110 AC outlets for NEVs or e-bikes is less intensive than providing Level 2 or DC fast charging. Where appropriate, this 'slow charging' option could be made easily available. More research and outreach will need to be conducted in order to determine the Best locations for this kind of charging.



Case Studies: Municipal Progress in DC Fast Charging

Vancouver

The City of Vancouver has allocated around \$2M to deploy hubs of public fast charging stations (known as “Ehubs”) into community development options and the redevelopment of existing parking facilities. Strong community interest in fast charging helped spur this investment: “Approximately 70% of [survey respondents said that having access to a fast charging station at a favorite amenity such as a coffee shop or grocery store within a 10-minute drive of their home would make them very or somewhat likely to consider an EV” (City of Vancouver Administrative Report, October 19, 2016).

Sacramento

The City of Sacramento partnered with EVgo in 2017 to install six curbside fast charging primarily to serve MUD

residents without garages. An initial three chargers and four EV-only parking spaces are expected to be in place by mid2018. Rates will be 20 cents per minute plus a flat fee of \$4.95 per session or \$19.95 per month (Knowles, 2017).

Portland

As part of the Portland Electric Vehicle Strategy, the City aims to increase access to EV charging infrastructure by doubling the number of both level 2 and DC fast chargers available to the public (Portland Electric Vehicle Strategy, 2017).

Seattle

Seattle’s EV carshare program, ReachNow, will be adding 20 fast charging stations across the city (\$1.2M). Each station will be able to accommodate about five EVs, supporting up to 100 total once complete.

Private Charging: Increase EV Charging for Multi-Unit Dwellings (MUDs) and Workplaces



- a** Develop a pilot rebate program for MUD residents and workplaces; include additional funding for low-income residents.
- b** Identify qualified vendors to handle MUD and workplace charging in Santa Monica.
- c** Streamline the permitting process and allow online permits for small-scale installations.
- d** Designate off-street and on-street locations for public charging infrastructure.
- e** Implement a pilot program to provide EV charging through streetlights.
- f** Partner with priority destination sites to install EV charging.

Financial and logistical barriers coupled with a lack of awareness and incentives inhibit access to onsite charging for MUD tenants and workplaces. Addressing barriers to EV charging in MUDs and workplaces is imperative to making EV ownership a truly viable option for the majority of Santa Monica residents. An early Los Angeles pre-survey estimated that increasing access to charging in MUDs to 50% could increase EV adoption 10% (Plug in America, 2016).

Santa Monica has approximately 36,000 MUDs, which make up 71% of the total housing stock. Most MUD residents lack access to home charging stations, and the process to install them can be overwhelming and expensive. Meanwhile, existing funding opportunities such as SCE's Charge Ready Program are limited to large properties with the ability to dedicate at least ten spaces to EV charging.

Constraints to charging in MUDs include:

Figure 12: Top MUDs with Residents Likely to Purchase EVs



Propensity to Purchase



Source: UCLA Luskin Center, 2017

- Limited supply of on-site private parking
- Insufficient electrical service access and/or electrical loads
- Locational constraints between the electrical service and desired charging location
- High installation costs
- Legal barriers to cost recovery
- HOA/landlord opposition
- Lack of education and understanding of technology and options

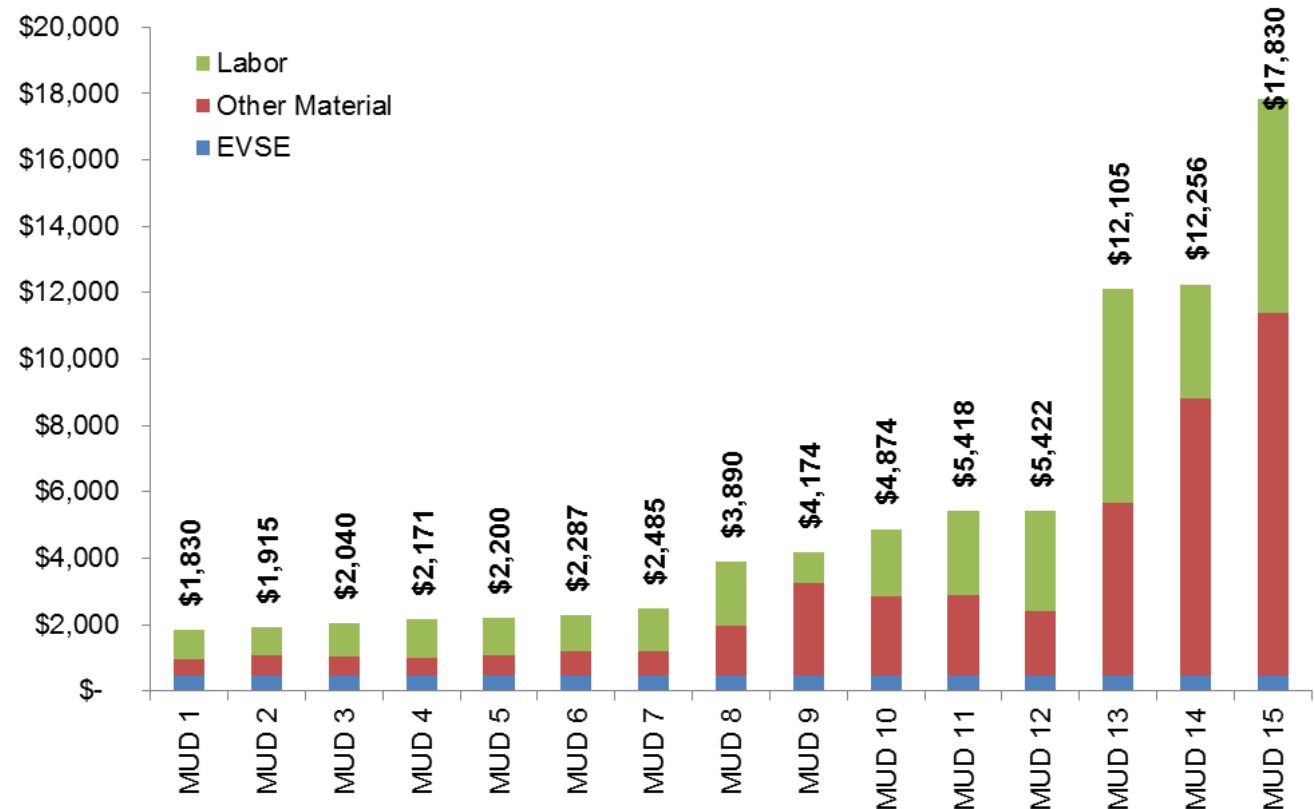
Most small commercial and residential property owners are not familiar with the type of infrastructure that is required to install EV charging stations on their properties. More than half of the property managers surveyed by Westside Council of Governments have been approached by tenants requesting an EV charging station on their property and felt unprepared to respond. The primary barriers to installation were high cost and space constraints.

A study by the UCLA Luskin Center (Figure 12) identifies MUD households with the highest latent demand for PEVs. The score accounts for the historical adoption rate of PEVs in each census tract, as well as the PEV adoption rate of individuals living in households of a certain value. Figure 13 shows a

breakdown of costs related to EVSE installation based on estimates from 15 MUD site visits.

Numerous reports and resources have been developed to help address these barriers, including the *Governor's Office*

Figure 13: Breakdown of Installation Costs for Level 2 EVSE Units



Source: UCLA Luskin Center for Innovation, 2016: Overcoming Barriers to Electric Vehicle Charging in Multi-Unit Dwellings: A South Bay Case Study

of Planning and Research's Zero-Emission Vehicles in California Community Readiness Guidebook, the California PEV Collaborative Plug-in Electric Vehicle Charging Infrastructure Guidelines for Multi-unit Dwellings, and the UCLA Luskin Center's Southern California Plug-in Electric Vehicle Readiness Plan.

The Luskin Center is a research center that has conducted extensive research related to electric vehicle market growth and demand for charging infrastructure. It has produced several additional publications to help guide EV programs and policies in California, including, *Overcoming Barriers to Electric Vehicle Charging in Multi-unit Dwellings: A South Bay Case Study, Factors Affecting Plug-in Electric Vehicle Sales in California, and Designing Policy Incentives for Cleaner Technologies: Lessons from California's Plug-in Electric Vehicle Rebate Program.*

The solution for charging in MUDs will vary on a case-by-case basis – largely dependent on demand and existing

conditions. See Appendix III: MUD Case Studies and Best Practices for a detailed overview of MUD installations with varying parking and cost recovery systems. The following recommendations will help address the identified barriers.

a) Develop a pilot rebate program for multifamily charging to help property owners and residents install charging stations; include additional funding for low-income residents.

A multi-state survey found that 22% of EV owners would not have purchased their vehicle without a home EVSE subsidy; another 39% said it was a very important part of the decision (Plug In America, 2016, p. 18).

A municipal rebate program can provide much-needed financial assistance for MUD property owners and residents who are ineligible for existing funding programs. A portion of funding

for this pilot program should be dedicated to low-income residents as this is crucial to providing clean air and cost-savings benefits and ensuring mass adoption.

San Diego Gas & Electric plans to install 350 EV charging stations in low-income areas within their service territory through their Power Your Drive Program. Targeting areas with affordable housing units and higher concentrations of low-

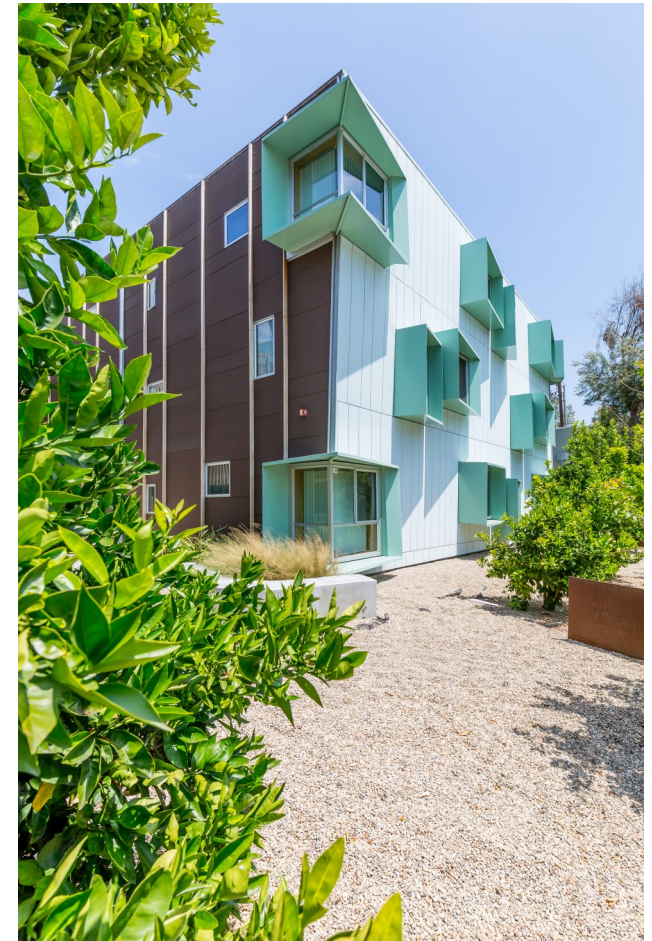


income residents can improve EV charging accessibility.

