CALIFORNIA ENERGY COMMISSION

California Energy Commission

Clean Transportation Program

FINAL PROJECT REPORT

Electrifying California's Highways

Prepared for: California Energy Commission

Prepared by: ChargePoint, Inc.

Gavin Newsom, Governor

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- The businesses, cities and tribes hosting charging on their properties.
- The local jurisdictions committed to streamlining permitting for electric vehicle charging stations.
- The California Governor's Office of Business and Economic Development (GO-Biz), which is working with local jurisdictions to streamline permitting for charging stations.
- Electric utilities across the state supporting electric vehicle charging and working to energize stations as quickly as possible.
- California Department of Transportation, which installed highway signs to help drivers find the stations.
- Electric vehicle drivers, who have made the personal decision to move to cleaner transportation that benefits us all.

PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program, formerly known as the Alternative and Renewable Fuel and Vehicle Technology Program. The statute authorizes the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. Assembly Bill 8 (Perea, Chapter 401, Statutes of 2013) reauthorizes the Clean Transportation Program through January 1, 2024, and specifies that the CEC allocate up to $20 million per year (or up to 20 percent of each fiscal year's funds) in funding for hydrogen station development until at least 100 stations are operational.

The Clean Transportation Program has an annual budget of about $100 million and provides financial support for projects that:

- Reduce California's use and dependence on petroleum transportation fuels and increase the use of alternative and renewable fuels and advanced vehicle technologies.
- Produce sustainable alternative and renewable low-carbon fuels in California.
- Expand alternative fueling infrastructure and fueling stations.
- Improve the efficiency, performance and market viability of alternative light-, medium-, and heavy-duty vehicle technologies.
- Retrofit medium- and heavy-duty on-road and nonroad vehicle fleets to alternative technologies or fuel use.
- Expand the alternative fueling infrastructure available to existing fleets, public transit, and transportation corridors.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued Grant Solicitation GFO-15-603 to fund installations of direct current fast chargers (DCFC) on various highway corridors across the state. In response to GFO-15-603, the recipient submitted an application which was proposed for funding in the CEC's notice of proposed awards October 10, 2016 and the agreement was executed as ARV-16-005 on December 14, 2016.

ABSTRACT

California has set a target of deploying 5 million zero-emission vehicles by 2030 and 250,000 electric vehicle (EV) charging stations by 2025. While many of these charging stations will serve relatively short trips around each driver's local community, charging stations positioned near highway exits and spaced at strategic intervals also are needed to enable long-distance EV trips. ChargePoint and its subcontractors installed direct current fast chargers and Level 2 charging stations at 49 sites conveniently located along highway corridors across the state. The process to install charging stations included site acquisition, design and engineering, permitting, construction, utility work and energization, activation on the ChargePoint network, and highway and wayfinding signage. Over a six-month period in 2021, the charging stations at these sites provided a total of 26,344 charging sessions, dispensing more than 405,000 kWh, enabling more than 1.2 million miles of travel, displacing more than 43,500 gallons of gasoline, and reducing greenhouse gas emissions by 307 metric tons of CO_2-equivalent. Lessons learned from this project include that potential site hosts benefit from education about EV charging; the permitting process caused delays at some sites, but AB 1236 and GO-Biz are helping; California's EV charging station accessibility regulation is interpreted differently across local jurisdictions; coordinating with utilities on energization presents a significant challenge in executing projects efficiently; it can be difficult to find contractors with charging station installation experience in rural areas; demand charges significantly impact the value proposition for station owners; and stacking incentive programs can improve cost efficiency.

Keywords: Electric vehicles, EVs, charging stations, charging infrastructure, fast charging, DCFC, Level 3, Level 2, transportation electrification, highway, corridor, rural, ChargePoint.

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EXECUTIVE SUMMARY

California has set a target of deploying 5 million zero-emission vehicles by 2030 and 250,000 electric vehicle (EV) charging stations by 2025. While many of these charging stations will serve relatively short trips around each driver's local community, charging stations positioned near highway exits and spaced at strategic intervals also are needed to enable long-distance EV trips. To meet the need for highway corridor charging, the California Energy Commission selected ChargePoint, Inc. to install and operate charging stations at dozens of sites along several highway corridors.

Charging station installations

Under CEC Agreement ARV-16-005, ChargePoint and its subcontractors installed direct current fast chargers (DCFCs) and Level 2 charging stations at 49 sites conveniently located near highway exits across the state. Site types included fueling and convenience, dining, retail, municipal parking and lodging. The process to install charging stations included the following steps: site acquisition, design and engineering, permitting, construction, utility work and energization, activation on the ChargePoint network, and installing highway and wayfinding signage.

Charging station utilization

From March through August 2021, the charging stations provided a total of 26,344 charging sessions, dispensing more than 405,000 kWh and enabling more than 1.2 million miles of travel. DCFCs were used more than the Level 2 stations, providing more than two times as many sessions and six times as much energy.

Across all sites, drivers logged an average of 2.9 sessions per day. Drivers stayed plugged in for an average of 37 minutes at DCFCs (36 minutes of which was active charging time), compared to 105 minutes (with 84 minutes of active charging) at Level 2 stations. Approximately 19% of charging sessions were conducted by regular commuters.

Charging station utilization was highest on Fridays, Saturdays and Sundays and sessions were most commonly initiated during afternoon hours. Utilization increased from March through July, before declining slightly in August. The stations will continue to be operated and maintained for at least five years after the date each was activated.

Environmental and job creation benefits

The charging sessions recorded during the six-month reporting period displaced 43,662 gallons of gasoline and reduced greenhouse gas emissions by 307 metric tons of CO_2-equivalent – in addition to unquantified reductions of other air pollutants that negatively impact air quality and public health. Furthermore, this grant stimulated more than 13.2 full time job-years of labor to install the charging stations, as well as operations and maintenance jobs that will continue over the life of the charging stations.

Lessons learned

To help accelerate the deployment of EV charging for other highway corridors, the project team documented a variety of lessons learned, including that potential site hosts benefit from education about EV charging; the permitting process caused delays at some sites, but AB 1236 and efforts by the Governor's Office on Business and Economic Development (GO-Biz) are helping; California's EV charging station accessibility regulation is interpreted differently across local jurisdictions; coordinating with utilities on energization presents a significant challenge in executing projects efficiently; it can be difficult to find contractors with charging station installation experience in rural areas; demand charges significantly impact the value proposition for station owners; and stacking incentive programs can improve cost efficiency. Addressing these issues can reduce project timelines and costs and make EV charging stations a more attractive investment for site hosts and station owners.

CHAPTER 1: Introduction

Transportation accounts for more than 40 percent of California's greenhouse gas emissions – with passenger vehicles responsible for most of these emissions. Conventional passenger vehicles also emit nitrogen oxides, particulate matter and other pollutants that cause respiratory, cardiovascular and reproductive health problems. In light of the urgent need to slow the effects of climate change, improve public health, and mitigate the economic impacts associated with each of these problems, California has instituted a suite of ambitious goals and policies to transition to a clean transportation sector. This includes a target of deploying 5 million zero-emission vehicles by 2030 and 250,000 electric vehicle (EV) charging stations by 2025.[1]

Unlike gas stations, EV charging stations have many different use profiles, from overnight sessions in the home garage to quick stops solely for the purpose of charging. Most car trips are shorter than the battery range of EVs currently on the market; in these cases, drivers are well served by home, workplace, retail center or other charging stations in their local community. However, many drivers use their personal vehicles for long-distance travel for at least a few days out of the year. Consequently, charging stations positioned near highway exits and spaced at strategic intervals are critical to ensure more drivers adopt EVs and use those EVs for long-distance trips. (Importantly, these charging stations also serve local residents in what are often small, rural communities that otherwise may not have many public charging options.)

To meet the need for highway charging, the California Energy Commission released a funding opportunity to install charging stations on corridors facilitating interregional travel within California as well as to and from Nevada, Arizona, and the Oregon coast. These corridors support the alternative transportation fuel and vehicle technology goals of the State of California, such as the goal of having sufficient infrastructure to support up to 1 million zero-emission vehicles by 2020. The CEC selected ChargePoint to install and operate charging stations at 49 sites (conducted under agreement ARV-16-005). This report summarizes the charging station installations, six months of operational data, and benefits and lessons learned from the project. In addition, a video summary and celebration of this project is available at https://tinyurl.com/ytc46jt6.

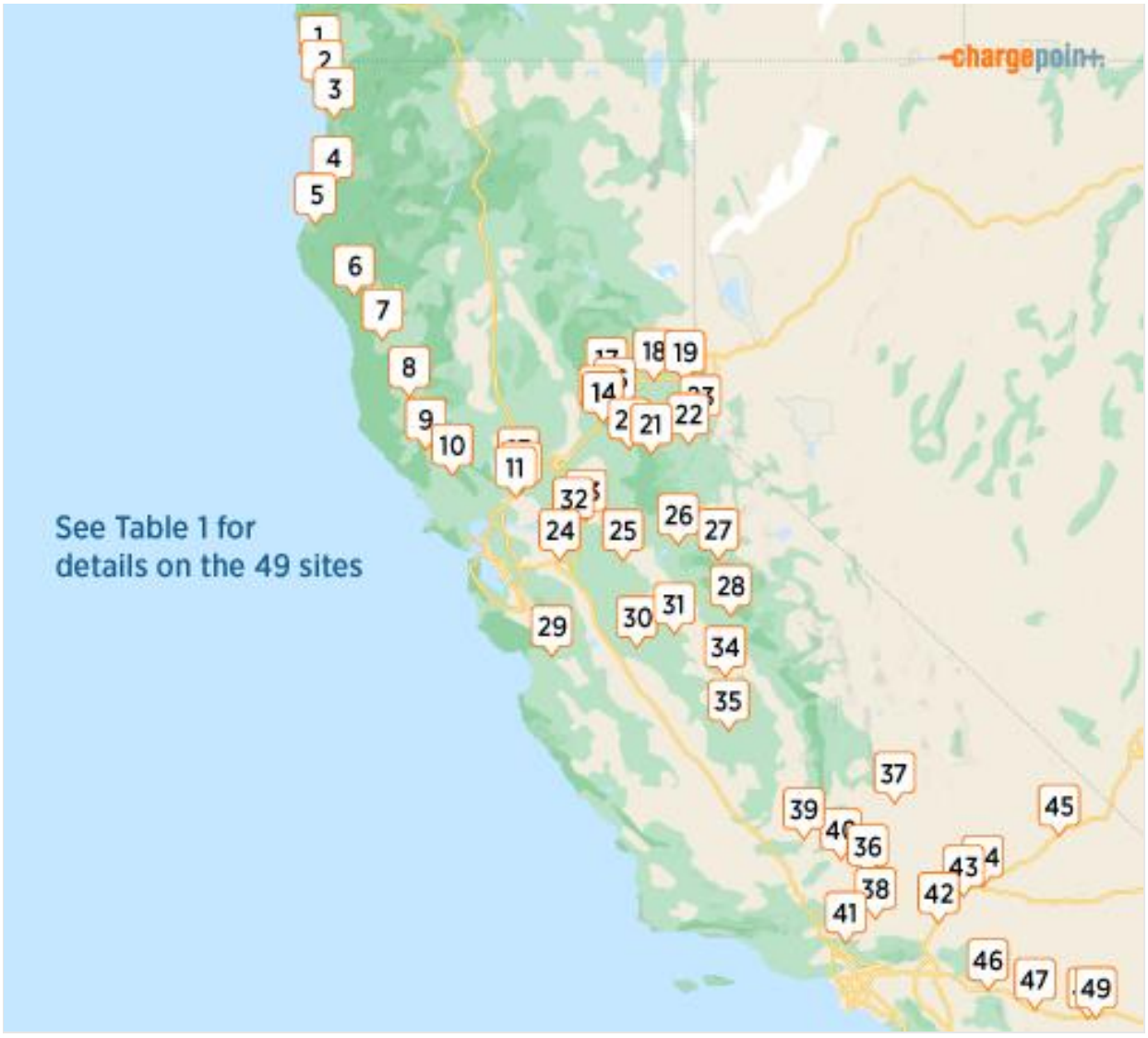
1 *California Executive Order B-62-18*. 2019. https://www.ca.gov/archive/gov39/2019/01/04/executive-order-b-62-18/index.html.

