

Task 4.1: Evaluate Current Status and Utilization of Public and Workplace EVSE

ARV-17-042

Table of Contents

Introduction	1
Current Status of Public and Workplace EVSE	1
Curbside Charging	4
City-owned EVSE Infrastructure	5
City EV Parking Program	6
Finding the Right Mix of EVSE Levels	6
Impact of Workplace EVSE Availability on EV Adoption	7
Example Workplace EVSE Programs in the Sacramento Region	7
Utilization of Public and Workplace EVSE	9
Usage of EVSE at City Garages – a Proxy	9
EVSE Congestion	9
Future Need for Public and Workplace EVSE	11
Existing Incentives for Public and Workplace EVSE	11
Challenges	12
ATTACHMENT A: CITY-Owned EVSE	14
ATTACHMENT B: City-Garages EVSE Utilization Summary Data	16

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Introduction

Although most early electric vehicle (EV) adopters currently charge their vehicles at home, public charging is an important part of the EV ecosystem. The need and demand for public and workplace charging connectors is dynamic and based on many factors including: user type, travel patterns, advancements in battery technology and more. For example, demands for public charging connectors may increase if EV adoption grows among drivers without access to reliable home charging. Several studies and analysis of U.S. and international markets shows a link between public charging infrastructure and electric vehicle uptake at the metropolitan-area level.^{1,2} It can help relieve range anxiety, improve connectivity between and within regions, make the technology feel more familiar/approachable, and increase equity and accessibility if planned appropriately. Public and workplace charging infrastructure is essential to spur increased EV adoption, particularly for residents of multi-family dwelling units.

Figure 1: The charging pyramid representation of charging infrastructure expected use



Source: U.S. Department of Energy, 2013

Many stakeholders, including The International Council on Clean Transportation (ICCT), U.S. Department of Energy³ and SMUD⁴, continue to explore best practices for workplace and public electric vehicle supply equipment (EVSE, or charging connector) programs. These organizations agree on one simple premise: employers can be a critical piece in encouraging adoption of EVs. Although there are many unknowns as EVSE technologies and business models continue to evolve, City engagements with the Urban Sustainability Directors Network indicate that Cities must start somewhere and it's important to simply get the infrastructure built.

Current Status of Public and Workplace EVSE

Public charging infrastructure expanded by about 22% in California (and in the United States overall) during 2017, and now represents 31% of all U.S. public charging infrastructure. While

¹ ICCT: [Emerging Best Practices for Electric Vehicle Charging Infrastructure](#) (2017)

² ICCT: [The Continued Transition to Electric Vehicles in U.S. Cities](#) (2018)

³ U.S. Department of Energy: [Plug-In Electric Vehicle Handbook for Workplace Charging](#) (2013), [A Guide to Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Project](#) (2014)

⁴ Workplace Charging Workshop, Bill Boyce – SMUD (2013)

Sacramento has been a long-standing leader in electrification and has implemented a range of initiatives to deploy EV programs and infrastructure, there is opportunity for continued improvement: public charging installation and availability is at a much lower rate per million of the population when compared to other California metropolitan areas such as San Jose, San Francisco, Santa Rosa, San Luis Obispo, San Diego and others.⁵

Sacramento has over 600 public and workplace charging connectors within city limits. The 2017 EV Strategy set key performance targets including attainment of 75,000 ZEVs and 3,800 public or workplace Level 2 and Direct Current Fast Chargers (DCFC) within city limits by 2025. This was based on the City-wide goal of 75,000 ZEVs by 2025 and target of approximately one public EV connector for every 20 EVs. This target assumes ongoing improvements in vehicle range and an emphasis on home charging options, reducing the need for public L2, DCFC, and high-power charging infrastructure.⁶ A May 2018 report by the Energy Commission includes updated calculations from the EVi-Pro tool. It assumes the number of public charging connectors needed is dependent on several factors, including the mix of BEVs and PHEVs and the availability of DC fast charging. The assumptions about connectors-per-car has evolved in the last year. For more information, reference Task 2.1.

According data from the Alternative Fuel Data Center and PlugShare,⁷ Sacramento has 110 public and workplace charging locations that are open or under construction. When all are completed, the sites will have 612 connectors, as list in Table 1 below.

Table 1: Public charging available and under construction

Public charging available or under construction	
Total Charging Connections	612
Level 1 (wall outlet—full charge in 8+ hours)	72
Level 2 (full charge in 4-6 hours)	454
DC Fast Charging (full charge in less than an hour)	39
Tesla-only (uses a specific connector)	47

The map below shows the public and workplace charging locations in Sacramento as of January 2019.⁸ Most charging locations are in parking garages and lots, and at the area's largest employers including SMUD, Kaiser, UC Davis, government buildings, and at colleges. PlugShare is a user-driven, map-based database of public charging locations. Drivers can check into a site and leave comments about the functionality.