The Luskin Center developed rebate specifications for an EVSE pilot program as part of their comprehensive analysis to support EV adoption in Santa Monica. In order to create an effective, equitable, and robust EVSE rebate program, the Luskin Center recommends the following rebate specifications:

- Rebates should cover 100% of EVSE equipment costs (up to \$750 in funding) and 75% of the installation costs (up to \$3,000 in funding).
- Increase the installation incentive amounts from \$3,000 to \$4,000 for the following applicants: (1) low-income property owners, (2) property owners that rent to low-income residents who will charge an EV in their designated parking spot, (3) property owners that have a building located in a Disadvantaged Community, and (4) property owners that install two or more EVSE units.

- Rebates for purchase and installation costs should be awarded separately to help control for the cost of the program. Setting maximum incentive amounts for EVSE and installation activities also encourages retailers and contractors to keep their prices low, since property owners can't combine incentive amounts for any single expense.
- Since EVSE installations become more cost-effective as the number of chargers increase, financial incentives should increase for property owners who install more than one EVSE unit.
- Review the program after one year to evaluate whether the program is inducing demand, whether the incentive amounts accurately reflect the cost of EVSE installation for buildings in Santa Monica, and whether property owners are realizing private benefits from EVSE installation (e.g., an increase in property value).



In addition to these recommendations from the Luskin Center, City staff recommends the following specifications:

- No one site should receive more than 10% of the funding.
- No single recipient should receive more than 12.5% of the funding for its combined sites.

Case Studies: Incentive Programs

Los Angeles Department of Water and Power (LADWP)

LADWP is offering \$21.5M in rebate funding through the Charge Up LA! pilot program, which runs until June 2018, or until funds are exhausted. The program encourages EV charging station installations in workplaces and multi-family buildings. LADWP provides a rebate of up to \$500 per wall-mounted charger for residential customers (hardware only). Commercial and multi-family residential customers receive up to \$4,000 per hardwired Level 2 charger. LADWP has an EV Program Customer Service Representatives to assist with charger installations and service.

Bay Area Air Quality Management District

The Air District committed \$12.5M for EV-related projects, with \$5M reserved for EV charging infrastructure as part of a regional EV readiness commitment. Unlike most rebate projects, participants must be eligible for at least \$10,000 in

funding, with a cap of \$500,000 per year per facility. Eligible facilities include MUDs, workplaces, transit parking, and destination facilities. Stations must operate for at least three years and achieve minimum usage requirements. Rebates cover up to 75% of the cost of purchase installation, and operation of the equipment.

Austin Energy

Austin Energy facilitates EV charging in MUDs by offering EVSE rebates and a range of benefits to MUD property owners and EV drivers. Rebates are available for up to \$4,000 or 50% of the cost to install Level 2 charging stations, which must be compatible with software to enable usage data collection.

Residents are charged a flat fee of \$25 every six months on their electric bill for unlimited electricity. Station hosts are reimbursed for electricity used at the station. Property owners have access to operational support, may be eligible for a green building innovation point, and

receive EV charging decals to promote the amenity at their building. Austin Energy provides property owners with a list of approved vendors to help with the selection process.

Austin Energy is in the process of conducting a new pilot program with an increased rebate to 80% of the installation cost at 20 properties.

Southern California Edison

Southern California Edison currently does not offer a rebate program for EV infrastructure, however the 2017 Transportation Electrification proposal includes a customer rebate for residential charging installation. This rebate would apply to single-family residences and smaller MUDs that are not covered under the current Charge Ready program.

**See Appendix V for Additional Rebate Programs.*

- Rebates may be used in conjunction with other local or Federal incentive programs.
- Once the application is approved and funding reserved, the applicant has six months to complete the installation.

b) Identify qualified vendors to handle MUD and workplace charging in Santa Monica.

EVs are still relatively novel for many people and the intricacies of charging can be confusing. Everyday, there are more providers offering different technologies and solutions. For property owners, it can be confusing to navigate options and keep costs low. According to a recent survey of MUD property owners in the Westside, over 50% of respondents were unfamiliar with EV charging technology.

With a majority of Californians and potential EV drivers living in MUDs, a growing number of service providers are providing lower-cost solutions by taking advantage of new technologies and financing models. Identifying local

vendors who specialize in MUD charging and workplace charging through an open vetting process will save property managers time and money searching for their own vendors. It will also provide a frame of reference for residents and managers interested in bringing EV stations to their properties in Santa Monica.

c) Streamline the permitting process and allow online permits for small-scale installations.

More than 85% of EV charging takes place at home, which is why a streamlined permitting and installation process is crucial to facilitating EV adoption. Plug In America advocates: “[Do] what you can to make home EVSE installation a quick, high-value, one-stop shopping trip.

Under Assembly Bill 1236, cities are required to provide a streamlined and expedited permitting process for EV charging stations by September 30, 2017. A first reading of the new ordinance took

place at a City Council meeting on September 12, 2017.

EV charging stations in single-family units or projects involving less than 40 amps of service will be available in an online, streamlined application process, as other cities have implemented. Permits for multi-family units and projects requiring more than 40 amps of service must remain over-the-counter and require inspections due to safety concerns with higher voltages and more complicated electrical wiring procedures.

Permits for EV charging station installations are issued by the Building and Safety Division and can be obtained same day if all the required documents are ready. The process for applying and receiving an over-the-counter EV Charger Permit is as follows:

1. Complete a Single Trade Permit Application online or at the permit counter.
2. A site plan is required for review, and any other applicable documents.

3. The applicant must see the Transportation counter, and in some cases, the Planning counter (depending on the exterior location of the charger).
4. Once reviews are complete, the applicant must see a Permit Specialist to process the application.
5. The applicant pays the \$5 mandatory Strong Motion and Green Building fee; all other fees are waived.

Note: Three inspections are included in the inspection process fee. Any additional inspections incur additional costs.

d) Designate off-street and on-street locations for public charging infrastructure.

Increasing public charging in high-density multi-family residential neighborhoods will offer an option for MUD residents who lack off-street (private) charging. Stand-alone parking lots offer the most convenience in terms of EVSE installation and monitoring, however, these are not conveniently located for residential charging.

Case Studies: Streamlined Permitting
Several cities nationwide, including Los Angeles, Portland and San Francisco, have implemented streamlined permitting systems.

Los Angeles

The City of Los Angeles' expedited permitting system issues permits instantly online for single-family units with up to 40 amps of service (including any needed charging equipment, service upgrade, receptacle and associated wiring). A follow-up inspection occurs within 24 hours and stations can be used immediately following inspector

approval. EVSE permits for multi-family and workplace charging stations are over-the-counter and typically take between 5 to 15 days for approval.

Portland

The City of Portland streamlined its permitting process for charging station installations by following the state's minor label program – inexpensive permits for minor electrical and plumbing residential and commercial installations. This allows for faster, more cost effective deployment by contractors and requires inspections in only one out of ten installations.

In addition to off-street parking, on-street locations have been identified for charging opportunities. Providing charging at these locations, however, can be challenging due to lack of available electrical infrastructure, undetermined rules and regulations concerning use, and due to right-of-way conflicts with other users. The high demand for all on-street parking in multi-family districts and commercial areas must be considered

when creating dedicated EV charging spaces.

Head-in parking spaces, diagonal or perpendicular, are ideal for curbside charging as they take up less curb space and can utilize stations that feature two charging ports. These types of spaces, however, are much less prevalent than parallel curbside spaces and create less safe conditions for cyclists than head-out

spaces. Efforts should be made to coordinate competing uses in the right-of-way. When siting EV charging locations, areas identified for future bike, pedestrian, or transit facilities should be avoided.

Appendix I shows an overview of proposed public stations, including curbside locations. These sites were identified given the following factors: the availability of head-in parking spaces; underutilized parking meters; a lack of nearby charging infrastructure; high-density neighborhood location; and/or close proximity to streetlights.

Figure 14 shows areas with high curbside charging potential based on proximity to commercial destinations and mid-day trips.

Figure 14: Curbside Charging Siting Potential



Source: UCLA Luskin Center, 2017



e) Implement a pilot program to provide EV charging through streetlights.

Streetlight EV charging is an innovative option to provide public curbside charging; the charging infrastructure is affixed to the existing streetlight. As streetlights are converted to efficient LED lighting, electrical power demand becomes available for additional uses like EV charging. Cities like Los Angeles, Munich, and Oxford have piloted this new technology to provide a new source of EV charging.

In early 2017, over 1,270 Santa Monica streetlights were upgraded to LEDs. When converted to LED, streetlight circuits have excess capacity that could potentially be utilized for EV charging.

For sites where there is not enough electrical capacity to install a 240V Level 2 charger, 120V outlets could be installed to supply power for e-bikes and EVs parked overnight.

Future streetlight conversion projects

should take a proactive approach and build in the ability to add circuits (i.e. empty conduit) so that the infrastructure can accommodate EV charging.

City staff will need to assess the following areas with SCE prior to implementation: availability of City-owned streetlights with ample electrical capacity; requirements for separate meters and breakers; increased costs due to new rate categories; conduit and trenching requirements; and engineering and design fees.