CHAPTER 2:
Charging Station Installations

Charging sites and equipment

ChargePoint and its subcontractors installed charging stations at 49 sites along various highway corridors under Agreement ARV-16-005 (Figure 1).

Figure 1: Charging Sites



Source: ChargePoint, Inc.

Between one and four direct current fast chargers (DCFCs) were installed at each site. Each DCFC includes a CCS Combo and CHAdeMO connector, allowing one vehicle per DCFC to charge using the connector type with which it is compatible. CHAdeMO connectors are used primarily by Asian-manufactured EVs and, via an adapter, Tesla vehicles; CCS Combo connectors are compatible with vehicles from other manufacturers. Some sites offer ChargePoint's Express 200, which allows vehicles to charge at up to 50 kilowatts (kW). Other sites offer the Express 250, which charges at up to 62.5 kW (or up to 125kW when two stations are installed in a paired configuration). While the actual charging rate depends on how much power can be accepted by an individual vehicle, these DCFCs enable many EVs to charge 75-100 miles of battery range in approximately 30 minutes.

Because not all EVs can use DCFCs (for example, most plug-in hybrid vehicles cannot use DCFCs), at least two Level 2 charging ports were installed at each site. The equipment installed was either the single-port or dual-port version of ChargePoint's CT4000. Each port on the CT4000 enables a vehicle to charge at up to 7.2 kW. Level 2 charging stations tend to be used by vehicles that are parked for longer periods, as it can take 3-5 hours to charge 75-100 miles of battery range. Figure 2 shows an example of a site with two Express 250s in the foreground and one dual-port CT4000 in the background.

Figure 2. Charging Stations at Santa Rosa Chevron

Source: ChargePoint, Inc.

All charging stations can be used by drivers with or without a ChargePoint account. Drivers activate the stations by swiping their ChargePoint RFID cards; tapping the ChargePoint app, Apple Pay, Google Pay or Samsung Pay on their smart phones; tapping a contactless Visa, Mastercard or American Express debit or credit card; using the card or app of a different charging network with a ChargePoint roaming agreement (available for EVBox, EVgo, FLO and Greenlots); or calling the toll-free number on the stations to make a payment. ChargePoint also provides 24/7 customer service to address any driver questions or problems.

Table 1 describes the nearest highway, equipment installed and activation date for each site. In addition, each site is classified in one of five site types: Fueling/Convenience, Dining, Retail, Municipal Parking or Lodging. In many cases, a site could be considered to fit more than one type, but only one type is labeled for the purpose of grouping station utilization trends later in this report. Finally, each site is classified as rural or urban, based on eligible ZIP codes used by the Federal Office of Rural Health Policy.[2]

2 Federal Office of Rural Health Policy. October 2021. https://www.hrsa.gov/rural-health/about-us/definition/datafiles.html

Table 1. Site Descriptions.

Site #[3]	Site name and address	Nearest highway	# DCFCs	# L2 ports	Activation date	Site type	Rural vs. urban[4]
Highway 101 from the Oregon Border to the Bay Area[5]							
1	Smith River Lucky 7 Casino & Hotel 350 North Indian Road	Hwy 101	1	2	10/2/18	Lodging	Rural
2	Crescent City Best Western Plus Northwoods Inn 655 US Highway 101 S	Hwy 101	2	2	2/5/19	Lodging	Rural
3	Klamath Holiday Inn Express 171 Klamath Blvd	Hwy 101	2	2	6/5/20	Lodging	Rural
4	City of Arcata Parking Lot 601 8th Street	Hwy 101	2	2	2/10/21	Municipal Parking	Rural
5	Loleta Bear River Casino 11 Bear Paws Way	Hwy 101	2	2	9/13/18	Lodging	Rural
6	Garberville Benbow Inn 445 Lake Benbow Drive	Hwy 101	1	2	8/13/18	Lodging	Rural
7	Laytonville Larson Building 45020 US-101	Hwy 101	2	2	8/21/19	Dining	Rural
8	Ukiah Burger King 711 E Perkins St	Hwy 101	2	2	10/29/20	Dining	Rural
9	Cloverdale Furber Ranch Plaza	Hwy 101	2	2	11/5/19	Retail	Urban

3 See Figure 1 to match site numbers with geographic locations.

4 Rural/urban status was assigned based on eligible ZIP codes used by the Federal Office of Rural Health Policy. Source: https://www.hrsa.gov/rural-health/about-us/definition/datafiles.html

5 The North Coast Unified Air Quality Management District provided match funding for six sites on this corridor (from Smith River to Garberville).

Site #[3]	Site name and address	Nearest highway	# DCFCs	# L2 ports	Activation date	Site type	Rural vs. urban[4]
	1139 S. Cloverdale Blvd						
10	Santa Rosa Chevron 879 Hopper Ave	Hwy 101	2	2	11/5/19	Fueling/ Convenience	Urban
Bay Area to Sacramento Valley							
11	Fairfield Target 2059 Cadenasso Dr	I-80	2	2	9/11/20	Retail	Urban
12	Vacaville Nugget Market 130 Browns Valley Pkwy	I-80	2	2	12/8/20	Retail	Urban
13	Dunnigan Chevron 4040 County Road 89	I-5	1	2	11/13/19	Fueling/ Convenience	Urban
Sacramento Valley to Lake Tahoe							
14	Auburn Holiday Inn 120 Grass Valley Hwy	I-80	2	2	12/27/19	Lodging	Rural
15	Auburn Target 2700 Bell Rd	Hwy 49	2	2	7/22/20	Retail	Rural
16	Colfax Dine N Dash 1516 S Canyon Way	I-80	2	2	1/20/20	Dining	Urban
17	Grass Valley BriarPatch 290 Sierra College Dr	Hwy 49	2	2	8/21/19	Retail	Rural
18	Soda Springs Lucky's Travel Plaza 90 Cisco Rd	I-80	2	2	10/13/20	Fueling/ Convenience	Rural
19	Truckee Railyard 10152 Church St	I-80	2	4	7/8/20	Municipal Parking	Rural
20	Placerville Hangtown Village Shopping Center 1216 Broadway	Hwy 50	2	2	10/22/19	Retail	Rural
21	Pollock Pines Crystal View Station 6529 Pony Express Trail	Hwy 50	1	2	7/3/20	Fueling/ Convenience	Rural
22	Kyburz Strawberry Lodge 17510 US-50	Hwy 50	1	2	7/9/20	Lodging	Urban

Site #[3]	Site name and address	Nearest highway	# DCFCs	# L2 ports	Activation date	Site type	Rural vs. urban[4]
23	South Lake Crossing at Tahoe Valley 2012 Lake Tahoe Blvd	Hwy 50	2	2	11/13/20	Retail	Rural
Yosemite via Highway 120 or Highway 41							
24	Tracy Target 2800 Naglee Road	I-205	2	2	8/4/20	Retail	Urban
25	City of Oakdale Parking Lot 200 North 3rd Ave	Hwy 120	2	2	5/10/19	Municipal Parking	Urban
26	Groveland Yosemite Gateway Museum 18990 CA-120	Hwy 120	2	2	2/19/21	Municipal Parking	Rural
27	Groveland Rush Creek Lodge 34001 CA-120	Hwy 120	1	2	5/6/19	Lodging	Rural
28	Oakhurst Old Mill Village 40179 Enterprise Drive	Hwy 41	2	2	2/12/20	Retail	Rural
Highway 152 from Santa Clara County to Central Valley							
29	Gilroy Chevron 7110 Camino Arroyo	Hwy 152	2	2	1/29/21	Fueling/ Convenience	Urban
30	Los Banos SaveMart 1400 Mercey Springs Rd	Hwy 152	2	2	7/2/20	Fueling/ Convenience	Rural
31	Chowchilla Shell 105 Chowchilla Blvd	Hwy 99	1	2	6/23/20	Fueling/ Convenience	Rural
Central Valley							
32	Lodi Shell 6437 W Banner Street	I-5	2	2	11/12/20	Fueling/ Convenience	Urban
33	Lodi Target 2355 W Kettleman Lane	Hwy 12	2	2	7/20/20	Retail	Urban
34	Fresno Macy's RiverPark 35 E. Via La Plata	Hwy 41	2	2	12/16/19	Retail	Urban
35	City of Lemoore Parking Lot 711 W Cinnamon Drive	Hwy 41	1	2	6/9/20	Municipal Parking	Urban