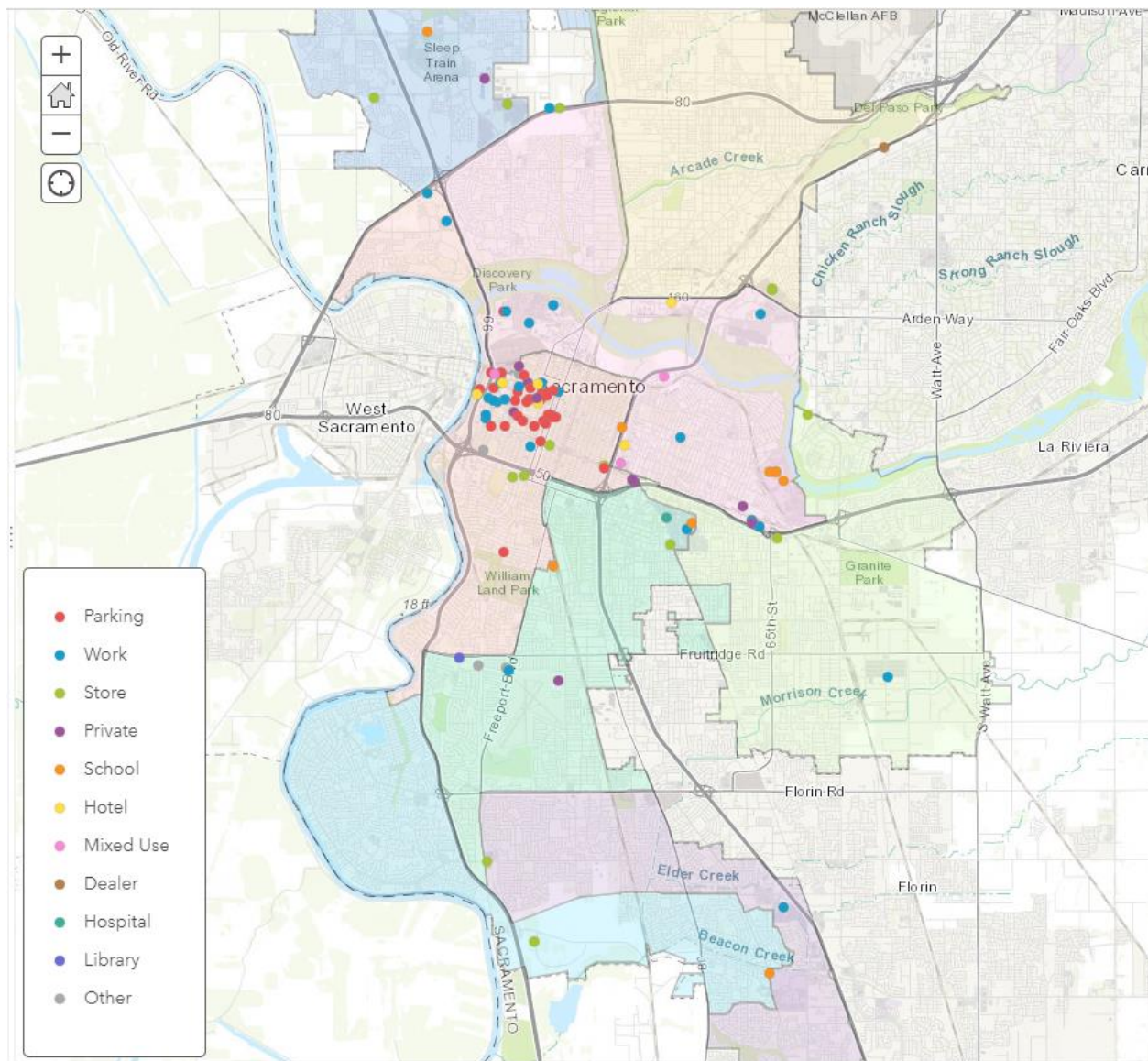
⁵ ICCT: [California's continued electric vehicle market development](#) (2018)

⁶ City of Sacramento: [Electric Vehicle Strategy](#) (2017)

⁷ <https://www.plugshare.com/>

⁸ Other locations are in permitting processes, and some existing chargers may not appear on maps or in databases

Figure 2: Public charging locations in Sacramento from AFDC and PlugShare



As the map shows, much of the known existing infrastructure is located in downtown Sacramento. Gaps still exist in South Natomas, which has the largest amount of multifamily housing in Sacramento; the Pocket area that has low-density suburban homes and few workplaces, and in Sacramento's disadvantaged communities. Current public and workplace infrastructure mostly supports commuters, not residents.