Lotus Solar EV Charger



Source: Inhabitat, 2011

Streetlight Charging Station



Source: Charged EVs, 2017

Case Studies: Streetlight Charging/ Innovative Technologies

City of Los Angeles

The City of Los Angeles replaced its energy-intensive sodium-vapor streetlights with LEDs reducing energy use by 80%. The City utilized the excess electrical capacity in the street lighting circuit to charge electric vehicles. Thirty-two Level 2 streetlight charging stations were installed and are operated by ChargePoint. Usage data for 22 of the stations show more than 3,500 sessions during 2016.

Fees to park and charge at the stations are \$1-\$2/hour depending on infrastructure requirements and whether or not the City had to forgo revenue from a pre-existing parking meter.

Initially, higher-revenue metered spaces were avoided, but due to high usage rates, the City has been able to earn enough revenue to pay for the electricity. All stations have credit card readers with RFIDs. Installations take about two to three hours to attach the unit to the

streetlight and cost around \$9,000 per unit.

A rebate from LADWP covered about 40% of the cost and charging revenue helps make up the difference. Street striping around the stations indicates EV-charging only.

City of Lancaster

Munich-based startup eluminocity and the BMW Group announced their “Light and Charge” pilot project in January 2016. The project is a system of “smart” streetlights that double as charging stations for EVs and are being tested in Munich, Oxford, Los Angeles, Seattle, and now Lancaster.

The City of Lancaster launched a demonstration project in 2017 that will integrate chargers into five streetlights in the downtown area. A grant from the Antelope Valley Air Quality Management District will cover 80% of project costs, including installation, maintenance, and data collection. The remaining 20% will be

covered by project partners, including EasyCharge and eluminocity.

Drivers connect a standard charging cable to the streetlight, and use a control panel on the light to swipe their charge card to register use.

Lotus

The Lotus technology is a solar-powered EV charger that doubles as an LED streetlight and a sheltered bench. The Lotus was designed by Luminexence for both parking areas and parks. It has a 2.8 kW photovoltaic surface, built-in LED lights, and a waterproof Scame electrical outlet to charge EVs. It currently only fits European plug outlets and is produced in Bergamo, Italy. The grid independence makes it a resilient option in the case of power outages. If a similar technology becomes available in the U.S. and is financially feasible, it may be worth pursuing.

f) Partner with priority destination sites and large employers to install EV charging.

Priority destination sites may include movie theatres, schools, churches, retail centers, and other entities that serve multiple uses with relatively long dwell times (at least one hour). The City will solicit interest from key sites and reach out to property owners to address concerns and facilitate EV charging in strategic locations. Public-private partnerships could provide additional charging opportunities throughout the City.

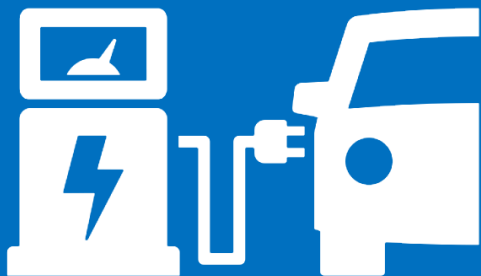


What is a Priority Destination Site?

Characteristics include:

- Long dwell times
- Open to the public
- Located next to residential neighborhoods
- Serves multiple commercial uses
- Private host

Public Policy: Update parking policies and practices for efficient charging access and station use



- a Modify City Ordinance to allow on-street EV charging.
- b Update zoning ordinance requirements to increase the parking spaces available for EV charging.
- c Review and update parking policies and signage for public EV charging locations.
- d Explore a program to adjust nighttime parking rates or provide resident charging permits for overnight charging at public facilities.
- e Explore carshare and rideshare services to increase access to EVs.
- f Expand the fleet-sharing system for all city departments and divisions located at the Civic Center.

A variety of regulations and practices can be enhanced to optimize EV charging.

The City's existing parking requirements do not adequately incentivize or require property owners or developers to designate additional EV charging spaces and install EV infrastructure.

Other issues that could be addressed through policy updates include on-street parking designation, EV parking signage, unutilized public charging facilities at night, and charging access for EV car sharing services.

a) Modify City Ordinance to allow on-street EV charging.

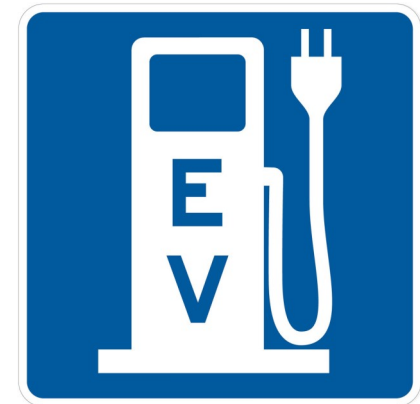
Under the existing ordinance 3.12.835, the Director of Planning and Community Development (PCD) can designate parking spaces in City-owned *off-street* parking facilities for the exclusive purpose of charging electric vehicles. Modifying this ordinance to include *on-street* parking would enable the PCD Director to enforce time limits on public

chargers to ensure user turnover.

Despite the resources that are currently available for multifamily unit dwellings, limited access to off-street EV parking and charging remain an issue for MUD residents who wish to drive EVs. Street parking is an available asset that can be leveraged to provide additional public charging, with an emphasis in the multifamily neighborhoods.

The majority of Santa Monica neighborhoods have dedicated preferential parking. Approximately 50,000 preferential parking and visitor permits are issued per year. By 2025, California will aim for 15% of all new vehicles sold to be emissions-free. If Santa Monica meets this goal, the proportionate number of EVs that will need to park and charge in residential neighborhoods will increase substantially over the next 10 years.

Due to limited curbside parking in many dense neighborhoods, dedicating public curb space to EV charging may be controversial; however, there is a high demand for EV charging in these areas due to limited garage space and/or access to electricity to plug in. A balanced approach will be necessary to ensure that both charging and parking can be adequately and equitably provided for all.



Case Studies: Curbside Charging Programs

City of Vancouver

The City of Vancouver created a Curbside Electric Vehicle Charging Pilot Program as part of their broader EV Ecosystem Strategy adopted by Council in October 2016. The Pilot Program serves both non-residential and residential users, with a maximum of five installation for non-residential and a maximum of fifteen residential installations. Applications for the program are be open through June 2019, with each installation permitted under a licensing agreement for a five-year term. All applicants are responsible for the cost to buy, install, maintain and remove the EV charger.

City of Berkeley

The City of Berkeley implemented a 3-year Residential Curbside EV Charging Pilot in 2014 to allow Berkeley residents without off-street parking the opportunity to charge at home. Though this Pilot, accepted applicants can either create a new space to charge on their property or

install a station at the curb adjacent to their home . Grant funding is available to reduce permit fees; however, the purchase, installation, and electric costs are the responsibility of the resident installing the station.

As of September 2017, only five out of the 29 approved curbside projects had been installed. This is largely due to high installation costs (ranging from \$5,000-\$20,000) and the inability to guarantee access to the charging station.

City of Walla Walla

The City of Walla Walla, Washington allows EV charging in the public right of way as long as they meet certain size, location, design and signage standards. The city engineer approves the location of charging facilities following review and recommendation from the site plan review committee. The location and design criteria require proper signage, maintenance, accessibility, lighting, and equipment protection. Location preference for EV charging stations is at

the beginning or end stall on a block face.

City of Burbank

The City of Burbank conducted the first curbside EV charging pilot in the country in summer 2015, known as the EV Charge N' Go Curbside Project. Eight dual-port level 2 chargers were installed curbside in the public ROW near retail, park, and library facilities. The total project cost of \$230,000 (about \$30,000 per site) was funded in part by a grant from the California Energy Commission. Usage tripled over the first six months, with peak charging times at 12pm and 7pm.

City of Seattle

The City of Seattle is in the early stages of designing a residential EV charging pilot program. The program will support the installation of level 2 chargers in the residential sector by providing on-bill repayment and a time-of-day pricing model for EV charging.

b) Update zoning ordinance requirements to increase the parking spaces available for EV charging.

Per the 2015 Zoning Ordinance Update, all new development in Santa Monica, including remodels or expansions, must have one charging station for facilities with 25-49 parking spaces and two charging stations for 50-99 parking spaces. One additional charger is required for each additional 50 spaces.

As of January 1, 2017, all new EVSE installations must comply with the State Architect's ADA Accessibility Building Standards. A minimum of one van-accessible space must comply with ADA Section 11B-812 for every 1-4 charging stations at a facility.

Per section 8.106.100 of the Santa Monica Green Building Standards Code, Developer Agreements (DAs) must adhere to requirements to install electrical service panels in MUDs. Parking facilities must include a load of ten kilowatts per

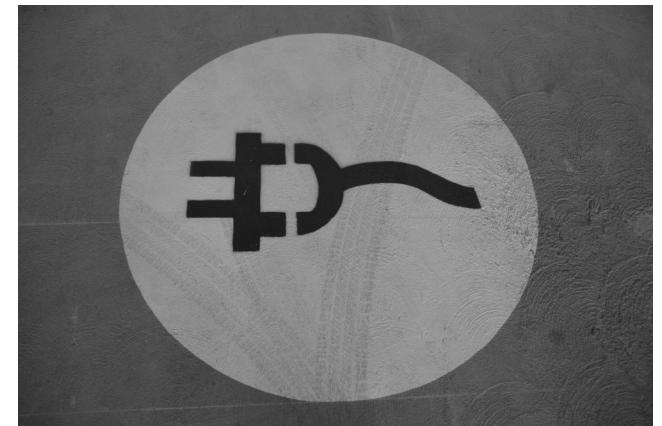
5% of the parking spaces provided. These minimum requirements should be increased to accommodate for current and future demand for EV charging.

This plan recommends amending the Zoning Ordinance to require one EV-ready space per dedicated set of residential unit parking in new buildings. This will ensure greater access to EV charging compared to a minimum percentage requirement. Parking spaces must be served by a 208/240 volt, 40 amp, grounded AC outlet, or there must be electric panel capacity and conduit to support future 208/240 volt, 40 amp outlets at each subject parking space.

The City should increase requirements for EV-ready spaces in new commercial buildings from 5% to 15%. On a case-by-case basis, where the Planning Director has determined EV charging and infrastructure are not feasible due to unreasonable hardship, the Director may consider an appeal from the project

sponsor to reduce the number of EV spaces required.