Site #[3]	Site name and address	Nearest highway	# DCFCs	# L2 ports	Activation date	Site type	Rural vs. urban[4]
High Desert and Surrounding Areas							
36	Mojave Denny's 16262 Sierra Hwy	Hwy 14	4	2	2/24/21	Dining	Rural
37	Inyokern Brady's Market 4467 US-395	Hwy 395	1	2	2/24/21	Retail	Rural
38	Palmdale Target 39440 10th St West	Hwy 14	2	2	4/20/20	Retail	Urban
39	Bakersfield Countryside Market & Restaurants 1631 Comanche Dr	Hwy 58	2	2	1/22/21	Retail	Rural
40	Tehachapi Denny's 9000 Magellan Dr	Hwy 58	2	2	6/25/20	Dining	Rural
41	Santa Clarita Kohl's 19307 Golden Valley Rd	Hwy 14	2	2	8/28/20	Retail	Urban
Interstate 15 to Las Vegas							
42	Victorville Motel 6 & 154 Diner 16868 Stoddard Wells Road	I-15	2	2	4/27/20	Lodging	Urban
43	Barstow Love's Travel Stop 2974 Lenwood Rd	I-15	2	2	6/2/20	Fueling/ Convenience	Rural
44	Yermo Eddie's World 36017 Calico Blvd	I-15	3	2	5/14/20	Fueling/ Convenience	Rural
45	Baker Grewal Travel Center 72922 Baker Blvd	I-15	4	2	1/28/20	Fueling/ Convenience	Rural
Interstate 10 from SoCal to Arizona Border							
46	Beaumont Kohl's 1479 E 2nd St	I-10	2	2	3/6/20	Retail	Urban
47	Palm Desert Kohl's 34940 Monterey Ave	I-10	4	2	2/26/20	Retail	Urban
48	Indio Chiriaco Summit 62450 Chiriaco Rd	I-10	2	2	11/11/19	Dining	Urban

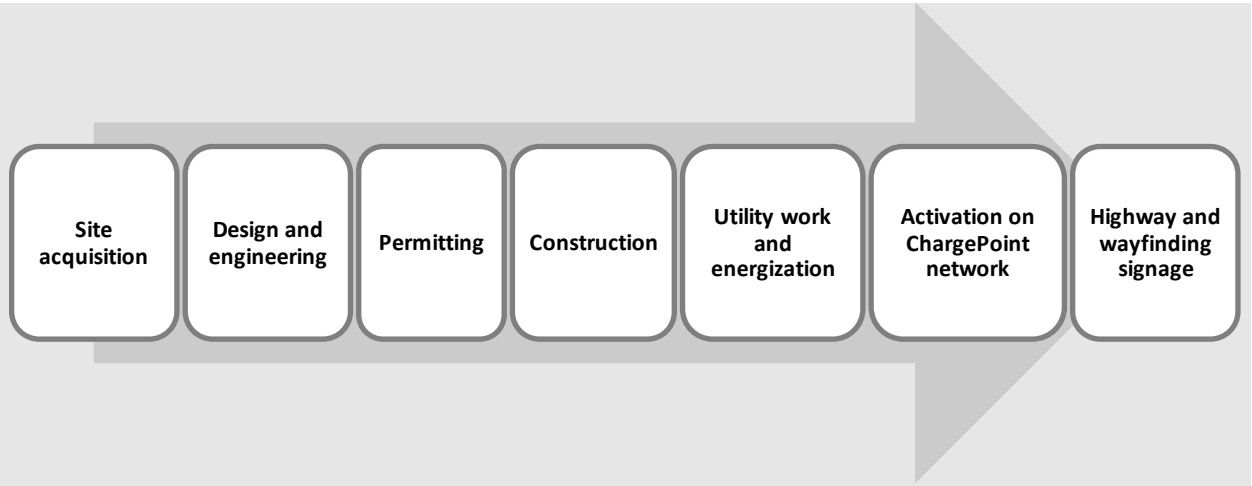
Site #[3]	Site name and address	Nearest highway	# DCFCs	# L2 ports	Activation date	Site type	Rural vs. urban[4]
49	Blythe Denny's 876 W Donlon St	I-10	2	2	8/6/20	Dining	Rural
Total (all sites)			**96**	**100**			

Source: ChargePoint, Inc.

Installation process

The complete process to install charging stations began long before breaking ground at the site and extended beyond activation of the charging stations. Figure 3 summarizes the steps involved with installing charging stations; a description of each step follows. Most of these steps are further addressed in Chapter 6: Lessons Learned and Recommendations.

Figure 3. Process to Install Charging Stations



Source: ChargePoint, Inc.

Site acquisition

The first step to installing charging stations was to engage with businesses (or other property types) that were strategically located near highway exits and met several requirements. First, sites had to be safe, publicly accessible 24/7 and have attractive amenities (e.g., food, water, restrooms) for drivers. Next, sites needed sufficient electrical capacity and parking spaces, as well as a layout that facilitated reasonable construction costs and options for future expansion. ChargePoint conducted site-walks with its design-build subcontractors to inform this assessment.

Finally, the site needed a decision-maker who was willing to dedicate space to EV charging and allow temporary construction on the property. Often site host recruitment began with a basic education on EV charging and the overall EV market before a site host was willing to support the project. Under this grant, site hosts were not required to contribute any funds because ChargePoint maintained ownership of the charging stations. Thus, upfront capital contribution was not a barrier for site hosts to participate.

ChargePoint often engaged with several site host candidates before the right site was identified and the site host signed an agreement to license space on their property for EV charging stations.

Design and engineering

Once a site host agreement was executed, ChargePoint and its subcontractors designed the construction project. This step included working with the local electric utility to design the electrical requirements. Once the construction drawings were finalized, they could be submitted as part of the permit application to the local authority having jurisdiction.

Permitting

Next, the project team submitted permit applications, which included the construction drawings, to the local city or county building department with jurisdiction over the site. Permit review times have improved in recent years as AB 1236, the EV charging station permit streamlining law, has taken hold and more building departments and contractors have become familiar with this type of installation. Once a permit was received, the project team could mobilize for construction.

Construction

The construction phase began with a kickoff meeting with the site host, followed by a series of civil and electrical construction tasks. These tasks typically included trenching and excavation, installing conduits, conducting backfill trenching or regrading, pouring concrete pads, installing charging stations and electric service equipment, installing EV-charging signage and protective bollards or wheel stops, patching asphalt, restriping parking stalls, and fixing the landscaping. The local permitting authority and utility inspected the relevant civil/electrical work to confirm the site was prepared to receive power – referred to as "meter release" – at which point the project entered an energy queue for utility work. The permitting authority typically returned to the site a second time, after the striping and landscaping were complete, to verify the charging stations were functional and close out the permit.

Utility work and energization

After the project was cleared for meter release and the utility inspected the installed equipment, the utility performed its portion of the work. Depending on the site, this may have involved setting a new transformer, setting a new utility pole, and pulling wire through the primary and secondary conduits to the meter and current transformer cabinet. The final step for the utility was to energize the charging stations. Some utilities performed their civil and electrical work in unison with the energization step; others scheduled these activities as separate steps.

Activation on the ChargePoint Network

Shortly after charging stations were energized, they were connected to ChargePoint's software network that enables ChargePoint and charging station owners to monitor the

charging stations' operational status and utilization. (Utilization data are presented in Chapter 4.) Adding them to the network also allows drivers to locate them on the ChargePoint app or website, and to see in real-time if a charging station is in use. As a final step, the charging stations were added to Google Maps, Apple Maps, the U.S. Department of Energy's Alternative Fuel Data Center, and Plugshare to help drivers locate them.

Highway and wayfinding signage

Once charging stations were activated, signage could be installed to direct drivers from the highways to the charging sites. For most sites, this involved coordination with two agencies: the jurisdiction that controlled the local streets and the California Department of Transportation (Caltrans), which has jurisdiction over interstates and state roads. Wayfinding signs between the highway and the charging site had to be installed before highway signs, so that drivers were not stranded once they exit the highway (Figure 4).

Figure 4. Wayfinding Sign in Indio

Source: ChargePoint, Inc.

Installation timelines

The site acquisition timelines, as measured from the grant's start date until execution of site host agreements for the sites where charging stations were ultimately installed, ranged from 0 to 112 weeks, with a median timeline of 40 weeks. The site acquisition timeline for any given site does not always represent the time spent educating and negotiating with one site host; in some cases, a site that appeared promising (and may even have executed a site host agreement) fell out of the project, causing the site acquisition process to start again. Chapter 6: Lessons Learned and Recommendations describes some reasons why sites fell out of the project.

The design-build timelines, as measured from execution of site host agreements until station activation, ranged from 42 to 187 weeks, with a median timeline of 129 weeks. These timelines far exceed ChargePoint's design-build timelines for current projects for a variety of reasons discussed in Chapter 6. In addition, various wildfires impacted utilities across the state and delayed some utility coordination timelines. The Covid-19 pandemic and associated stay-at-home orders in 2020 delayed permitting, construction and utility coordination timelines for several sites.

CHAPTER 3:
Workforce Development

ChargePoint's primary business model is to sell charging stations to site hosts and collect subscription fees for networking. ChargePoint does not directly install charging stations. ChargePoint and ChargePoint customers rely on contractors to install and maintain charging stations. To help develop the EV charging installation and maintenance workforce, ChargePoint offers self-paced training through its ChargePoint University online portal. The training covers everything from site assessment to station activation and prepares contractors to install and activate ChargePoint stations. The portal also offers resources such as data sheets and technical guides. Initially, ChargePoint charged a fee to access ChargePoint University. Shortly after this project began, ChargePoint made access to ChargePoint University free of charge which significantly increased enrollment. During the implementation of this project, ChargePoint University trained more than 10,000 professionals across the country. This included 2,300 from California, more than 900 of whom were from ZIP codes designated as rural or containing a disadvantaged community.

CHAPTER 4:
Charging Station Utilization

ChargePoint's charging stations report utilization data in real time through its cloud network. The data presented in the remainder of this chapter represent six months of operations: March 1, 2021 through August 31, 2021. Data is grouped by site type (e.g., fueling and convenience, dining, etc.) and rural/urban status. Although site type and rural/urban status are useful lenses for identifying utilization trends, it should be noted that several other factors influence an individual site's utilization, including neighboring amenities, size of nearby population centers, overall popularity of the travel route, elevation changes on the travel route, number of charging stations installed at the site, and distance from other viable charging sites.

Across all sites, the charging stations provided a total of 26,344 charging sessions[6], dispensing more than 405,000 kWh and enabling more than 1.2 million miles of travel (Table 2). DCFCs were used more than the Level 2 stations, providing more than twice as many sessions (18,704 vs. 7,640) and six times as much energy (352,863 kWh vs. 52,189 kWh). Across all sites, drivers logged an average of 2.1 DCFC sessions per day and 0.8 Level 2 sessions per day, for a total of 2.9 sessions per day. The 21 urban sites averaged more sessions per day than the 28 rural sites (3.7 vs. 2.4) but dispensed less energy per session on average (14.5 kWh vs. 16.4 kWh; Table 3). The pattern of dispensing more energy at rural sites could reflect longer distances between viable charging sites and/or longer overall trip distances for drivers in rural areas.

Among the DCFC sessions, 75% used CCS Combo connectors and 25% used CHAdeMO connectors. Drivers stayed plugged in for an average of 37 minutes at DCFCs (36 minutes of which was active charging time), compared to 105 minutes (with 84 minutes of active charging) at Level 2 stations. The average connected time of Level 2 sessions at the nine lodging sites was much higher than the other site types at 288 minutes, likely indicating some overnight sessions (Table 2).