There are multiple incentives in place to encourage the development of workplace and public EVSE (more information provided later in this memo). For example, one local program that has seen rapid growth since 2017 is SMUD's Workplace and Multi-family Incentive Program. This program allows eligible businesses to receive up to a \$1,500 incentive for each Level 2 (240V) hardwired wall or

pedestal mounted electric vehicle charger port; up to 20 incentives are available per location.⁹ In January 2019, SMUD received more applications than in all of 2018, which indicates more workplaces and multiunit dwellings may have car charging available in 2019.¹⁰

Table 2: Growth in utilization of SMUD's Workplace and Multi-family Incentive Program since program inception

Year	Number of Charging Connectors that received SMUD Workplace or Multi-Family Incentive
2017	2
2018	159
2019 YTD (January only)	40+

This pattern of growth is anticipated to continue, especially with the the implementation of the CALeVIP program, managed by Center for Sustainable Energy through a grant from the California Energy Commission and in partnership with SMUD. CALeVIP offers \$14 million in rebates for the purchase and installation of Level 2 and DCFC in Sacramento County.

At City-owned parking facilities, the City currently offers EV charging at no additional cost to patrons, except for the pay-to-charge DC fast charger at the Sacramento Valley Station. Some privately owned, publicly available stations charge fees for EVSE use but there is no standard approach at this time. Charging fees for use of EVSE has been shown to increase availability of connectors at otherwise congested sites by decreasing unnecessary charging or idle time. For example, a 2013 study from UC Davis found that when workplace charging is free, people use the EVSE four times more than they need to.¹¹ The City is currently exploring a pay-to-charge strategy as a potential to improve use-efficiency and access to charging connectors. Data from Tasks 4.2 and 4.3 will help inform recommendations and future action.

Major investment is still needed to achieve the 2025 targets. Recent public-private partnerships, such as Electrify America's Sac-to-Zero program, help provide a strong foundation for future efforts and will increase the amount of EVSE infrastructure.¹² Electrify America's plan includes at least 10 charging sites to be built within the City of Sacramento and Sacramento region, with each site having between three and eight charging dispensers. It is important to note that most EVSE forecasts focus on light-duty vehicles and don't include potential needs for charging for medium-and heavy-duty vehicles.

Curbside Charging

Interest in curbside charging is increasing at the City and by private companies, though implementation has proven to be challenging. Throughout 2017 and 2018 the City took steps to

⁹ <https://www.smud.org/en/Going-Green/Electric-Vehicles/Business>

¹⁰ From discussion with Brent Sloan, SMUD Business Incentive Program Manager (January 2019)

¹¹ UC Davis Institute of Transportation Studies: [Charging for Charging at Work: Increasing the Availability of Charging Through Pricing](#) (2013)

¹² Electrify America: [Supplement to the California ZEV Investment Plan Cycle 1](#) (2017)

better understand, test and develop the needs and challenges specific to a program that would allow curbside EVSE. EVgo is currently in the process of installing up to six high power, 150-kilowatt (kW) charging stations in angled on-street parking spaces at Southside Park. The intent of this project is to test, evaluate, and demonstrate the feasibility of curbside EV charging, with the early intent of developing a city-wide permit process to accommodate additional curbside EV charging projects.

City staff convened a multi-city workshop with other West Coast cities that are implementing or exploring curbside charging. This meeting convened in July 2018 and brought together cities that are leading in the EV space to share experiences and evaluate opportunities. It became clear that there is no single, one-size-fits all approach for curbside EVSE programs or universal curbside design schematics that would work for every situation. The City drafted general policy guidance but delayed adopting a City-wide permitting process until further implementation of the first curbside pilots in Sacramento. In response, the City released a Request for Proposals in December 2018 to solicit proposals to address emerging considerations and continue testing by allowing one or more vendors to construct and operate up to a total of 15 curbside EVSE units in the right-of-way, and potentially provide a path for rapid program expansion, based on project performance.

Some of the emerging considerations that led to the City supporting a more targeted pilot approach to the right-of-way include the following:

- Competing demand between new mobility services and existing vehicle demand
- Limited space for supportive equipment in the right-of-way and potential conflicts between existing trees, utilities, and sidewalk space
- Challenges in accommodating van accessible widths and ramps
- Time required for evaluating and vetting opportunities site by site
- Range of business and profit models and need for recovery of investment costs, balanced with City need to iterate and learn from pilots prior to rapid expansion

City-owned EVSE Infrastructure

City-owned EVSE infrastructure comprise approximately 12% of all workplace and public connectors available in city limits: as of January 2019, the City owns and operates 120 charging connectors at City facilities, 72 of which are available for public and/or employee charging and 48 are available for fleet charging (see Attachment A for the complete list). For most networked garages, the average charging session was just over 3 hours (with the exception of Old Sacramento Garage, which averages 7-8 hours per session).

All the City-owned garages have reached the maximum electricity load so adding more charging equipment is currently not viable, despite increased EVSE use and interest from EV drivers and parking program members. Task 4.3 will provide a near-term plan to optimize existing public and workplace EV charging infrastructure and establish a pipeline of EV infrastructure projects that will expand public charging access, with focus on increasing service in disadvantaged communities.