The additional costs to add charge-ready spaces during the initial construction process are minimal compared to the cost of upgrading service panels and installing stations after the development process has been completed.



Case Studies: Building Codes Supporting EV Readiness

City of San Francisco

In February 2017, the City of San Francisco introduced new legislation requiring all new buildings to provide electrical capacity and infrastructure capable of supporting EV charging in 100% of parking spaces. The ordinance requires all new residential and commercial buildings to configure 10% of parking spaces to be “turnkey ready” for EV charger installation, and an additional 10% to be “EV flexible” for potential charging and upgrades. The remaining 80% of parking spaces must be “EV capable” by ensuring conduit is run in difficult to reach areas of a parking garage to avoid future cost barriers.

City of Fremont

EV Ready parking spaces equipped with the electrical raceway, wiring, and electrical circuit must be included in all residential and non-residential new construction projects and in additions where new parking spaces are provided. For single-family residential,

the City of Fremont requires one EV ready parking space per each new dwelling unit. For multifamily projects of three or more units and for non-residential projects, 8% of the total number of new parking spaces must be EV ready.

City of Vancouver

In 2013, the City of Vancouver adopted new minimum requirements for parking stalls in both residential and commercial buildings. Twenty percent of parking stalls in new MUDs (with three or more units) must have Level 2 EV charging capacity; MUDs con-

structed since 2011 must support at least Level 1 EV charging. By 2023, 10% of all new commercial buildings must be equipped with Level 2 charging circuits.

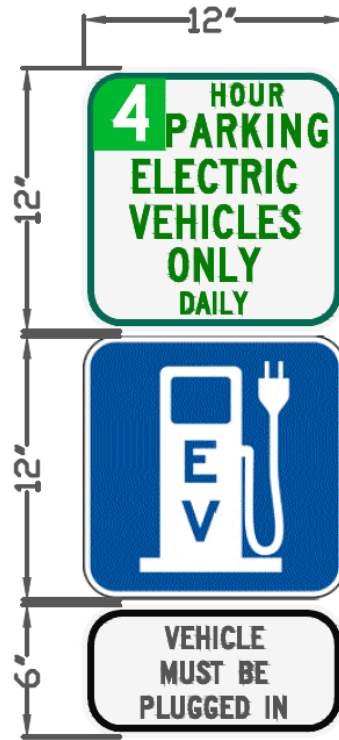


c) Review and update parking policies and signage.

Public charging is available in off-street lots, parking structures, and on-street parking facilities. Regardless of the location, restrictions on time and length of use must be implemented to ensure turnover, prevent abuse of the system and enforce facility operating hours. Signage, communications, cost, and enforcement are tools that can help ensure efficient use of public chargers.

Replacing existing signs with standardized signage at all EV charging and parking stations in Santa Monica would enhance clarity for users. The two basic types of signs found at charging stations are general service signs, which identify and direct drivers to charging stations, and regulatory signs, which convey time- and permit-related restrictions.

In August 2017, the City approved the following EV parking signage standards:



There are currently seven EV charging locations in Santa Monica that do not meet these signage standards: Santa Monica Airport, Civic Solar Port, Montana & 11th St (curbside), Parking Structure 7, Santa Monica Pier, and Virginia Avenue Park.

Virginia Avenue Park (Pico Lot)



Montana Ave & 11th St



For private installations of EV charging infrastructure, installers should follow the existing layout pattern at parking locations. This practice is necessary to prevent the re-striping of parking lots or drive aisles within a parking structure.

Though the City wishes to explore all avenues to increase public charging infrastructure, non-proprietary stations provide greater access than proprietary options, and thus will be prioritized.

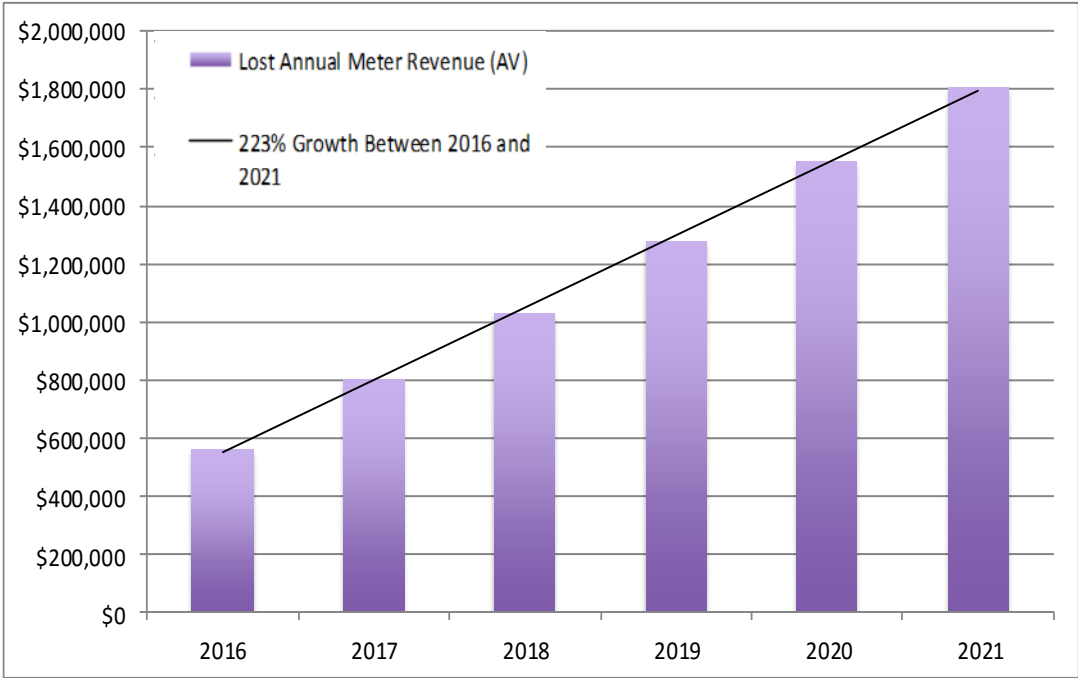
Once additional public charging infrastructure and incentives are implemented, it may be beneficial to explore alternative benefits to the metered parking privileges for EV drivers. While EVs provide environmental and community benefits by reducing pollution and noise, it is important to recognize that EVs still contribute to congestion and traffic just like any other vehicle.

Santa Monica remains one of four cities in California that still offers free parking for

EVs, and one of only two cities that allows both BEVs and PHEVs to park for free. The cities of Manhattan Beach and Hermosa Beach allow free metered parking for BEVs only and San Jose allows all EVs to park for free. Staff estimate that approximately \$560,000 of meter revenue was forgone by offering free street parking in 2016. This

impact could grow to \$1.8M by 2021 as EV ownership grows over time. As more charging benefits are provided through infrastructure and resources, parking will be monitored to ensure a balanced approach toward mobility and sustainability goals.

Figure 15: Predicted Lost Meter Revenue from Free EV Parking



Sources: Predicted EV purchase growth rate, UCLA Luskin Center for Innovation; California EV Market Share, IHS Markit; Annual Meter Revenue, City of Santa Monica, 2017

d) Explore a program to adjust nighttime parking rates or provide resident charging permits for overnight charging at public facilities.

Public charging facilities can be utilized by neighborhood residents who lack access to charging in their buildings. Locations such as the Nielson Way lots and Santa Monica College could offer charging facilities in high-density areas where there is limited access to residential EV charging. Rates should be affordable (no more than \$5 per night) and residential charging permits could be available for EV owners in the designated parking zones.

e) Explore carshare and rideshare services to increase access to EVs.

The City supports the growing shift toward shared-use mobility options such as carsharing (e.g. Car2Go) and shared ride services (e.g. LyftLine and Uberpool), both of which present an opportunity to reduce vehicle ownership and vehicle miles traveled. The growing use of EVs in both industries increases demand for charging spaces.



Carshare providers such as WaiveCar, Car2Go, ReachNow and BlueIndy operate all-electric fleets, which require convenient drop-off stations and EV charging. Public-private partnerships with EV carshare providers can help foster EV usage and provide EV access to residents who may not be able to purchase an EV on their own.

Future Considerations: Autonomous Vehicles

Though not specifically addressed in this plan, the future of autonomous vehicles (AVs) will impact the City's mobility network and sustainability goals. Charging infrastructure will likely be utilized by autonomous EVs, requiring strategic site planning and use of curb space. Future investment will need to be made to designate EV charging facilities for AVs.

f) Expand the fleet-sharing system for all departments and divisions located at the Civic Center.

City staff currently manages a pool of vehicles that are available to all City staff, located within the Civic Center. Several City divisions also retain their own fleet vehicles, primarily for field inspection services.

As City staff converge into the City Services Building by 2020, fleet management will become a key strategy to effectively manage vehicle resources and the supply of available parking and charging. Instead of individual departments and divisions ‘owning’ their own fleet vehicles, Civic Center staff will be able to access a centrally managed citywide fleet.

This system will encourage greater vehicle utilization, reduce the total number of vehicles and increase supply of available parking and charging within the Civic Center. Effective energy management will be a key factor in

ensuring fleet vehicles are charged when needed at rates that do not overload the grid.

Since few fleet parking locations have the existing electrical capacity to support the installation of multiple charging stations, it is important to choose systems with load sharing technology that can charge more vehicles with less infrastructure (to significantly lower equipment and installation costs).

Smart dashboards can communicate with a controller to manage charging times per station, set charging priority, and remotely turn off a station if necessary. Certain charging systems also have the capability to integrate with building management systems to help manage energy loads.



Case Studies: The Rise of EVs in Carshare and Rideshare Services

City of Knoxville & Zipcar

The City of Knoxville has a lease agreement with Zipcar for 4 parking spaces, and an EVSE supply contract with Car Charging Group for EV charging that acts similar to a lease (Knoxville offers the space in exchange for charging as a service). Currently, there is no charge to use the space, but in the case of Car Charging Group, the City receives a small share of the revenue.

Knoxville pays the provider \$15/month per EVSE deducted from gross revenue generated at the EVSE. An 8% transaction fee is deducted from gross revenue generated at the EVSE. The provider remits to the client 10% of net profits generated by the equipment.