Approximately 19% of charging sessions across all sites and stations were conducted by regular commuters – which the project team defines as drivers that used any charging station at a given site at least 24 times within the reporting period, or an average of roughly one session per week (Table 4). The lodging and fueling and convenience sites recorded the smallest percentage of sessions by regular commuters at 5% and 13%, respectively. At rural sites, regular commuters made up a smaller percentage of Level 2 sessions than DCFC sessions (12% vs. 21%; Table 5).

6 Sessions that dispensed no energy are excluded from this report.

Charging station utilization is generally observed to be highest on Fridays, Saturdays, and Sundays, indicating likely usage by weekend road-trippers (Figures 5-8). DCFC sessions were most commonly initiated during afternoon hours (i.e., between 12:00 and 4:00 p.m.), followed by the evening hours (between 4:00 and 8:00 p.m.); this pattern held for Level 2 sessions at all site types except the lodging sites, where sessions were more commonly initiated in the evening (Figures 9-12).

Utilization increased from March through July, before declining slightly in August for some sites (Figures 13-16). This trend may be due in part to the deployment of Covid-19 vaccinations and decline in Covid-19 cases that occurred from March through July; it also likely reflects the typical increase in travel during the summer months.

The stations will continue to be operated and maintained for at least five years after the date each was activated. ChargePoint anticipates station utilization to continue to grow as more EV models are released and more drivers adopt EVs and choose to use them for long distance trips.

Table 2. Charging Statistics by Site Type and Station Type, Mar – Aug 2021

Site type and station type	Total charging sessions[7]	Number of sites or ports	Average daily charging sessions per site	Average connected time per session (min)	Average charge time per session (min)	Average energy per session (kWh)	Total energy (kWh)	Estimated miles driven on charge received[8]
Fueling and Convenience	**4,673**	**11 sites**	**2.3**	**40**	**39**	**16.1**	**75,315**	**236,246**
DCFC	3,696	22 ports	1.8	37	36	19.3	71,322	223,720
Level 2	977	22 ports	0.5	53	51	4.1	3,993	12,526
Dining	**3,282**	**7 sites**	**2.5**	**52**	**49**	**18.3**	**60,061**	**188,398**
DCFC	2,560	17 ports	2.0	41	40	21.8	55,869	175,247
Level 2	722	14 ports	0.6	93	83	5.8	4,193	13,151
Retail	**13,477**	**17 sites**	**4.3**	**49**	**45**	**14.4**	**193,471**	**606,873**
DCFC	9,491	35 ports	3.0	36	35	18.0	170,401	534,508
Level 2	3,986	34 ports	1.3	79	70	5.8	23,070	72,365
Municipal Parking	**2,846**	**5 sites**	**3.1**	**63**	**58**	**14.3**	**40,659**	**127,538**
DCFC	1,799	8 ports	2.0	38	37	18.0	32,389	101,597
Level 2	1,047	12 ports	1.1	105	94	7.9	8,270	25,941
Lodging	**2,066**	**9 sites**	**1.2**	**148**	**96**	**17.2**	**35,545**	**111,497**
DCFC	1,158	14 ports	0.7	39	38	19.8	22,882	71,776

7 Sessions that dispensed no energy are excluded from this report.

8 Assumes 31.88 kWh per 100 miles. Source: Verified Carbon Standard. 2018. *Methodology for Electric Vehicle Charging Systems.* https://verra.org/wp-content/uploads/2018/09/VM0038-Methodology-for-Electric-Vehicle-Charging-Systems-v1.0-18-SEP-2018.pdf.

Site type and station type	Total charging sessions[7]	Number of sites or ports	Average daily charging sessions per site	Average connected time per session (min)	Average charge time per session (min)	Average energy per session (kWh)	Total energy (kWh)	Estimated miles driven on charge received[8]
Level 2	908	18 ports	0.5	288	169	13.9	12,663	39,722
All Sites and Stations	**26,344**	**49 sites**	**2.9**	**57**	**50**	**15.4**	**405,052**	**1,270,553**
All Sites DCFC	**18,704**	**96 ports**	**2.1**	**37**	**36**	**18.9**	**352,863**	**1,106,848**
All Sites Level 2	**7,640**	**100 ports**	**0.8**	**105**	**84**	**6.8**	**52,189**	**163,705**

Source: ChargePoint, Inc.

Table 3. Charging Statistics by Rural/Urban Status and Station Type, Mar – Aug 2021

Site type and station type	Total charging sessions[9]	Number of sites or ports	Average daily charging sessions per site	Average connected time per session (min)	Average charge time per session (min)	Average energy per session (kWh)	Total energy (kWh)	Estimated miles driven on charge received[10]
Rural	**12,175**	**28 sites**	**2.4**	**68**	**57**	**16.4**	**199,822**	**626,793**
DCFC	8,265	55 ports	1.6	39	38	20.5	169,093	530,406
Level 2	3,910	58 ports	0.8	129	96	7.9	30,728	96,387
Urban	**14,169**	**21 sites**	**3.7**	**47**	**44**	**14.5**	**205,231**	**643,759**
DCFC	10,439	41 ports	2.7	35	34	17.6	183,770	576,442
Level 2	3,730	42 ports	1.0	80	71	5.8	21,461	67,317
All Sites and Stations	**26,344**	**49 sites**	**2.9**	**57**	**50**	**15.4**	**405,052**	**1,270,553**
All Sites DCFC	**18,704**	**96 ports**	**2.1**	**37**	**36**	**18.9**	**352,863**	**1,106,848**
All Sites Level 2	**7,640**	**100 ports**	**0.8**	**105**	**84**	**6.8**	**52,189**	**163,705**

Source: ChargePoint, Inc.

9 Sessions that dispensed no energy are excluded from this report.

10 Assumes 31.88 kWh per 100 miles. Source: Verified Carbon Standard. 2018. *Methodology for Electric Vehicle Charging Systems.* https://verra.org/wp-content/uploads/2018/09/VM0038-Methodology-for-Electric-Vehicle-Charging-Systems-v1.0-18-SEP-2018.pdf.

Table 4. Driver Characteristics by Site Type and Station Type, Mar – Aug 2021

Site and station type	Percent of sessions conducted by ChargePoint account holders	Number of sessions conducted by ChargePoint account holders	Among ChargePoint account holders:[11]	
			Unique drivers identified	Percent of sessions conducted by regular commuters[12]
Fueling and Convenience	**85%**	**3,951**	**1,829**	**13%**
DCFC	85%	3,140	1,382	16%
Level 2	83%	811	513	0%
Dining	**90%**	**2,966**	**1,116**	**22%**
DCFC	90%	2,314	857	21%
Level 2	90%	652	320	27%
Retail	**86%**	**11,569**	**4,073**	**21%**
DCFC	85%	8,102	2,731	22%
Level 2	87%	3,467	1,617	20%
Municipal Parking	**88%**	**2,518**	**977**	**20%**
DCFC	88%	1,576	589	23%
Level 2	90%	942	460	16%
Lodging	**88%**	**1,812**	**973**	**5%**

11 ChargePoint cannot identify unique drivers among those who do not use a ChargePoint account to initiate their charging sessions thus regular commuters can be identified only among those who use their ChargePoint account to initiate their session.

12 Regular commuters defined as those who use any station at the site at least 24 times within the reporting period.

Site and station type	Percent of sessions conducted by ChargePoint account holders	Number of sessions conducted by ChargePoint account holders	Among ChargePoint account holders:[11]	
			Unique drivers identified	Percent of sessions conducted by regular commuters[12]
DCFC	86%	1,000	499	10%
Level 2	89%	812	522	0%
All Sites and Stations	**87%**	**22,816**	**7,865**	**19%**
All Sites DCFC	**86%**	**16,132**	**5,096**	**20%**
All Sites Level 2	**87%**	**6,684**	**3,320**	**15%**

Source: ChargePoint, Inc.

Table 5. Driver Characteristics by Rural/Urban Status and Station Type, Mar – Aug 2021

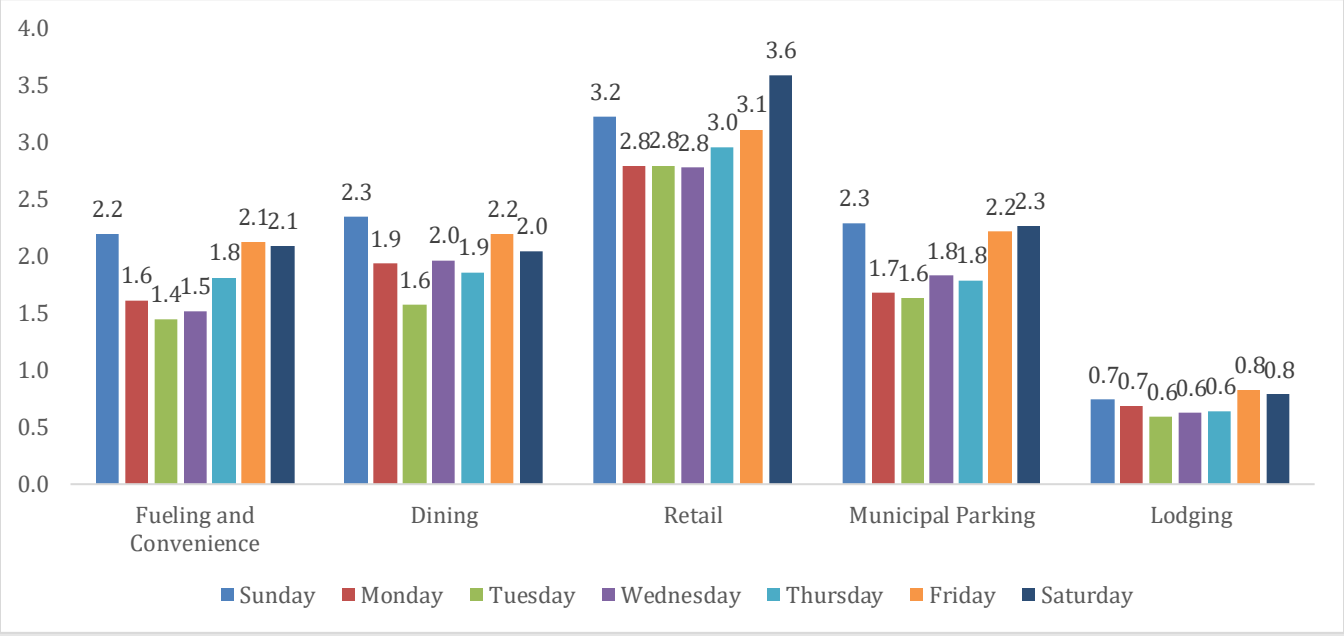
Site and station type	Percent of sessions conducted by ChargePoint account holders	Number of sessions conducted by ChargePoint account holders	Among ChargePoint account holders:[13]	
			Unique drivers identified	Percent of sessions conducted by regular commuters[14]
Rural	**88%**	**10,737**	**4,269**	**18%**
DCFC	89%	7,319	2,638	21%
Level 2	87%	3,418	1,886	12%
Urban	**85%**	**12,079**	**4,263**	**19%**
DCFC	84%	8,813	3,055	19%
Level 2	88%	3,266	1,494	18%
All Sites and Stations	**87%**	**22,816**	**7,865**	**19%**
All Sites DCFC	**86%**	**16,132**	**5,096**	**20%**
All Sites Level 2	**87%**	**6,684**	**3,320**	**15%**

Source: ChargePoint, Inc.