City EV Parking Program

In 1994, the City Council adopted a policy that first established the City's EV Parking Program, providing discounted parking and charging to EV drivers. The original charging infrastructure supporting this effort was installed by SMUD in both the City Hall and Capitol parking garages. This was the City's first program to specifically encourage EVs. The City continues to operate the program, providing reduced-cost parking for 116 active participants (membership total as of January 2019). To date, the EV Parking Program has served as the City's primary program to incentivize the use of EVs. As currently structured, eligible EV participants can receive half-price monthly parking rates. The City is currently exploring different scenarios and discount rates with the goal to incentivize new EV drivers. The goal established in the EV Strategy is to reach 800 program participants by 2025. The current wait time for membership is 2-3 years and will need to be addressed. If program membership continues to increase as planned, this is another reason optimizing connector usage is crucial since the demand will increase while the number of connectors in City owned garages is not likely to increase much – or at all – due to electricity loads. This may be able to change with technological advancements in EVSE.

A 2017 study of the City's EV Parking program found that 37% of program participants indicated the program was “very influential” in their decision to own or lease an EV; an additional 45% of participants said the program was “influential” or “somewhat influential.”

However, there is more work to be done regarding education and enforcement: a January 2018 audit of EV parking program participants found that over 25% of participants from a sample group were found to be violating the terms of the EV agreement.

Finding the Right Mix of EVSE Levels

For residential, workplace, and some fleet charging, Level 1 or 2 can cost-effectively accommodate charging needs; for workplace-exclusive charging connectors (not open to general public), the relative desirability of Level 1 versus Level 2 stations, or the most desirable mix of these levels, is still being debated and depends on the various objectives, incentives and policies set forth by the employer. For public charging, especially stations on highways between metro areas, faster charging stations are needed to deliver significant charges within typical travel schedules.¹³

According to a 2017 national PEV infrastructure analysis report by the U.S. Department of Energy, communities will need significantly larger charging infrastructure than interstate corridors. The study found that approximately 4,900 DCFC stations are required across cities with an additional 3,200 DCFC stations required in towns to provide a minimum level of nationwide coverage in the communities where 81% of people live. Such a network would dampen range anxiety concerns by providing drivers with a safety net for emergency charging situations. Intracommunity charging demand analysis demonstrates how utilization of a DCFC coverage network would be expected to

¹³ U.S. Department of Energy: [A Guide to the Lessons Learned from the Clean Cities Community Electric Vehicle Readiness Projects](#) (2014)

grow in increased PEV adoption scenarios based on a home-dominant charging assumption. Results for a 15-million PEV market estimate a DCFC plug requirement of 25,000 in communities (approximately 3.1 plugs per average DCFC station and 3.4 plugs required to support 1,000 BEVs). Demand for non-residential L2 EVSE (including work and public charging) is estimated as 600,000 plugs necessary to support 15 million PEVs (approximately 40 plugs per 1,000 PEVs).¹⁴ The City is interested in increasing access to DCFC through partnership models, especially at the curbside and other strategic locations. This may serve specific use cases and supplement Level 1 and Level 2 EVSE.

Impact of Workplace EVSE Availability on EV Adoption

Findings from a 2017 study conducted by SMUD concluded that workplace charging programs have a positive impact on EV adoption and survey respondents rated workplace EVSE as important in EV purchasing decisions¹⁵. When asked why users charge their EV while at work, most frequently cited convenience and low charging costs as the primary reasons for utilizing available charging at work. Other reasons included that workplace charging reduced their range anxiety and 47% of users stated that they charge whenever they have the chance. 18% stated that they wouldn't be able to make their commute without charging at work. While this represents a minority of respondents, it demonstrates the essential role workplace EVSE can play for some users, especially with longer commutes.

It is important to note that battery technology is expected to advance. As a result, range anxiety and the desire for charging at work will likely decrease among employees with access to charging at home, especially if various pricing mechanisms make home charging more attractive among those users. Some workplace charging programs may look to shift their structure and policies to prioritize/incentivize serving the needs of employees without access to reliable charging at home (such as those living in multifamily dwelling units).

Example Workplace EVSE Programs in the Sacramento Region

Data and examples of workplace EV charging programs is scarce. The following list is a sample of types of Workplace EVSE programs in the Sacramento region; it demonstrates the wide variety of program policies and structures in place. It is based on publicly available information and correspondence with Dwight MacCurdy, Project Manager with SMUD.¹⁶

Sacramento Municipal Utilities District (SMUD) maintains a workplace EV charging program for around 75 participating employees. Employees can access 16 Level 1 and 38 Level 2 EVSE at a monthly rate of \$5 per pay period or \$10 per month for “all-you-can-eat” charging. Parking is free,

¹⁴ U.S. Department of Energy: [National Plug-In Electric Vehicle Infrastructure Analysis](#) (2017)

¹⁵ Per conversations with Dwight MacCurdy, SMUD Project Manager, Energy Strategy Research and Development (January 2019)

¹⁶ Per conversations between Previous Civic Spark Fellow, Cailey McCain and Dwight MacCurdy, SMUD Project Manager, Energy Strategy Research and Development (2018)

with no time limits. The public may park and charge in the SMUD Headquarters employee surface lot for free after business hours (typically between 5pm – 7am). A DCFC station is also available to employees and members of the public for \$0.25/kWh, plus a \$0.35 access fee per session. Parking at the DCFC station is free and limited to one hour.