WaiveCar

Waive Car launched in Santa Monica in 2016 with a fleet of 20 EVs, and offers two hours of free driving in their all-electric fleet.

WaiveCar built their own EV charging facilities at their headquarters due to the lack of public charging facilities. The location of existing public chargers in parking structures that require payment created an additional challenge for the company. A new partnership between WaiveCar and Hyundai will add 150 IONIQ EVs throughout Los Angeles by mid-2017.

ReachNow

ReachNow is a premium car sharing service that includes a fleet of electric BMW i3 vehicles and is currently operating in Seattle, Portland, and Brooklyn (the EV option is not yet available in Brooklyn). Parking is free in public spaces anywhere within the designated home area. A ReachNow service team picks up EVs with low batteries and recharges the vehicles at their stations when necessary. ReachNow drivers can see the available mileage through the app before reserving the vehicle.

Bolloré Group (BlueLA, BlueIndy & AutoLib)

In 2017, Los Angeles launched an EV carshare program called BlueLA. The program intends to serve disadvantaged neighborhoods and will scale to 100 EVs and 200 charge points by the end of 2017. The service is operated by Bolloré Group, which operates the AutoLib carshare program in Paris. AutoLib now has more than 4,000 vehicles and 130,000 active users. A similar program called BlueIndy is also underway in Indianapolis.

Membership for BlueLA will range from \$0 to \$10 per month and member usage fees will be \$0.20 per minute, with lower rates for low-income members. Cars and parking spaces can be booked online and cars are returned to designated stations at the end of each use.

General Motors, Uber & Lyft

A new car sharing partnership between General Motors and Uber and Lyft enables drivers to rent Chevy Bolts through a service called Maven Gig. The program is live in San Diego and will launch in San Francisco and

Los Angeles in late 2017. The growing usage of EVs among rideshare drivers creates additional demand for easily accessible public charging infrastructure.

Designating parking and charging spaces specifically for EV car sharing and ridesharing will leave more public chargers available to residents and visitors. In addition, it will provide convenience and lower costs for both operators and users.



Community Outreach: Develop EV outreach programs and resources for residents and businesses



- a** Create a webpage with available EV resources, programs, and technologies.
- b** Develop an outreach program for EV charging stations similar to the Solar Santa Monica Program called EV Santa Monica.
- c** Develop outreach targeted to low-income residents.
- d** Encourage access to EV carsharing for MUD residents and a program for low-income individuals.
- e** Create an EV Program Coordinator position to manage all responsibilities related to EVSE coordination and implementation.
- f** Conduct regional coordination related to EV charging and funding opportunities.

Santa Monica residents and property owners need support and guidance to understand available funding to help purchase EVs and finance charging equipment and installation costs. The constantly changing landscape and range of resources can be difficult to navigate. This challenge is even greater for low-income populations and non-native English speakers.

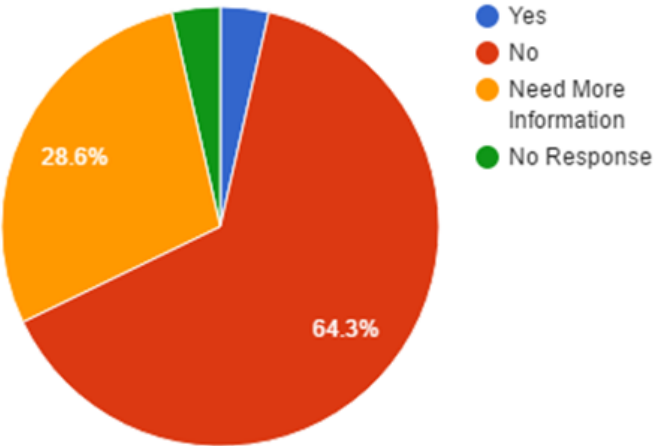
The City currently does not have dedicated staff managing and directing EV programs, policies and projects. A dedicated staff person will be essential to

implementing the plan and completing a broad portfolio of projects.

a) **Create a webpage with available resources, programs, and technologies.**

An abundance of information about installing electric vehicle charging stations is available online, however a lack of knowledge and awareness still pervades most communities. There is considerable confusion and apprehension surrounding MUD installations. Most potential buyers are unaware of PEV models and have never driven one, do not know where or how to

Figure 17: Property Owner Familiarity with EVSE Rebates and Subsidies

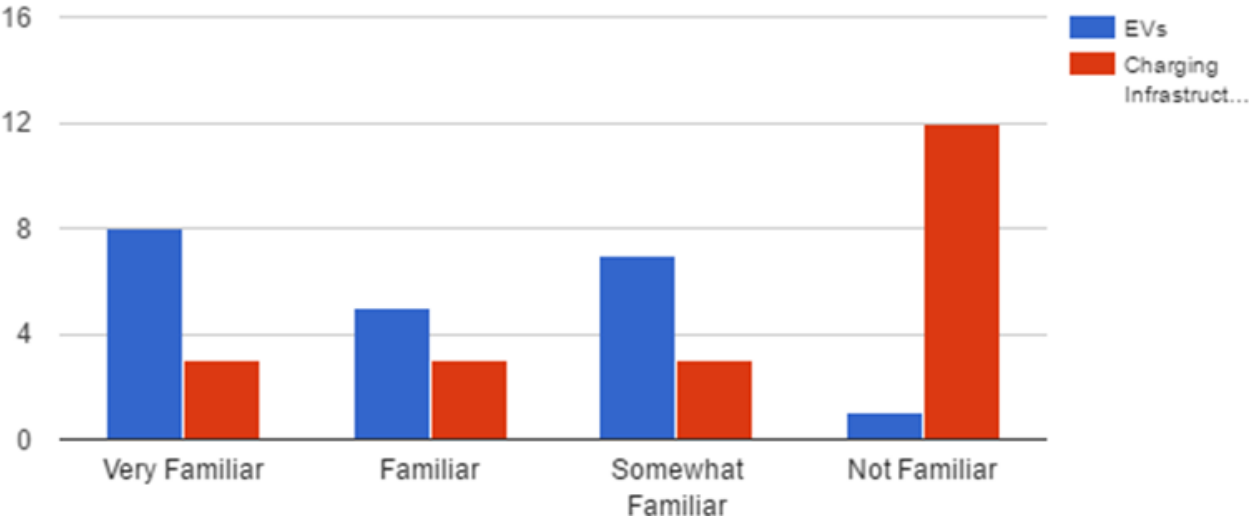


Source: Westside Cities Council of Governments, 2017

charge a PEV, and are more familiar with the high purchase price than the incentives or low operating costs. Most small commercial and residential property managers are also not familiar with the rebates and subsidies offered for EV charging stations.

A web-based platform is necessary to serve as a clearinghouse of information for resources and technologies for Santa Monica residents, employees, employers, and property owners. Basic information

Figure 16: Property Owner Familiarity with EVs and Charging Infrastructure Needs



can include types of charging stations, where and how to purchase EVs, and where to charge. In addition, resources like incentives, financing options, and technical assistance can be provided. Creating a list of EV-friendly condos and apartment buildings can also help prospective tenants who are EV-drivers or interested in purchasing an EV find a unit with existing charging facilities.

b) Develop an outreach program for EV charging stations similar to the Solar Santa Monica Program called EV Santa Monica.

Solar Santa Monica is a free service that provides technical assistance for residents and businesses to help navigate the rules, incentives, and financing options to install solar panels. Services include energy efficiency recommendations, rooftop analysis, bid comparison, and financial analysis.

An EV outreach program can provide a similar service to engage and inform property owners and residents. The goal is to educate the community about the

benefits of driving EVs and the incentives that are available to do so. These incentives include funding to purchase EVs and EVSE, in addition to residential EV TOU rate systems to save money on electricity.

Plug In America's report states that raising awareness about EV incentive programs is imperative. Effective outreach methods include: billing inserts, newsletter blurbs, social media, webpages, event brochures, letters to EV owners, and handouts to local car dealers (Plug In America, 2016, p. 10).

Property owners and residents are both uniquely positioned to facilitate EV charging in MUDs.

Property owners can be stewards of sustainable transportation practices by enabling their residents to drive electric vehicles. The City and local advocacy organizations can help by educating property owners on the environmental and economic benefits of adding EV charging stations in their buildings, in

addition to preparing a survey for property owners to distribute to residents.

Charging stations are an attractive amenity for Santa Monica's "eco-minded" demographic. Due to the limited number of MUDs with EV charging facilities, property owners can benefit from offering the added service, which is in high demand.



Directing information to property owners that explains the environmental

and financial benefits of driving EVs, the municipal requirements for charging stations, and the relevant policies (such as Senate Bill 880 EV owners right to charge) will help bridge the information gap. This will better prepare property owners to participate and spearhead the shift to EV ownership.

A list of FAQs can address common concerns expressed by property owners, such as liability and insurance requirements, vandalism, estimated equipment and installation costs, and metering solutions. Creating a central location for property managers to share advice and ask questions regarding EV charging installations in MUDs would be a valuable resource.

The case studies in Appendix II exemplify the influence residents can have on their property managers or HOA. The majority of EVSE installations were the result of

pressure from residents who either owned or were interested in owning EVs.

c) Develop outreach targeted to low-income residents.

Low-income populations tend to have the least amount of access and resources to own electric vehicles. Targeted information and outreach should be developed to facilitate awareness, interest and ability to own and charge EVs. This may include outreach to property owners and low-income residents, information sessions, mailers, and tabling at events.

Low- to moderate income residents may be eligible for funding through the SCAQMD EV Residential Charging Program. This program incentivizes Level 2 charging for residential garages, carports or parking spaces by providing \$400-\$800 for EVSE hardware costs. An additional \$250 is available for low-income residents. (The program does not cover installation costs.)

Case Studies: Low-Income EV Carshare Pilots

The BlueLA EV carshare pilot is expected to provide mobility access to approximately 7,000 new users from low-income L.A. communities. These users are expected to sell or avoid purchasing 1,000 private vehicles, which would prevent approximately 2,150 metric tons of CO₂ emissions (Shared-Use Mobility Center, 2016).