13 ChargePoint cannot identify unique drivers among those who do not use a ChargePoint account to initiate their charging sessions thus regular commuters can be identified only among those who use their ChargePoint account to initiate their session.

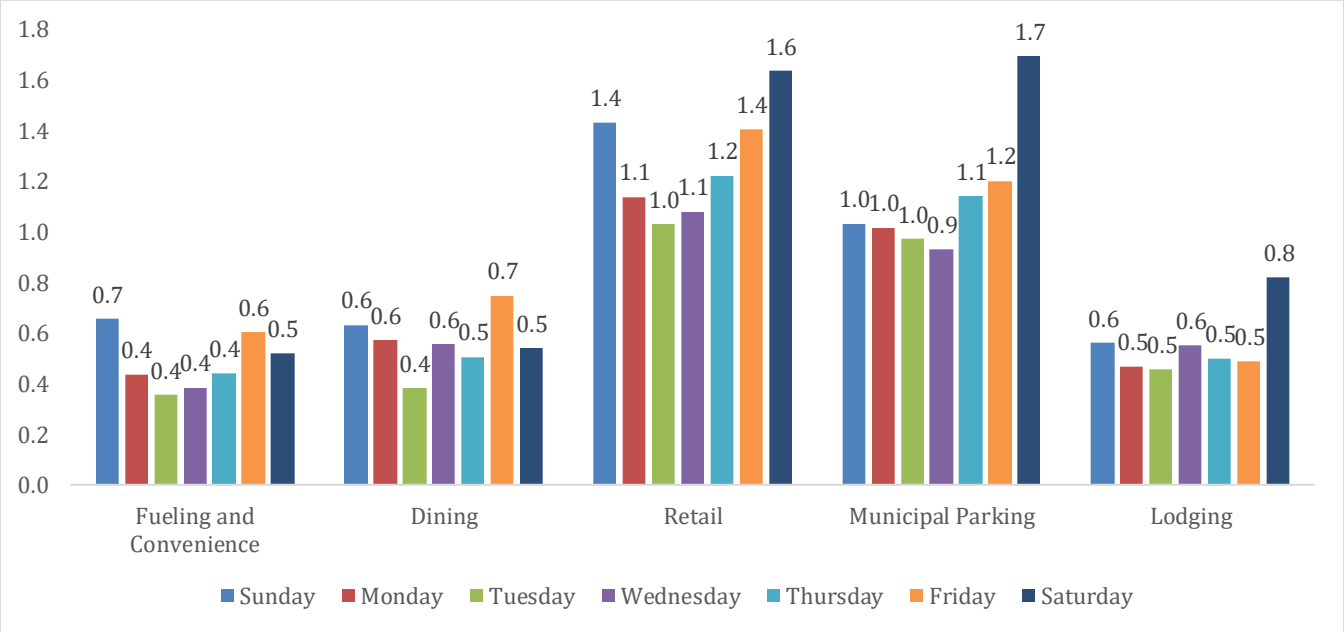
14 Regular commuters defined as those who use any station at the site at least 24 times within the reporting period.

Figure 5. Average Daily DCFC Charging Sessions per Site, by Day of the Week and Site Type, Mar – Aug 2021



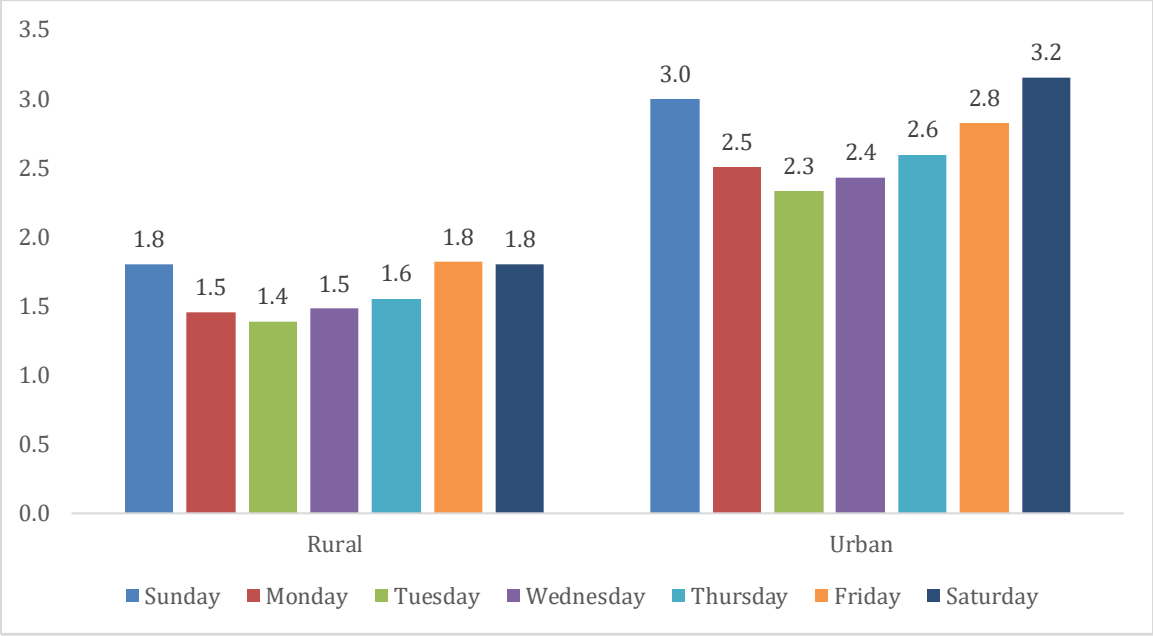
Source: ChargePoint, Inc.

Figure 6. Average Daily L2 Charging Sessions per Site, by Day of the Week and Site Type, Mar – Aug 2021



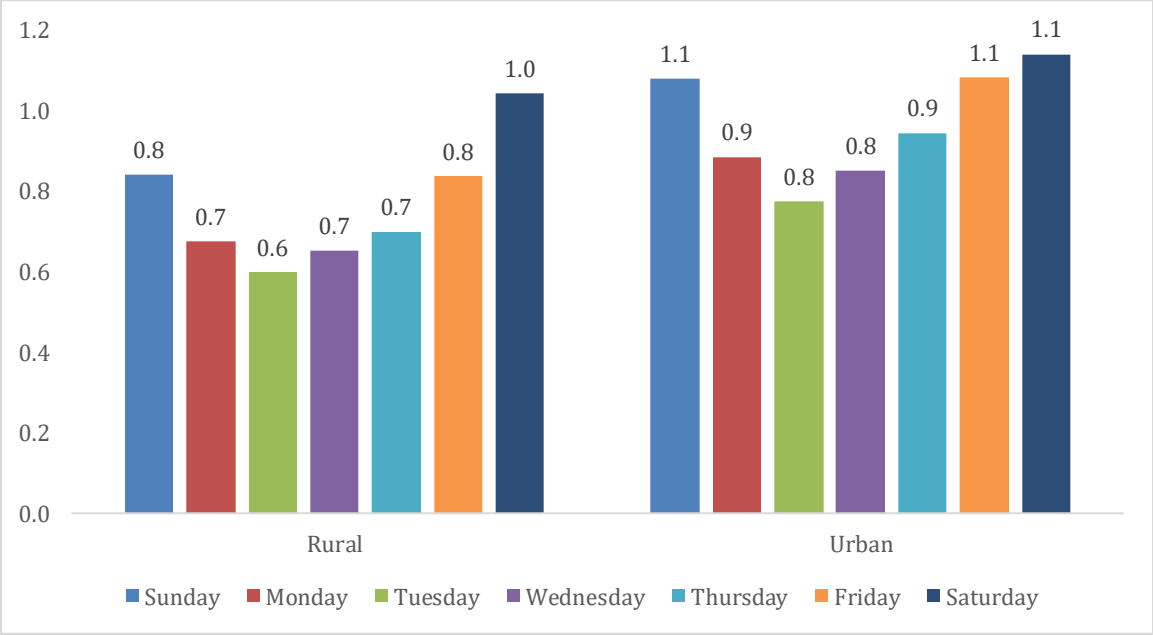
Source: ChargePoint, Inc.

Figure 7. Average Daily DCFC Charging Sessions per Site, by Day of the Week and Rural/Urban Status, Mar – Aug 2021



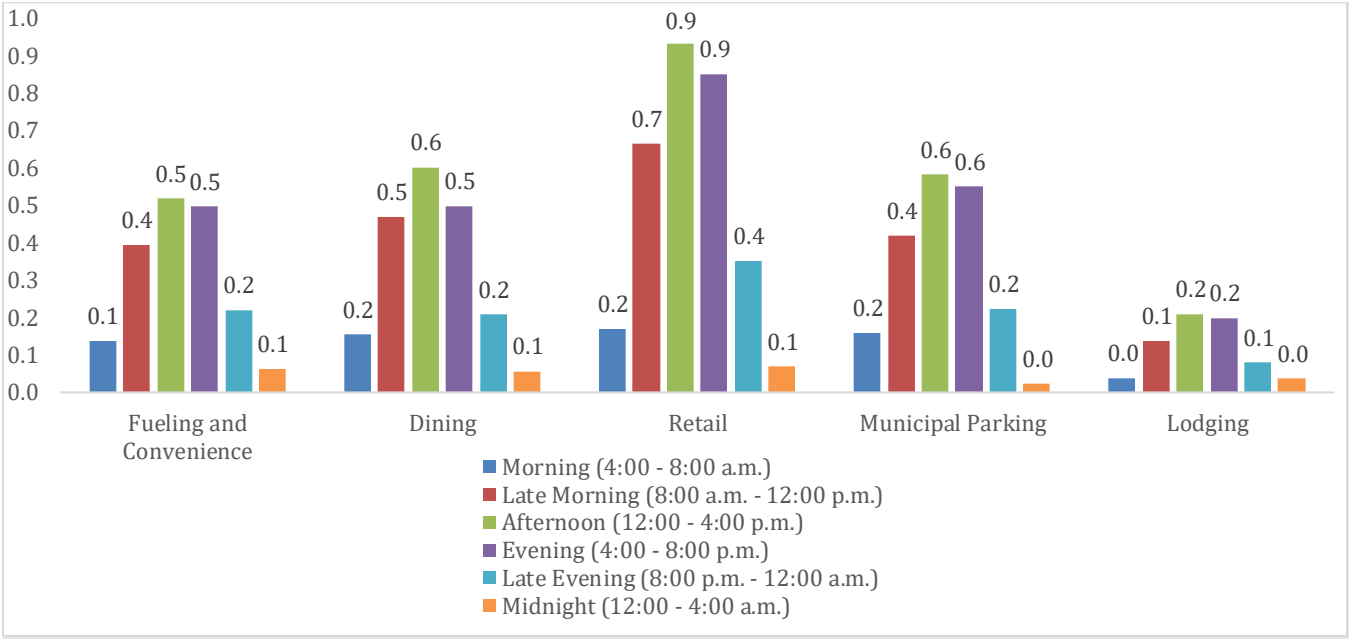
Source: ChargePoint, Inc.