California Department of General Services (DGS) offers EV charging at multiple State parking facilities in the Sacramento region. Employees who drive battery electric vehicle (BEV), a plug-in hybrid electric vehicle (PHEV), or a fuel cell vehicle (FCV) are eligible for reduced monthly parking rates of \$40 per month (up to 55% off standard rates). Level 2 charging is available at several parking facilities for a fee of \$0.12/kWh, plus a \$0.31 service fee per session. Any vehicle that exceeds the 4-hour maximum parking limit incurs an additional fee of \$1.15 per hour. Level 1 charging is also available at select locations, with no fees or time limits.

Intel's Folsom Campus offers EV charging to around 40 participating employees who share 12 Level 2 stations. The program in Folsom is managed by the users; there is no corporate plan or policy regulating the program. Level 1 charging is available for free, and employees pay per hour or per kWh for Level 2 charging.

Sacramento County maintains Level 1 and Level 2 EVSE for free to employees and public at several locations. Only one parking facility offers employee-only charging, with six level 2 stations. The County enforces four-hour parking limits for actively charging vehicles at all locations.

University of California, Davis provides 48 Level 2 EVSE and 16 Level EVSE to employees, students, and visitors for free. However, all vehicles are subject to a four-hour active charging limit and must display a valid UCD parking permit.

City of Sacramento currently provides free charging in all City-owned facilities, with time restrictions in most locations. Much of the charging infrastructure available to City employees is shared with the public (ex. City hall Garage) and therefore puts added demand on services.

Pricing scenarios could be used for workplace or public EVSE to help improve charger availability and recoup the cost of energy and programs. Please note that more in-depth descriptions, options and analysis will be included in Task 4.3. As UCLA notes, pricing policies have been subdivided into the following four base categories:

1. *Free*: these stations are free at all times
2. *Hourly rate*: these stations charge an hourly rate from the beginning of the session
3. *Fee per kWh dispensed*: these stations charge a flat fee per unit of energy (in kWh) dispensed
4. *Flat fee per session*: these stations charge a flat fee per session

Many policies include a combination of two or more pricing policy components listed above, such as:

1. *Fee per kWh dispensed*: stations can be a straight fee per kWh or can have a kWh rate in addition to another base pricing policy

2. *Graduated hourly rate*: after an established period of time, the hourly rate can increase
3. *Minimum*: stations can have a minimum fee per session
4. *Maximum*: stations can have a maximum fee per session
5. *Flat fee per session*: stations can be a flat session fee or have a fee per session in addition to another base pricing policy
6. *Preferred discounts*: some stations offer a cheaper or free rates for preferred members (i.e., management or specific tenants commuting especially long distances) and this can be enacted on an individual user basis¹⁷

Utilization of Public and Workplace EVSE

Usage of EVSE at City Garages – a Proxy

Understanding use of public and workplace EVSE is extremely difficult because the data is not shared openly. To get a sense of general usage patterns, data for five City-owned garages was analyzed (largely due to its availability). Additionally, it is important to note that there has been an increase in demand for the EV parking program and all City garages currently have a waitlist for membership. This could be a sign of increased EV adoption and other public or workplace EVSE programs are likely to be seeing an increase in demand as well; for example, ChargePoint's top 15 workplace charging customers saw a significant growth in EV drivers from the fall of 2017 through the fall of 2018 (an average of 60% growth).¹⁸

The five City-owned garages studied included: Capitol Garage, Memorial Garage, Tower Bridge Garage, Old Sacramento Garage, and City Hall Garage. All data was pulled from ChargePoint, Inc. for the garages with networked EVSE (all but City Hall Garage) and the City's EnergyCAP database for City Hall Garage. In total, the City spent over \$36,000 in FY18 in energy costs across the five garages (and nearly \$15,000 in the first five months of FY19). For more detailed energy use and cost per garage see Attachment B.

These five garages represent just 37 of the 120 City-owned EV infrastructure, indicating the total City cost for charging is therefore much higher. By totaling the cost and kWh use across the networked five garages, staff found an average of 6,317 kWh use and \$975 per connector for FY 2018. Therefore, by applying those averages across all 120 City-owned EVSE, staff developed a general estimate that the City used nearly 760,000 kWh and spent over \$116,000 for EVSE in FY2018.¹⁹

EVSE Congestion

¹⁷ UCLA: [Charging for Charging at Work: Understanding Workplace PEV Charging Behavior to Inform Pricing Policy and Investment Decisions](#) (2018)

¹⁸ January 2019 ChargePoint Webinar: Should You Charge for EV Charging?