The Sacramento-based affordable housing organization, Mutual Housing, launched an EV carshare program for residents in June 2017. Funding came from the California Air Resources Board, the Sacramento Metropolitan Air Quality Management District, Zipcar, and other partners. A study from the Transportation Research Board and the National Academy of Sciences estimates that each shared car removes 15 private vehicles from the road (Environmental Protection Agency, 2017).

d) Encourage access to EV carsharing for low-income residents.

Purchasing an EV and necessary EVSE is still a considerable burden for low-income residents, even with local and state assistance programs. Access to EV carsharing services offers a more affordable and convenient option for some residents. Incentives can encourage property owners to offer EV carshare services in MUD development agreements if such services are offered. A low-income carshare program could be modeled after the Breeze Bike Share buy-down program, which offers up to 90% reimbursements on bikeshare memberships.

e) Create an EV Program Coordinator position to manage all responsibilities related to EVSE coordination and implementation.

EV charging intersects the roles and responsibilities of many departments and divisions within the City. In order to achieve the goals of this plan, a dedicated

staff person should manage the various programs, policies and projects.

This staff will be responsible for: implementing and reporting on the plan, managing the City's public charging network; implementing programs and projects; coordinating with the utility and regional initiatives; seeking funding; and developing and implementing policies. This position can be funded in part by revenues from the City's EV charging fees.

f) Conduct regional coordination related to EV charging and funding opportunities.

Coordinating with regional entities such as the Westside Cities Council of Governments (WCCOG) and the Southern California Association of Governments (SCAG) can help advance EV deployment and secure competitive grants for Santa Monica and neighboring cities.

The City and eventually, an EV Program Coordinator, should coordinate with regional initiatives to plan more integrated charging networks and share best practices related to EV charging. Preparing joint proposals for EV funding

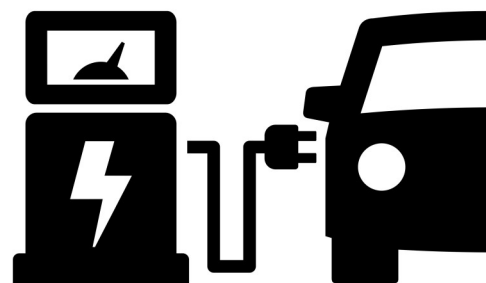
can help leverage local and regional resources and potentially secure additional grant funds, particularly through national opportunities such as the VW settlement funds.

Putting the Plan to Work

Funding the Plan

Implementing the Plan

Measuring Success



Funding the Plan

To date, EV charging and programming has largely come from the City's General Fund through existing budgets and the Capital Improvement Program (CIP). The City received a grant from the Air Quality Management District to procure and install most of the current installations (2017). Existing utility budgets pay for electricity consumption and facilities maintenance budgets support repair and upkeep of the equipment.

While General Fund resources can continue to support existing level of effort, new sources of revenue and financing will be required to expand infrastructure and develop new programs.

City Funds

Staff regularly apply to Southern California Edison for rebates and incentives for energy efficiency projects. These funds are separately maintained as

a revolving loan fund for new energy projects. As most energy efficiency and renewable energy projects can receive separate financing, this revolving loan fund could benefit EV charging projects and programs. Additional funding needs will be met by the Capital Improvement Program (CIP).

New Revenue Sources

With a smart charging system, the City will be able to create new revenue streams through the implementation of user fees and fines, LCFS credits as well as advertising opportunities. Additional revenue may come available if the City moves forward with discontinuing free metered parking for EVs. The revenues generated could be redirected to implement new EV projects and programs and help keep user fees affordable.

Grants and Outside Funds

SCE's Charge Ready program and Transportation Electrification program proposal will help support Santa Monica's

infrastructure needs. SCE has identified Santa Monica as a target community where there is strong interest and capacity to deploy EV infrastructure.

Additional state funding sources may help expand EV charging in Santa Monica. The California Energy Commission awarded the San Diego-based nonprofit, Center for Sustainable Energy, \$15 million to install charging stations statewide. The Cycle 1 Investment Plan of the VW settlement funding includes \$200M to be used for statewide EV charging projects.

Additionally, the Santa Monica has received free electric vehicle charging stations from UCLA through a grant-funded project. The City will continue to apply for State and regional agency funding that supports infrastructure and programs.

The following tables outline funding requirements and potential funding sources by project and program phase.

Table 12: Conceptual 5-yr Project Cost Estimates and Funding Sources

Project Phase	Proposed Chargers	Estimated Average Unit Cost (incl. design & labor)	Total Conceptual Cost (Rounded)	Potential Funding Sources (in addition to existing budget)
Phase IA: 2017-2018 Retrofit existing stations	75	\$2,500	\$310,000	CIP, Revolving Loan
Phase IB: 2017 Installations	34	\$10,200	\$346,800	Funded
Phase II: 2018 Off-street (Libraries, Parks, Lots)	41	\$6,000	\$246,000	CIP, Revolving Loan, SCE, Grants, New Revenue
Phase IIIA: 2018-2022 Curbside Stations	69	\$6,000	\$414,000	CIP, Revolving Loan, SCE, Grants, New Revenue
Phase IIIB: 2018-2022 Streetlight Stations	25	\$15,000	\$375,000	CIP, Revolving Loan, SCE, Grants, New Revenue
Phase IIIC: 2018-2022 Public/Private Partnerships	25	\$3,000	\$75,000	CIP, Revolving Loan, SCE, Grants, New Revenue
Phase IIID: 2018-2022 Public DC Fast Charging Stations	2	\$50,000	\$100,000	CIP, Revolving Loan, SCE, Grants, New Revenue
TOTAL Public Chargers	271		\$1,866,800	
Civic Center Fleet Charging	31	\$3,550	\$122,400	SCE Charge Ready
Total Chargers	302	Total Cost	\$1,989,200	
		SCE Charge Ready Funds	-\$12,485	
		Total 5-Yr Cost	\$1,976,715	

Table 13: Program Cost Estimates and Funding Sources

Program	Cost	Funding Sources (Potential)
Local Rebate Program (\$2500/charger)	\$50,000/yr	General Fund, EV program revenue
Program Coordinator	\$105,000/yr	General Fund, EV program revenue

Implementing the Plan

This section outlines action items, department leads, and project timeframes to implement the Plan. Implementation timeframes fall into the following categories: near-term (0-6 months); mid-term (6-18 months); and long-term (18 months-3 years).



Table 14: Division & Department Acronyms

Department & Division Acronyms	
OSE	Office of Sustainability & the Environment
PCD	Planning & Community Development Department
PW	Public Works Department
PW-SD	Streets Division
PW-CE	Civil Engineering
PW-FM	Fleet Management
SCE	Southern California Edison
UCLA	University of California, Los Angeles (UCLA Luskin Center for Innovation)

Table 15: Responsibilities Overview

Office of Sustainability & the Environment	Lead division responsible for development and implementation of EV charging station policies and practices
	Strategic planning
	Coordinate evaluation of CIP proposals necessary to meet infrastructure needs and purchase of EV charging stations
	Coordinate with SCE and other relevant entities
	Public outreach and education
Planning and Community Development	Facilitate changes to the zoning ordinance and building codes to encourage and streamline installation of charging stations
	Review site plans, issue permits, conduct inspections for installation of chargers
	Review potential locations for on-street charging
	Facilitate work with carshare and rideshare services
	Coordinate purchase and installation of charging station signage
Public Works Streets Division	Install and maintain City-owned charging stations
	Maintain City-owned electrical vehicles
	Evaluate City capital improvement projects and install appropriately sized electrical panels during new construction or major renovations
Finance	Manage EVSE revenue, when applicable
Fire Department	Maintain training on first responder protocols for EVs and EVSE
Police Department	Enforce EV parking and charging restrictions

Table 16: Implementation Timeframe

Modernize and expand public EV infrastructure to improve user experience and sustain operations & growth.	DEPT. LEAD	TIMEFRAME
a) Retrofit legacy chargers with “smart” chargers; add new smart chargers to the network.	OSE	Near- to mid-term
b) Consider a time-of-use fee (TOU) fee structure that covers operations and maintenance costs and supports community EV programs.	OSE, PCD	Near-term
c) Earn credit revenue by participating in the state Low Carbon Fuel Standard program.	OSE, Finance	Mid-term
d) Add charging stations for City fleet vehicles.	OSE, PW-FM, PW-CE, SCE	Mid-term
e) Explore innovative EV charging and storage technologies to integrate into Santa Monica’s EV charging network.	OSE	Mid- to long-term
f) Explore DC fast charging options where appropriate and feasible.	OSE	Mid-term
g) Develop guidelines and standards to support charging for e-bicycles and neighborhood electric vehicles.	PCD	Mid-term
Increase EV Charging for MUDs and workplaces.	DEPT. LEAD	TIMEFRAME
a) Develop pilot rebate program for MUDs and workplaces; include additional funding for low-income residents.	OSE	Near-term
b) Identify qualified vendors/EV service providers to handle MUD and workplace charging in Santa Monica.	OSE	Mid-term
c) Streamline the EVSE permitting process and allow online permits for small-scale installations.	PCD, OSE	Near-term
d) Designate off-street and on-street locations for public charging infrastructure.	OSE, PCD, PW-CE, UCLA	Mid-term
e) Implement a pilot a program to provide EV charging through streetlights.	OSE, PCD	Mid- to long-term
f) Partner with priority opportunity sites to install EV charging.	OSE	Mid- to long-term

Update parking policies and practices for efficient charging station use.	DEPT. LEAD	TIMEFRAME
a) Modify City Ordinance to allow for on-street EV charging.	OSE, PCD	Mid-term
b) Update zoning ordinance requirements to increase the parking spaces available for EV charging.	PCD	Mid-term
c) Review and update parking policies and signage.	OSE, PCD	Mid-term
d) Explore a program to adjust nighttime parking rates or provide resident charging permits for overnight charging at public facilities.	PCD	Near-term
e) Explore carshare and rideshare services to increase access to EVs.	OSE, PCD	Mid-term
f) Expand the fleet sharing system for all city departments and divisions located at the Civic Center.	OSE, PW-FM	Mid-term
Develop EV outreach programs and resources for residents and businesses.	DEPT. LEAD	TIMEFRAME
a) Create a webpage with available EV resources, programs, and technologies.	OSE	Near- to mid-term
b) Develop an outreach program for EV charging similar to the Solar Santa Monica program called EV Santa Monica.	OSE	Mid-term
c) Develop outreach targeted to low-income residents.	OSE	Mid- to long-term
d) Encourage access to EV car sharing for MUD residents and a program for low-income individuals.	OSE, PCD	Mid- to long-term
e) Create an Electric Vehicle Program Coordinator position to manage all responsibilities related to EVSE coordination and implementation.	OSE	Mid- to long-term
f) Conduct regional coordination related to EV charging and funding opportunities.	OSE	Near- to mid-term