Figure 8. Average Daily L2 Charging Sessions per Site, by Day of the Week and Rural/Urban Status, Mar – Aug 2021



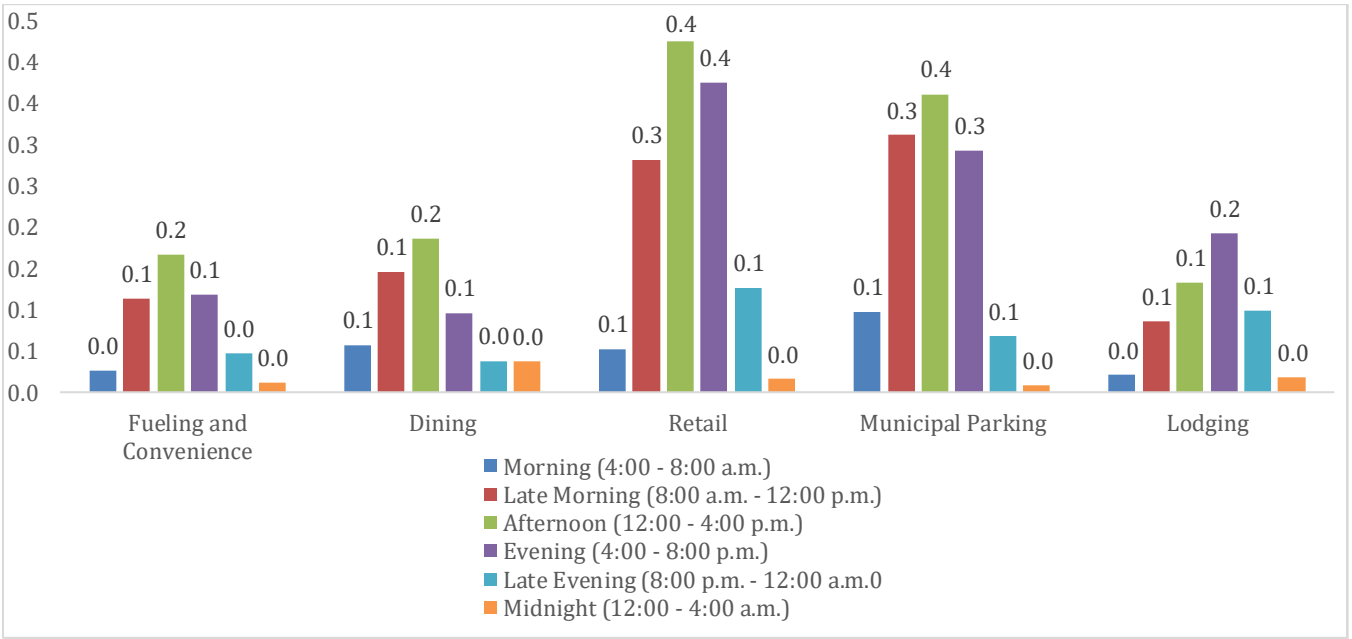
Source: ChargePoint, Inc.

Figure 9. Average Daily DCFC Charging Sessions per Site, by Time of Day and Site Type, Mar – Aug 2021



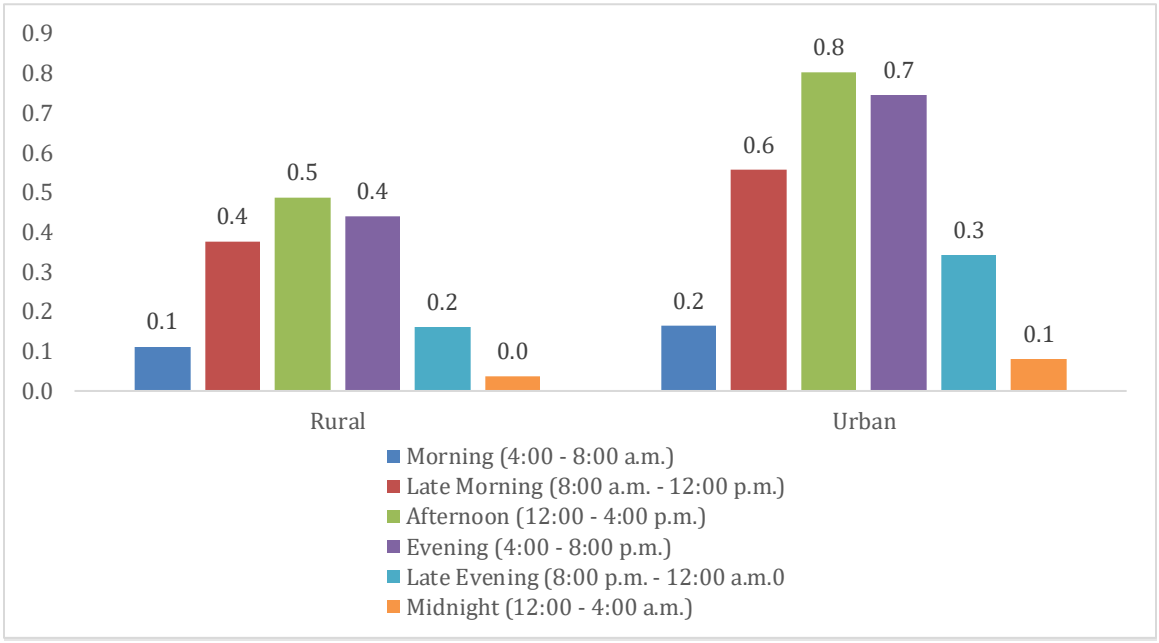
Source: ChargePoint, Inc. Sessions categorized by session start time.

Figure 10. Average Daily L2 Charging Sessions per Site, by Time of Day and Site Type, Mar – Aug 2021



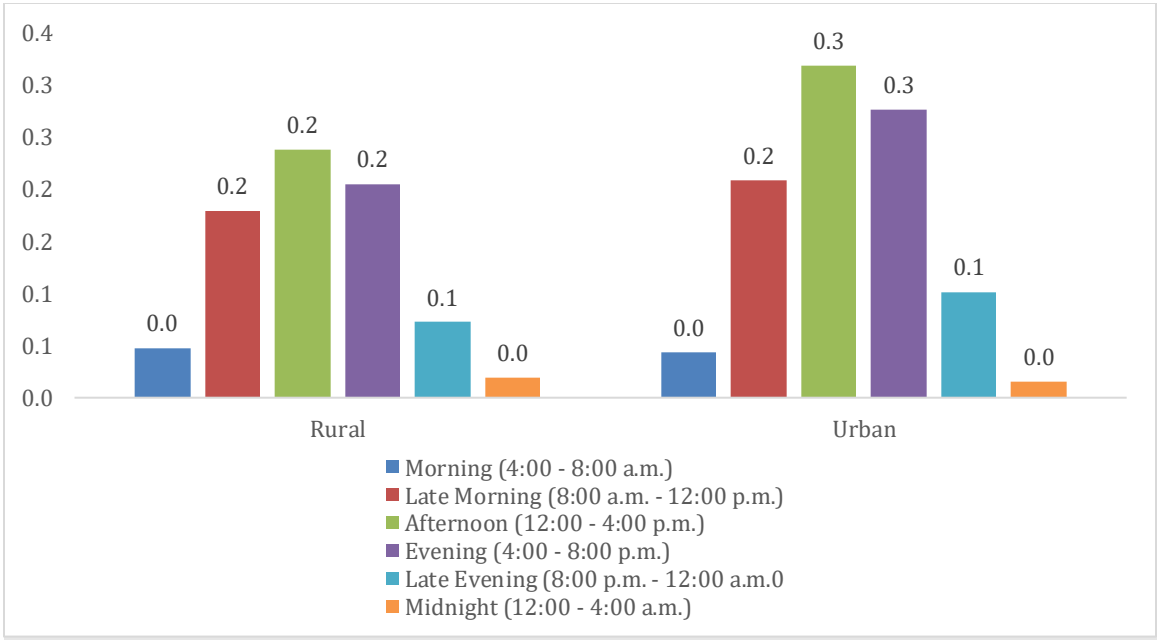
Source: ChargePoint, Inc. Sessions categorized by session start time.

Figure 11. Average Daily DCFC Charging Sessions per Site, by Time of Day and Rural/Urban Status, Mar – Aug 2021



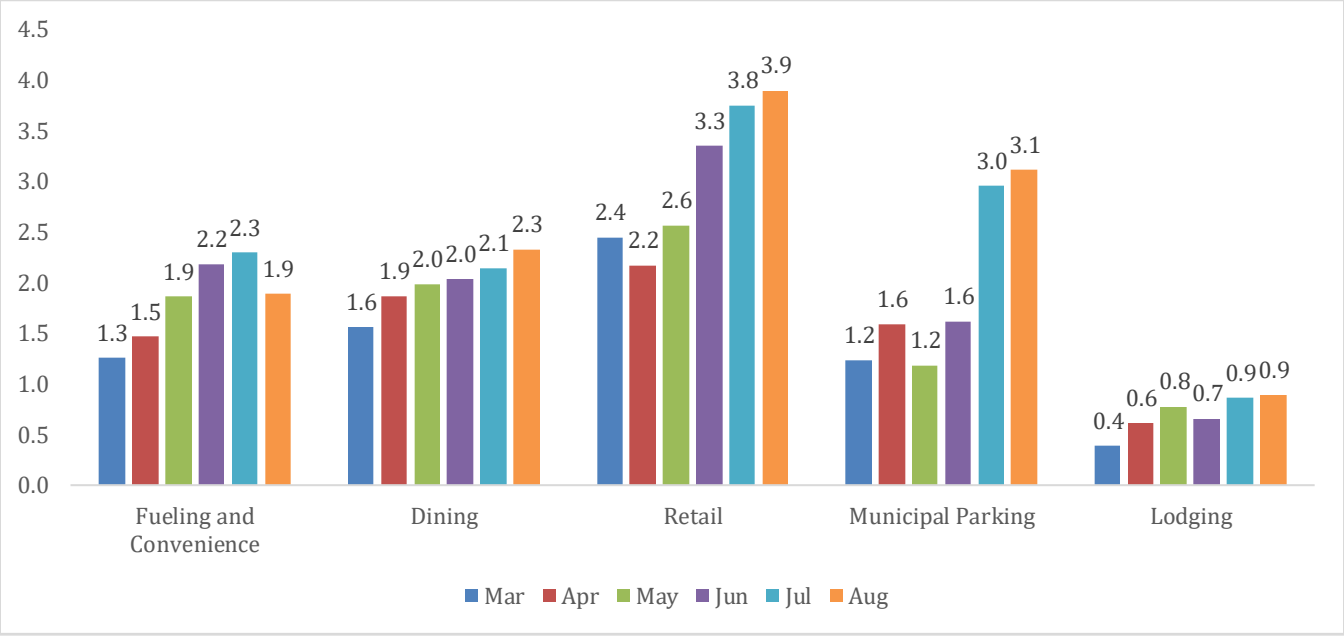
Source: ChargePoint, Inc. Sessions categorized by session start time.