¹⁹ Please note: these are estimates based on average use at public garages, actual numbers may vary based on use, location and vehicle type (e.g. fleet charging)

Attaining a suitable balance of charging types is key to EV adoption. While it is estimated that many EV drivers do more than 80% - and up to 95% in Sacramento – of their charging at home²⁰, research done by UC Davis’ Institute of Transportation Studies (ITS) found that 38% of EV drivers who charge at their workplace are unable to charge at least once a week due to station congestion. The study found that EV drivers are using free workplace charging 4 times more often than necessary. An over-emphasis on public or free charging may lead to excessive public charging demand and incentivize drivers to disregard viable home charging options. This context may result in scarcity of public charging for those who need it.^{21, 22} Additionally, many regional trips will continue to originate or end in Sacramento, resulting in high demand for public charging infrastructure.

2018 research from UCLA’s Luskin Center for Innovation built upon UC Davis’ research, further explaining the “tragedy of the commons” theory and including more quantitative, statistical and behavioral analysis. It describes that when a resource is free, it usually will be used more than an equal service that not free and will therefore become overused because there is no incentive to individuals to use it efficiently (a common issue among free or cheap EV charging).²³

These findings were further confirmed by a November 2017 City survey of participants in the EV Parking Program. When asked about the City parking facilities they use most regularly, 42% of users indicated that they had trouble accessing EV stations when they need it.

Table 3: Excerpt from November 2017 City Survey of Participants in the EV Parking Program

Question 21: For the City parking facilities you use most regularly, indicate how often you are able to access EV chargers when you need a charge. Select one.		
Answer Options	Responses	
I am never able to access an EV charging station when I need it	7	4%
I am seldom able to access an EV charging station when I need it	61	38%
I am usually able to access an EV charging station when I need it	72	44%
I am always able to access an EV charging station	9	6%
Other/NA	13	8%

Source: *City of Sacramento EV Parking Program Survey (11/1/2017 - 11/10/2017)*

Reducing charging station congestion leaves infrastructure available to those who have no other charging options, including those without home charging and/or low-range BEV drivers. When home-charging is prioritized, public charging stations can become more accessible and support a greater number of EV drivers. The City continues to explore options to improve availability and utilization of EVSE at its facilities, including potentially instituting fees for charging which can significantly lower the burden on EV infrastructure.

²⁰ PlugInsights [2013 U.S. PEV Charging Study](#)

²¹ UC Davis Institute of Transportation Studies: [Charging for Charging at Work: Increasing the Availability of Charging Through Pricing](#) (2013)

²² City of Sacramento: [Electric Vehicle Strategy](#) (2017)

²³ UCLA, Luskin Center for Innovation: [EV Charging at Work: Understanding Workplace PEV Charging Behavior to Inform Pricing Policy and Investment Decisions](#) (2018)

Future Need for Public and Workplace EVSE

While there has been growth in the installation of charging stations, the National Renewable Energy Laboratory estimates California will need as many as 51,000 public charging stations and 167,000 workplace charging units to achieve the Governor's goal. Sacramento still has a long way to go to achieve its 2025 goal of 3,800 EVSE available to the public and/or workplace.

NREL's EVI-Pro Lite²⁴ estimates that to support charging for 75,000 EVs (assuming the PHEVs will not use public or workplace charging, by 2025 Sacramento will need an additional:

- 738 Workplace L2 charging plugs
- 398 Public Level 2 charging plugs
- 399 DC fast charging plugs

Existing Incentives for Public and Workplace EVSE

Many incentives are in place to help spur EVSE infrastructure adoption as of January 2019, including:

CALeVIP Sacramento County Incentive Project promotes easy access to zero-emission vehicle infrastructure by offering \$14 million in rebates for the purchase and installation of eligible electric vehicle chargers in Sacramento County. \$7.7 million in rebates is available for Level 2 EV chargers, and \$6.3 million is available for DC fast chargers. Up to \$6,500 per Level 2 connector; up to \$80,000 per DC fast charger.²⁵

SMUD Workplace and Multi-family Charging Incentives offers a \$1,500 incentive for each Level 2 (240V) hardwired wall or pedestal mounted electric vehicle charger port at your place of business. Up to 20 electric vehicle charger incentives are available per business location.²⁶

CA State Treasurer California Capital Access Program (CalCAP) Electric Vehicle Charging Station (EVCS) Financing Program The goal is to expand the number of electric vehicle charging stations installed by small businesses in California. Millions of consumers in the state do not buy zero emissions electric vehicles because these vehicles have an average range of 80-100 miles and there is a dearth of charging stations. This \$2 million financing program provides incentives to small business owners and landlords to install electric vehicle charging stations for employees, clients and tenants. The program is funded through the California Energy Commission.²⁷