Measuring Success

This plan will need resources and coordination in order to be effective and successful. This plan will help to accelerate project development and support the City's bid for resources with shovel-ready projects. As a short- to long-term, action-oriented plan, tracking progress and measuring success will be essential to ensure that targets and goals are met for infrastructure, ownership and usage. Success of the EV Action Plan can be measured by tracking existing metrics and new metrics:

- Number of public & private chargers
- Number of EVs registered in Santa Monica
- Percentage of EVs registered out of total vehicles registered
- Number of charging sessions and length of charge
- Revenue earned from fees and LCFS credits

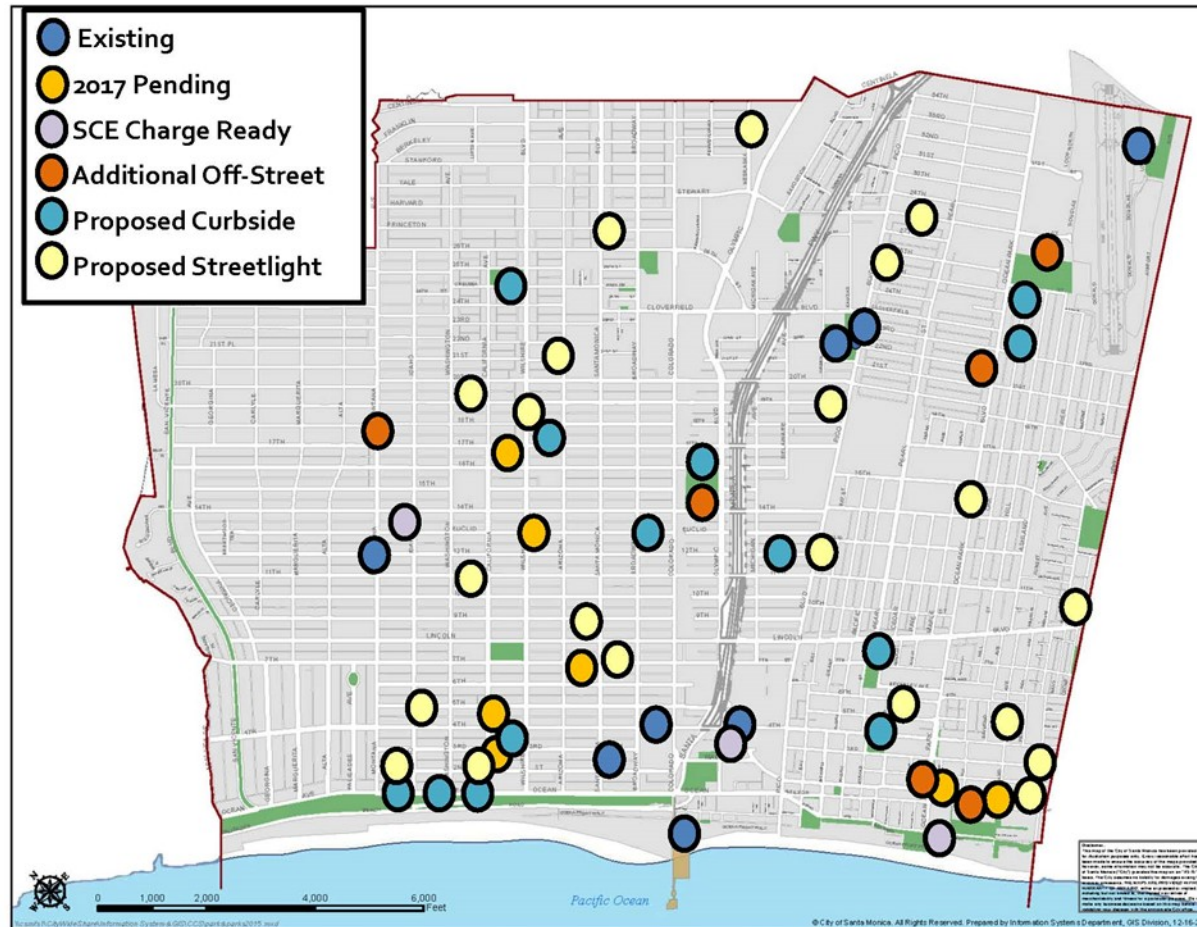
Conclusion

The EV Action Plan reflects the need for Santa Monica to meet the mobility needs of the 21st Century. Vehicle technology continues to improve and change the way we get around. Innovations in fuels and automation will continue to create challenges and opportunities to improve quality of life and reduce impacts on the environment.

This plan includes innovative projects, programs and policies to put Santa Monica on the path to becoming a more EV-friendly community. With the adoption and implementation of this Plan, coupled with development and implementation of the City's Climate Action and Adaptation Plan, the City will further its efforts to provide a model for a carbon neutral community.

Appendix

Appendix I: Santa Monica Proposed EV Infrastructure Map



Source: City of Santa Monica Office of Sustainability, 2017

Appendix II: State Policies & Legislation Supporting EVs

CALGreen EV Charging Station Requirements

Mandatory Requirements	
Multi-family Residential (applies to building sites with 17 or more units)	<ul style="list-style-type: none">• 3% of total parking spaces provided must be capable of supporting future EVSE (i.e. electrical system capacity, building plans, any underground conduits).
Single-family Residential	<ul style="list-style-type: none">• Raceway (e.g. conduit) and electrical panel capacity to support 40-amp capacity electric circuit required for each unit
Nonresidential	<ul style="list-style-type: none">• Raceway (e.g. conduit) and electrical panel capacity to support 40-amp PEV charging capacity required as follows:<ul style="list-style-type: none">• 1 EV charging space required for 10-25 parking spaces• 2 EV charging spaces per 26-50 parking spaces additional EV space required per additional 25 parking spaces.• If there are more than 50 parking spaces, at least 3% must be EV-ready.• If there are more than 200 parking spaces, at least 6% must be EV-ready

Source: Center for Sustainable Energy, Plug-In SD, June 2016

State Legislation

Assembly Bill 32 (2006): California Global Warming Solutions Act

AB 32 was the first comprehensive, long-term approach to address climate change in the country. The bill requires California to reduce its greenhouse gas emissions to 1990 levels by 2020 (a 15% reduction) through a range of clean transportation, land use and energy efficiency strategies.

CalGreen (2013)

The California Green Building Standards Code, (CalGreen) is Part 11 of Title 24, the California Building Standards Code. The 2015 CalGreen update includes both mandatory and voluntary measures that ensure residential and commercial new construction projects are prepared for EV infrastructure.

Local jurisdictions have authority to adopt their own PEV-readiness building code standards that go beyond CalGreen's mandatory requirements. The code requires pre-wiring to accommodate

future installations of a charging circuit and electrical retrofits to support EVSE.

SB 880 (2012): Owner's Right to EV Charging

SB 880 prohibits homeowner associations from imposing any condition that "effectively prohibits or unreasonably restricts" installation of charging in a homeowner's designated parking space. If the charging unit is installed in a common area, the law states that certain conditions can be imposed, e.g. a \$1 million homeowner liability policy that names the Homeowner Association as an additional insured.

Senate Bill 454 (2013): Electric Vehicle Charging Stations Open Access

The Electric Vehicle Charging Stations Open Access Act was created by Senate Bill 454 signed in 2013. The law prohibits the charging of a subscription fee at EV charging stations. The legislation calls for an open system for electric car charging payment via credit card.

Senate Bill 1275 (2014): Vehicle retirement and replacement: Charge Ahead California Initiative

SB 1275 established a goal to place 1 million zero-emission and near-zero-emission vehicles on the road. The bill created an enhanced fleet modernization program for the retirement of high polluting vehicles and authorizes increased funding for low-income individuals and families to purchase clean low- and zero-emissions vehicles.

California Building Code Chapter 11B-228 (2016): ADA Compliance for EV Charging Stations

As of January 1, 2017, all new EVSE installations must comply with the State Architect's ADA Accessibility Building Standards. A minimum of one van-accessible space must comply with ADA Section 11B-812 for every 1 to 4 EV charging stations at a facility. One standard accessible space is required for every 4 to 25 spaces, in addition to one ambulatory space for every 26 to 50 stations. The State's Parks Department is now budgeting \$30,000 for each new ADA

compliant parking space (See details in Appendix II).

Assembly Bill 1452 (2017): Parking: Exclusive Electric Charging on Public Streets

Proposed bill 1452 authorizes a local authority, by ordinance or resolution, to designate stalls or spaces on a public street within its jurisdiction for the exclusive purpose of charging and parking a vehicle that is connected for electric charging purposes. The bill also authorizes the removal of a vehicle from a designated stall or space on a public street if the vehicle is not connected for electric charging purposes. This bill helps facilitate enforcement of any regulations related to use of public EV stations proposed in this plan.

Assembly Bill 1088 (2017): Multiunit residential housing: energy programs

Proposed bill 1088 requires the Energy Commission to adopt regulations to enable access to combined program funding for zero- and near-zero emission

vehicle infrastructure, among other programs for multiunit residential properties.

The Energy Commission must report to the Legislature by January 1, 2019, on the extent to which renters and owners of low-income multiunit residential properties have sufficient technical and financial support to participate in existing programs and complete upgrades. The bill will likely provide incentives and programs to help multi-family building owners and tenants reduce their energy use and install EV chargers, among other benefits.

Assembly Bill 1239 (2017): Building Standards: Electric Vehicle Charging Infrastructure

AB 1239 requires the California Department of Housing and Community Development and the California Building Standards Commission to develop and adopt building standards regarding EV-ready parking spaces for existing parking

structures that are located adjacent to or associated with multifamily dwellings and nonresidential buildings.