Figure 12. Average Daily L2 Charging Sessions per Site, by Time of Day and Rural/Urban Status, Mar – Aug 2021



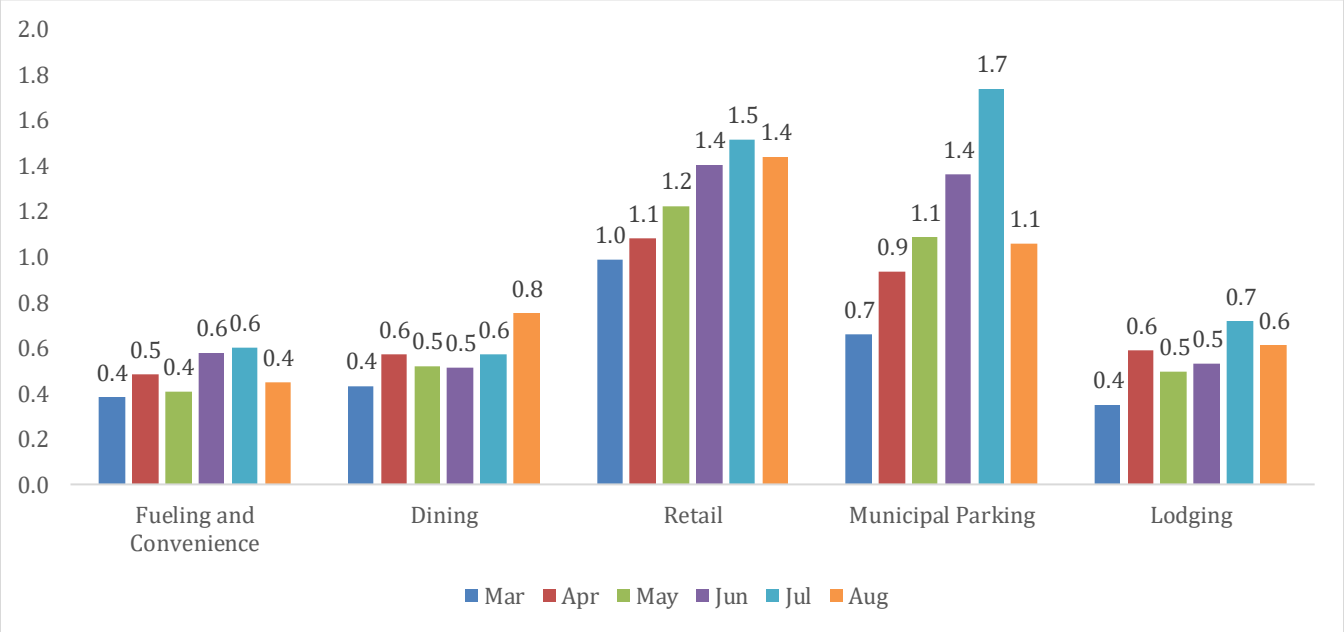
Source: ChargePoint, Inc. Sessions categorized by session start time.

Figure 13. Average Daily DCFC Charging Sessions per Site, by Month and Site Type, Mar – Aug 2021



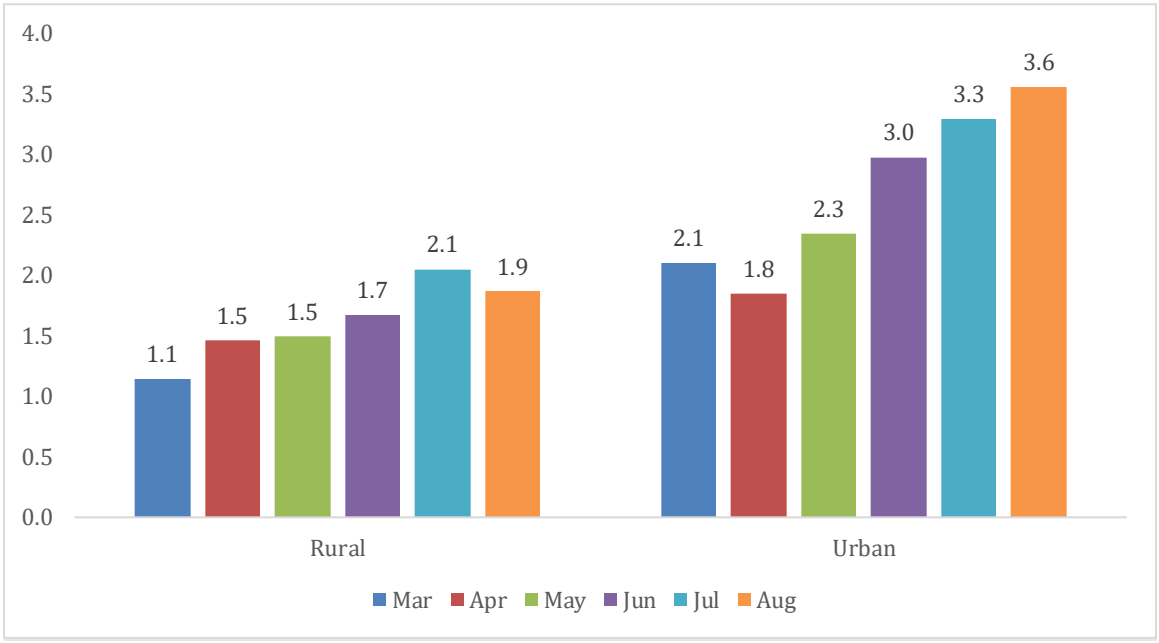
Source: ChargePoint, Inc.

Figure 14. Average Daily L2 Charging Sessions per Site, by Month and Site Type, Mar – Aug 2021



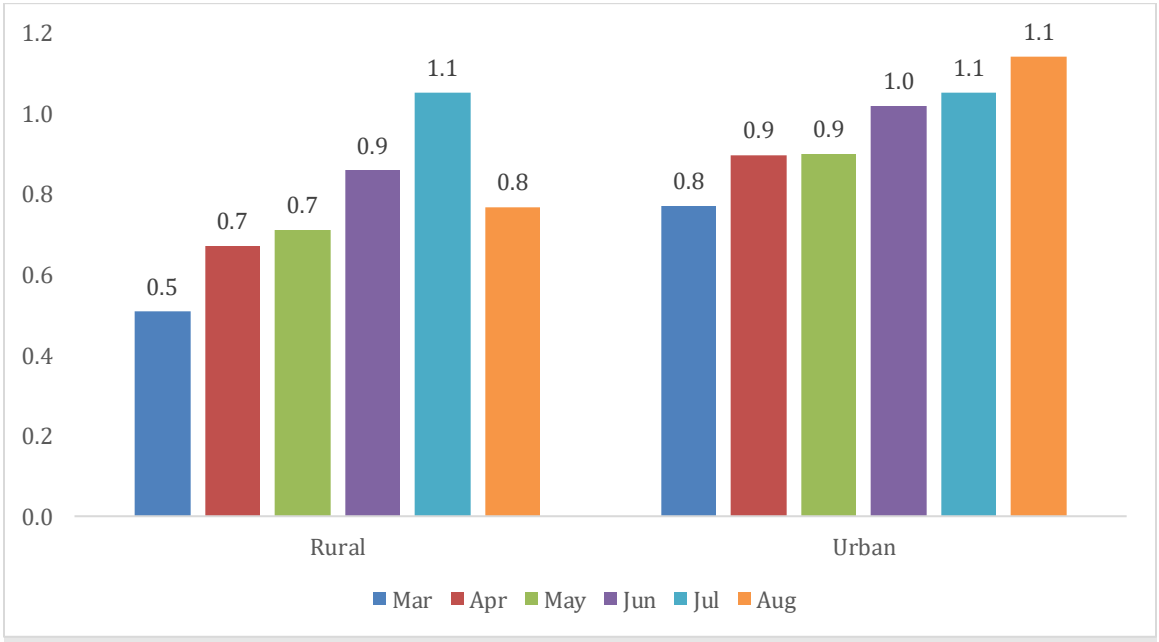
Source: ChargePoint, Inc.

Figure 15. Average Daily DCFC Charging Sessions per Site, by Month and Rural/Urban Status, Mar – Aug 2021



Source: ChargePoint, Inc.

Figure 16. Average Daily L2 Charging Sessions per Site, by Month and Rural/Urban Status, Mar – Aug 2021



Source: ChargePoint, Inc.

CHAPTER 5:
Benefits to California

Jobs

More than 27,500 labor hours were documented under this grant – some of which were reimbursed by the Energy Commission while others were contributed as match share. These labor hours, which translate to 13.2 full time job-years,[15] were recorded by ChargePoint and its major subcontractors. The grant supported additional labor hours for minor subcontractors during the installation stage; operations and maintenance jobs also will be required over the lifetime of the charging stations. Thus, it can be assumed that the true number of job-years stimulated by this grant exceeds 13.2.

Gasoline displaced

Assuming the EV miles enabled by these charging stations would have otherwise been conducted in gasoline-fueled vehicles, 43,662 gallons of gasoline were displaced during the six-month reporting period. This is based on an EV average of 0.3188 kWh per mile and a combustion vehicle average of 29.1 miles per gallon – translating to approximately 0.11 gallons displaced per kWh charged.[16]

Greenhouse gas reductions

Using the same assumption that electric travel replaced an equivalent amount of gasoline-fueled travel, the charging stations funded by this grant reduced greenhouse gas emissions by 307 metric tons of CO_2-equivalent during the six-month reporting period. This is based on a U.S. average of 0.0088 metric tons of CO_2-equivalent per gallon of gasoline[17] and the California average of 0.000191 metric tons per kWh emitted by the electric grid.[18] Combined with the mileage statistics described in the previous

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15 Assumes 2,080 labor hours in a full-time job year.