²⁴ <https://afdc.energy.gov/evi-pro-lite>

²⁵ <https://calevip.org/incentive-project/sacramento-county-incentive-project>

²⁶ <https://www.smud.org/en/Going-Green/Electric-Vehicles/Business>

²⁷ <https://www.treasurer.ca.gov/cpcfa/calcap/evcs/index.asp>

PACE financing allows property owners to borrow funds to pay for energy improvements, including purchasing and installing EVSE.²⁸

Challenges

In addition to the supply/demand imbalance of publicly available EVSE, excessive charging/idle times, oversubscribed City EV parking program, and other challenges discussed above, and despite all the EVSE improvements entering the market, charging infrastructure still suffers from fragmentation, inconsistent data availability, and a lack of consistent standards in most markets. Government can meet some of the demand, but much of it will need to come from private companies and investors – something that is hard to predict or control. There are various incentives in place that are designed to help spur investment (see next section for more detail).

According to the ICCT, in the rapidly evolving charging infrastructure industry, availability and access to accurate, up-to-date data can be limited in various markets. This situation can be problematic for drivers, who may have a more difficult time finding a place to charge; for EVSE operators, who may see lower use at their stations; for governments, unable to direct investment efficiently; and for auto dealers, who need to assure customers of charging availability. The City experiences this firsthand: as of January 2019, only 28% of their EVSEs are networked and provide access to accurate usage data. There are several kinds of data regarding charging infrastructure that can be recorded, including location, type, operational status, and usage.

More work needs to be done to properly cite public charging “hubs” to support residential and workplace charging (more information will be provided in Tasks 6.2 and 6.3). To accommodate overnight residential charging, the EVSEs must be in well-lit areas that are an easy walk to homes. Neighborhood libraries, community centers, and schools are likely candidates. It will be crucial to identify opportunities to add charging hubs or workplace charging to community plans in the 2040 General Plan update. Areas including North Natomas and Land Park include Mobility measure that address transit oriented development and could potentially be extended to car-sharing stations and/or charging hubs.

Another challenge is that as currently managed, charging infrastructure and operating and maintenance costs are unwritten by governments, utilities, and settlements with Electrify America and NRG, which is not a sustainable business model. Car-sharing and microtransit programs that are currently being deployed are also financed by grants and settlement money. Transitioning these to a sustainable business model will be essential to long-term success.

A lack of information about maintenance and operational status can present an issue for charging stations, leading to higher downtime and frustration for drivers. Many newer charging stations are connected to the internet and can provide live information about their status and any problems, which can be incorporated into online charging station locating services.

²⁸ <https://pacenation.us/>

Finally, more advanced networked stations frequently collect usage data from charging stations; these data can provide helpful lessons for governments and researchers and may eventually lead to more efficient charging station construction and management. For this reason, the City is increasingly interested in phasing in all upgrades to networked EVSEs, which could activate the ability to recoup costs through fees, if appropriate.²⁹

²⁹ ICCT: [Emerging Best Practices for Electric Vehicle Charging Infrastructure](#) (2017)

ATTACHMENT A: CITY-Owned EVSE

As of January 2019

Address	Total Connectors	Volt	Private/Public
Belle Cooledge Library 5600 S Land Park Drive, Sacramento, CA 95822	2	208-240 VAC	Public (open to all)
City Hall Garage (10th and I Street) 915 I Street Sacramento, CA	8	208-240 VAC 208-240 VAC	Private (employees and/or fleet)
City Hall Garage (11th and I Street) 939 10th St, Sacramento, CA 95814 #1	7	208-240 VAC 208-240 VAC	Public (open to all)
City Hall Garage (11th and I Street) 939 10th St, Sacramento, CA 95814 #2	16	208-240 VAC 208-240 VAC	Public (open to all)
Community Development Dept 300 Richards Blvd Sacramento, CA 95811	36	208-240 VAC 208-240 VAC	Private/Public
Dept of Utilities 1387-1399 35th Ave Sacramento, CA 95822	1	208-240 VAC	Private (employees and/or fleet)
Memorial Garage 801 14th St Sacramento, CA 95814	6	208-240 VAC	Public (open to all)
Old Sacramento City Garage 125 I St Sacramento, CA 95814	5	208-240 VAC	Public (open to all)
Sacramento Police Department 5770 Freeport Blvd #100 Sacramento, CA 95822	4	208-240 VAC	Private/Public
Sacramento Valley Station 401 I Street, Sacramento, CA 95814	4	500 vdc/125 amps	Public (open to all)
South Corp Yard 5730 24th Street Sacramento, CA 95822 #1 (Building 1)	4	208-240 VAC	Private (employees and/or fleet)
South Corp Yard 5730 24th Street Sacramento, CA 95822 #2 (Building 1)	1	208-240 VAC	Private (employees and/or fleet)
South Corp Yard 5730 24th Street Sacramento, CA 95822 #3 (Building 3)	4	208-240 VAC	Public (open to all)