Assembly Bill 1184 (2017): California Electric Vehicle Initiative

AB 1184 would allocate \$3 billion over 12 years to subsidize zero-emissions vehicles. The legislation passed the Assembly and is pending Senate approval. Funding would come from the Cap and Trade Program and buyers would receive rebate checks at the point of purchase.

Appendix III: MUD Case Studies and Best Practices for EV Charging

The PEV Collaborative provides cost recovery models and case studies for both individually assigned charging units and shared charging units, which are discussed below.

Individually Assigned Charging Units

Installation options for individually assigned charging units differ based on who pays for the installation costs and electricity. Some case studies include a combination of the various approaches and are listed below the most relevant option.

1. *Units are wired directly to the existing residence panel meter or through a separate electric meter. In this case, the resident EV owner is the electric utility customer and pays for the equipment and installation.*

Case Study: Brannan, San Francisco

The HOA at 200 Brannan Street installed six charging stations in deeded parking spaces based on

resident demand. The HOA selected EverCharge as the vendor to install the system and handle inspections, customer support, billing and liability insurance. Individual EV owners paid between \$1,000-\$2,800 for the installation based on the distance of the conduit run and an additional \$1,000 to purchase the unit. Residents pay a \$15 fixed monthly charge plus a flat electricity rate for usage.

2. *Units are sub-metered and the property owner is the electric utility customer. The EV owner pays for the 120VAC outlet or charging unit installation.*

Case Study: Broadstone Corsair, San Diego

Property managers at this new development were motivated to install 16 dual chargers based on resident interest, a green corporate culture, and pursuit of LEED

certification. Installation was relatively easy because the building was relatively new with accessible service panels. Additional chargers were installed in anticipation of future demand. ChargePoint was selected to manage metering and billing. Infrastructure costs were covered mostly by grants from the California Energy Commission and ChargePoint. EV owners plug in as needed or have the option to reserve stations for a small monthly fee. Electricity costs \$0.25/kWh. This is a good model for new buildings to follow.

3. *Units are sub-metered; the resident is the utility customer and buys the corresponding parking space. The property owner installs several new service meters and assigns them to resident EV owners. The EV owner pays a fee to the property owner to cover his or her*

portion of the capital expense to install the meter.

Case Study: CityFront Terrace, San Diego

Motivated by resident interest and a proactive community manager and facility manager, CityFront Terrace installed one level 2 charger and pre-wired 19 electric meters for level 2 charging. Residents pay a portion of the upfront capital cost and purchase their own units (\$4,000 per meter), which they can take with them if they move. Residents must secure liability insurance since the units are in a common area. Residents receive a monthly bill directly from their utility, SDG&E, at a discounted EV time-of-use rate. The CityFront manager encountered challenges such as assigned underground spaces located far from electric meters on upper floors and different wiring

needs for different brands of charging stations. In addition, some common-area meters were on commercial electric rates and will be subject to demand charges and time-of-use impacts.

4. Networked charging units with wireless communication capability are individually assigned with embedded metering. The property owner is the utility customer and determines how much to charge residents for electricity based on reported charging use. Property owners can set a cost recovery rate that covers installation, electricity and network access costs through shared usage fees.

5. Individually assigned units are wired into a common area electrical service with no metering. The property owner is the utility customer and charges a flat fee to recover installation, energy and network access costs.

6. A third-party service provider is contracted by the property owner to assign a monthly fee based on selected services. The utility customer can be either the resident or property owner.

Shared Charging Units

Installing shared charging units requires more coordination among resident EV owners and the property managers, however it is more cost effective and a better use of space compared to individually assigned units. Shared charging stations can also serve as a marketing tool to attract and retain current and future EV drivers and inspire existing residents to drive EVs because they know the charging infrastructure is already in place.

Different options for installing shared charging units are as follows:

- 1. 120VAC outlets or non-networked charging units are installed in common area parking spaces accessible to multiple EV owners. The property owner is the utility customer*

and adds a flat fee to the rent or lease to cover operating costs. EV owners can coordinate a charging schedule or sign-up process.

2. *Common area networked charging units are available for multiple EV owners and managed by an electric vehicle service provider (EVSP). The property owner is the utility customer. EV owners pay a monthly flat fee or per use. They access the EVSE network through a subscription service, electronic ID card or credit card. Tracking and billing capabilities are available in some of the newer, higher-cost systems.*

Case Study: The Elysian, Los Angeles

The property owner, Linear City Development, is a strong supporter of sustainable living and transportation options. This is exemplified through their unbundled parking policy, Nissan Leaf car share program, and 16

level 2 EV chargers onsite. ChargePoint operates the networked system via a wireless router on one of the stations. This program is unique because charging is free for residents. Stations are available to non-residents for a fee per kilowatt-hour. The management chose to provide free charging to residents as an amenity to attract renters and set a new standard for rental properties to include EV charging access.

3. *A third-party service provider handles all charging service and billing operations based on an agreement with the property manager.*

Case Study: The Towers at Costa Verde, San Diego

The Towers at Costa Verde has 10 level 2 chargers and 10 pre-wired stations. Management wanted to provide EV charging as an amenity to residents and prospective EV owners. EV charging stations are

located in a common area, replacing previous valet parking spots. The Towers used NRG eVgo's Ready for Electric Program to install the stations and manage billing each month. One smart meter tracks electricity use for all 10 charging units. The utility bills the property management, NRG bills individual resident subscribers based on their monthly usage, and then reimburses the property management. NRG eVgo covered the upfront costs of \$21,000 (~\$2,100 per charger).

Best Practices for Implementing EV Charging in MUDs

Charge Ready Parking Spaces

Per CalGreen requirements, property owners should add charge-ready parking spaces (spaces with electrical service wiring ready for EV charging) during new construction and major retrofits. CityFront Terrace and The Towers at Costa Verde installed pre-wired

connections ready for future charging stations. This reduces future installation and wiring costs for additional stations.

Resident Survey

All MUD property owners should conduct resident surveys to understand current and future demand for EV charging stations in their buildings. The PEV Collaborative has sample surveys available on their website for MUD owners.

Parking - Assigned vs. Common Area Spaces

The building owner should communicate with resident EV owners to determine whether assigned EV charging spaces or common area spaces work best.

Willingness to help pay for the stations will depend on the property owner's interest in providing EV charging as an amenity to residents. Installing personal stations for all EV owners will be more expensive than communal charging stations, though it is preferable to residents. This decision will weigh the

convenience of private stations against the lower cost of shared stations. For individually assigned spaces, residents should be charged a percentage of the equipment cost or a flat monthly fee to help the building owner recoup infrastructure and operating costs.

Third-party Service Provider

Selecting a third-party service provider to handle installation, maintenance, and billing will facilitate a turnkey process for property owners. Some EVSPs may install the equipment at no upfront cost (e.g. NRG eVgo at the Towers in Costa Verde), depending on future funding availability. As noted by several of the case studies, a third-party service provider has been a popular option for property owners. 200 Brannan in San Francisco selected EverCharge to offer full-service installation, permit and city inspection, customer support, management, billing, and liability insurance. Broadstone Corsair in San Diego, Millenium Tower in San Francisco, and The Elysian in Los Angeles selected ChargePoint to monitor metering and billing. The EVSP option

allows the property managers or HOA to have minimal responsibility tracking energy usage and the billing process.

User Management

Communication and cost-recovery systems can be utilized to manage various users accessing one charging device. One strategy to facilitate turnover is to bill for time the vehicle is connected rather than active charging time. This encourages drivers to move their cars once the charge is complete and also increases revenue potential for the property owner.

Appendix IV: California Building Code Ch. 11B-238.3.2.1 - ADA Accessibility Requirements for EV Charging Stations

Total Number of EVCS at a Facility ¹	Minimum Number (by type) of EVCS Required to Comply with Section 11B-812 ¹		
	Van Accessible	Standard Accessible	Ambulatory*
1 to 4	1*	0	0
5 to 25	1	1*	0
26 to 50	1	1	1*
51 to 75	1	2	2*
76 to 100	1	3	3*
101 and over	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

Source: Division of the State Architect, 2015

Appendix V: Existing EVSE Rebate Programs

Company	Program	Funding	Eligible Applicants	Eligible Facilities	Min. Reqs.	Rebate Amounts
BAAQMD	Charge!	\$5M	Businesses, non-profits, and public agencies	MUDs, Workplaces, Destination Facilities, Transit Parking, Transportation Corridors	Stations must operate for at least 3 yrs; achieve min. usage requirement	Up to 75% of cost of equipment, installation, and operation of EVSE; must qualify for at least \$10k in funding up to \$500k/yr
Austin Energy	Plug-in Austin	NA	MUD residents and property owners, workplaces	MUDs, Workplaces, Retail Properties	Host must allow AE to install monitoring devices or provide quarterly usage data report; L1, L2 and DCFC all eligible	Up to 50% of the cost and installation of L1 and L2 charging stations, up to \$4k for existing facilities and \$2.5k new construction
LADWP	Charge Up L.A.!	\$21.5M	MUD residents and property owners, workplaces	Any residential property or workplace, public locations	L2 charger; EVs must be purchased on or after October 1, 2015	Up to \$500 of the equipment cost per wall-mounted charger for residential customers; up to \$4,000 per L2 charger for commercial or MUD customers; commercial and MUD properties must have a minimum of 3 parking spaces
British Columbia Clean Energy Vehicle Program	Multi-Unit Residential Building Charging Program	\$688,500	Owners, building managers and strata councils, individual MUD residents	MUDs	L2 chargers	up to 75% of the total installation cost (\$4,500 max)
Anaheim Public Utilities	Personal Use EV Charger Rebate Program	NA	Residential, commercial, and industrial customers	Personal or business facility (not public)	L2 chargers	Up to \$500 of the equipment and installation cost, permit fees also waived
Pasadena Water and Power	Plug-in EV Incentive Program	NA	Residential and commercial customers	Residential, MUDs, workplaces	L2 chargers - wall-mounted or hardwired	Up to \$400
Burbank Water and Power	BWP EVSE Rebate	NA	Residential and commercial customers	Residential, MUDs, workplaces	L2 charger	Up to \$500 for residential; \$1,000 for commercial (equipment costs only); limit of 1 rebate per residential account and 4 rebates per MUD or commercial account

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