South Corp Yard 5730 24th Street Sacramento, CA 95822 #4 (Parking Lot)	4	120 Volts Max	Public (open to all)
South Corp Yard 5730 24th Street Sacramento, CA 95822 #5 (Building 4)	2	120 Volts Max	Private (employees and/or fleet)
South Corp Yard 5730 24th Street Sacramento, CA 95822 #6 (Building 10)	1	208/240 VAC	Private (employees and/or fleet)
South Corp Yard 5730 24th Street Sacramento, CA 95822 #6 (Building 12)	2	208/240 VAC	Private (employees and/or fleet)
State Capitol 1303 10th St Sacramento, CA 95814 #1	6	208-240 VAC 208-240 VAC	Public (open to all)
State Capitol 1303 10th St Sacramento, CA 95814 #2	0	208-240 VAC	Public (open to all)
Meadowview City Service Center 2812 Meadowview Road	2	208-240 VAC	Private (employees and/or fleet)
Tower Bridge Garage 1289 Front St Sacramento, CA 95814	5	208-240 VAC	Public (open to all)
TOTAL CHARGING CONNECTORS	120		

ATTACHMENT B: City-Garages EVSE Utilization Summary Data

Capitol Garage - 3 chargers, 5 Ports							
	Total for Garage			Average Use by Connector			Units
	FY17	FY18	FY19 (YTD)	FY17	FY18	FY19 (YTD)	
Energy Usage (kWh)	39,526	45,215	17,366	7,905	9,043	3,473	kWh
Energy Cost (\$)	\$4,963	\$5,784	\$2,169	\$993	\$1,157	\$434	\$ (USD)
Total Sessions	4,396	4,354	1,847	879	871	369	sessions
Average Amount of Unique Drivers per month	76	97	91	15	19	18	unique drivers
Average Session Length (minutes)	191	191	193				Minutes
Average Session Length (hours)	3:11	3:11	3:13				Hours

Memorial Garage - 6 chargers, 6 Ports							
	Total for Garage			Average Use by Connector			Units
	FY17	FY18	FY19 (YTD)	FY17	FY18	FY19 (YTD)	
Energy Usage (kWh)	33,298	43,507	26,613	5,550	7,251	4,436	kWh
Energy Cost (\$)	\$4,134	\$5,470	\$2,718	\$689	\$912	\$453	\$ (USD)
Total Sessions	3,384	4,094	2,298	564	682	383	sessions
Average Amount of Unique Drivers per month	65	80	92	11	13	15	unique drivers
Average Session Length (minutes)	211	209	200				Minutes
Average Session Length (hours)	3:31	3:29	3:20				Hours

Tower Bridge Garage - 4 chargers, 5 connectors							
	Total for Garage			Average Use by Connector			Units
	FY17	FY18	FY19 (YTD)	FY17	FY18	FY19 (YTD)	
Energy Usage (kWh)	32,043	35,483	9,799	6,409	7,097	1,960	kWh
Energy Cost (\$)	\$4,221	\$4,794	\$1,333	\$844	\$959	\$267	\$ (USD)
Total Sessions	3,295	32,043	1,184	659	6,409	237	sessions
Average Amount of Unique Drivers per month	65	68	55	13	14	11	unique drivers
Average Session Length (minutes)	203	225	230				Minutes
Average Session Length (hours)	3:23	3:45	3:50				Hours

Old Sacramento Garage - 6 chargers, 6 Ports							
	Total for Garage			Average Use by Connector			Units
	FY17	FY18	FY19 (YTD)	FY17	FY18	FY19 (YTD)	
Energy Usage (kWh)	19,886	21,325	8,841	4,972	5,331	2,210	kWh
Energy Cost (\$)	\$2,572	\$2,853	\$1,156	\$643	\$713	\$289	\$ (USD)
Total Sessions	2,169	2,262	931	542	566	233	sessions
Average Amount of Unique Drivers per month	50	58	60	12	15	15	unique drivers
Average Session Length (minutes)	434	425	484				Minutes
Average Session Length (hours)	7:14	7:05	8:04				Hours

City Hall Garage - Non-networked; 15 connectors							
	Total for Garage			Average Use by Connector			Units
	FY17	FY18	FY19 (YTD)	FY17	FY18	FY19 (YTD)	
Energy Usage (kWh)	91,405	88,187	41,319	6,094	1,144	2,755	kWh
Energy Cost (\$)	\$17,483	\$17,158	\$7,597	\$1,166	\$1,144	\$506	\$ (USD)

TOTAL COST TO THE CITY FOR THE 5 GARAGES	Total for Garage			Average Use by Connector		
	FY17	FY18	FY19 (YTD)	FY17	FY18	FY19 (YTD)
Energy Usage (kWh)	216,159	233,717	103,938	5,842	6,317	2,809
Energy Cost (\$)	\$33,372	\$36,059	\$14,973	\$902	\$975	\$405

Estimate for all 120 City-owned EVSE, based on use and cost in FY 2018:

Energy Usage (kWh): 758,002 kWh

Energy Cost (\$): \$116,948