16 Verified Carbon Standard. 2018. *Methodology for Electric Vehicle Charging Systems.* https://verra.org/wp-content/uploads/2018/09/VM0038-Methodology-for-Electric-Vehicle-Charging-Systems-v1.0-18-SEP-2018.pdf.

17 Verified Carbon Standard. 2018. *Methodology for Electric Vehicle Charging Systems.* https://verra.org/wp-content/uploads/2018/09/VM0038-Methodology-for-Electric-Vehicle-Charging-Systems-v1.0-18-SEP-2018.pdf.

18 U.S. Environmental Protection Agency. 2020. *eGRID Summary Tables 2018*. https://www.epa.gov/sites/production/files/2020-01/documents/egrid2018_summary_tables.pdf.

paragraph, this equates to a reduction of approximately 0.000241 metric tons of CO_2-equivalent per electric mile traveled.

Other air pollution reductions

While not quantified for this report, EVs also reduce emissions from nitrogen oxides, particulate matter and other pollutants as compared to gasoline-fueled vehicles. These pollutants can cause a variety of respiratory, cardiovascular and reproductive health problems, as well as premature death. Communities located next to highways and other major roads, which are often economically disadvantaged, appear to suffer the most health impacts of pollution emitted by vehicles.[19] Hence, electric travel enabled by this project's charging stations likely contribute to improved health outcomes for nearby communities.

19 U.S. Environmental Protection Agency. *How Mobile Source Pollution Affects Your Health.* https://www.epa.gov/mobile-source-pollution/how-mobile-source-pollution-affects-your-health

CHAPTER 6:
Lessons Learned and Recommendations

ChargePoint executed much of this project concurrently and in close coordination with three other CEC-funded projects to electrify California's Interstate 5 corridor (Agreements ARV-15-061, ARV-15-062 and ARV-15-063). These projects experienced similar challenges and successes; thus, this section highlights some of the lessons from all four projects.

Site acquisition

- **Potential site hosts may require basic education about EV charging.** Site host recruitment began in 2015, when the EV market was nascent in California – especially in the remote, rural areas covered by this grant. Accordingly, site host negotiations typically required starting with a basic education about EVs and EV charging. As the market has evolved, potential site hosts may already see EV drivers visiting their businesses and have some basic knowledge and interest in installing EV charging. In this way, site host recruitment is easier today than it was a few years ago. However, funding agencies planning similar agreements in areas with lower EV market share may want to allow plenty of time for site host recruitment efforts.
- **Some site hosts expect to receive ongoing rental payments for installing EV charging on their land.** As the EV market has grown, some EV charging providers have offered site hosts in high demand areas annual payments of $5,000 – $10,000 to operate charging stations at their properties. This expectation has impeded site host negotiations when no funds are available to offer these payments. This will become less of an issue with increased EV market penetration, demand charge relief, and elevated site host interest in owning and operating their own DCFCs. There are some site hosts willing to host chargers at no costs due to their sustainability goals or the desire to attract more drivers to their business.
- **Historical survey or utility data may need to be updated.** At one site, ChargePoint had broken ground on construction before discovering that the site was actually on Caltrans' right of way. The entire installation, which had been designed based on historical survey data, had to be moved by 15 feet. At another site, a utility had initially assumed that a site had easy access to three-phase power, but that turned out to be inaccurate or outdated information. If possible, charging station installers should confirm data via new surveys and site walks to avoid these types of scenarios, which can add to project costs, cause significant delays, or simply make a site unbuildable.

- **Site hosts sell their property**. Even when a site host agreement is in place with provisions to extend the charging station project to the next property owner, the installation process will likely be delayed (and possibly fall through) if the property sells. Real estate transactions happen regularly. ChargePoint encountered several situations where properties sold before construction of the agreed-upon charging stations began. It then took a few months to make contact with the new site host and restart the process to educate, engage and gain official approval for the project. Funding agencies and installers should plan contingencies in their timeline for these potential scenarios, try to build as quickly as possible after a site host agreement is executed, and allow flexibility in contract language to change site locations without a formal amendment.

Permitting

- **The permitting process caused delays at some sites, but AB 1236 and the GO-Biz are helping.** Across all ChargePoint's CEC-funded highway corridor sites, the project team submitted permit applications as early as late 2017 and as late as mid-2020. California's law requiring local jurisdictions to streamline permitting processes for EV charging stations, known as AB 1236, took effect in September 2017. ChargePoint found that permit review times have improved since 2017, as both building departments and contractors have become more familiar with AB 1236 requirements and proper permit application documentation. While the project team still encountered a few building departments requiring measures in violation of AB 1236 as late as 2019-2020, they have typically adjusted their approach once educated about the details of the law. However, the back-and-forth communications about AB 1236 still can add weeks or months to a project. In addition, some building departments have applied streamlined reviews to the initial permit application, but not to corrections submitted later in the process. California can continue to improve permitting timelines by conducting ongoing outreach efforts to building departments to ensure even greater fluency in AB 1236 requirements, a process which the Governor's Office of Business and Economic Development (GO-Biz) is doing now. Other states seeking to accelerate deployment of EV charging infrastructure should consider implementing similar legislation and outreach efforts.
- **California's EV charging station accessibility regulation is interpreted differently across local jurisdictions**. The California Building Code requires charging stations to meet certain accessibility requirements to accommodate individuals with disabilities. These requirements, which scale with the number of charging stations installed, include electric vehicle parking spaces wide enough to accommodate a van and adjacent accessible aisles wide and flat enough to serve a wheelchair. Accessibility requirements are enforced at the local level through

the permitting process. ChargePoint found that local jurisdictions interpreted accessibility requirements in different ways (sometimes there were even different interpretations within the same jurisdiction), introducing unexpected requirements either during plan review or at final inspection after construction was complete. Changing the planned/constructed location of an access aisle or accessible route and incorporating a path of travel involves much more than simply re-striping parking stalls; it can potentially add tens of thousands of dollars to development and construction costs. Adding another van-accessible parking space reduces a site host's total parking count, a precious resource for many businesses. California's Department of the State Architect updated the state accessibility regulation in July 2021, providing more clarity that hopefully will mitigate these risks. Additional outreach to local governments on how to apply these new requirements would be helpful. In addition, funding agencies may consider providing a contingency budget to adapt to new versions of the code, as grant budgets are often designed for projects that will take place over the course of a few years.

Utility design and energization

- **Coordinating with the utility may present a significant challenge in executing projects efficiently.** EV charging installations require the local electric utility to draw up designs before construction begins and energize the stations after most construction is complete. These activities typically involve different departments within any given utility – and these departments may not communicate with each other or potentially even prohibit the installer to coordinate with multiple departments simultaneously. The investor-owned utilities, being much larger organizations, tend to be more siloed than the municipal utilities or co-ops. In addition to extending the overall project timeline, energization delays put equipment at risk for theft. Utilities can help installers work more efficiently by establishing one point of contact and one database to facilitate interactions with all relevant utility departments. In addition, it may be helpful for the Public Utilities Commission to collect and publish data on average utility energization timelines.
- **Utility easements can delay a project.** Utility easements are commonly required when conductors must be run to the charging stations from a pole or transformer. This presents a risk that depends on the site host's or a neighboring property owner's willingness to sign the easement. Acquiring a notarized signature for utility easements delayed several projects. And in one instance, the local utility initially believed an easement was not necessary – an assessment based on decades-old data. After construction began, stakeholders discovered the error and ChargePoint had to negotiate with a neighboring property owner before the project could move forward. Installers should confirm that utility

easement information is up to date before investing significant resources or breaking ground at a site, and plan appropriate time for executing utility easements.
- **Energization can interrupt some business operations.** To energize stations, the power may need to be shut off at the site host property for up to eight hours. This blackout may be mitigated by using a generator, but this adds considerable cost and there will still likely be a blackout of an hour or two. This may negatively impact businesses that are open 24/7 or that provide critical services. Installers should ensure site hosts understand the impact of energization before beginning a project; they can help the site host by providing a checklist of potential systems they may need to reboot.

Construction

- **Some sites prohibit construction during their busy season or winter.** Some retail stores implement construction blackout periods for a few months during the holiday shopping season. Tourism-dependent cities or businesses may prohibit construction during their high season. Similar no-build periods may be imposed by winter conditions at high altitude sites. Typically, projects cannot be put on hold mid-construction during a blackout period; construction must be fully completed before the blackout or wait until after the blackout to begin. In these cases, a relatively short delay in starting construction can turn into in a several-month delay if the adjusted project schedule would overlap with the blackout period. Installers should account for these blackout periods in their project planning.
- **It can be difficult to find contractors with charging station installation experience in rural areas.** This issue is of particular importance for programs seeking to electrify highway corridors to enable long-distance trips, as these initiatives inherently include remote locations. Funding agencies may help mitigate this challenge by authorizing budgets to cover travel expenses and investing in workforce development efforts in rural areas.
- **Equipment theft is a risk at open construction sites.** For example, at one site that waited to be energized for a few months, charging cables were cut and stolen four times, likely for the assumed value of the copper. This risk can be mitigated through quick energization schedules and by building in a contingency budget to replace stolen equipment.

Signage

- **Identifying who has jurisdiction over planned wayfinding signage can be time consuming.** Before Caltrans will install highway signage, wayfinding signage must be in place to direct drivers from highway exits to the charging site. It can be difficult to track down which agency grants encroachment permits

for the streets between the highway and the charging site. Local jurisdictions can help this process by providing a contact for encroachment permits as part of their EV charging station permitting process. On occasion, what appear to be local streets (i.e., not labeled as state routes) have been transferred to Caltrans' jurisdiction, so there may be no need for a local permit. Or the alternate scenario happens, where a state road was transferred to the local jurisdiction. It would be helpful for Caltrans to publish more online resources that identify the boundaries between Caltrans and local jurisdictions' rights of way, so that EV charging station installers can efficiently identify the correct points of contact to install signage.

Operations

- **Demand charges significantly impact the value proposition for station owners**. This is particularly true for remote, rural charging stations that might be used infrequently in the near term. For example, a low-utilization site with two DCFCs could rarely experience two high-capacity vehicles charging at the same time and incur demand charges on that peak power draw. But the low overall utilization gives the station owner little opportunity to earn enough energy- or time-based revenue to cover these costs. Utilities with low demand charges (either as part of a standard rate schedule or a special rate for EV charging stations) help make EV charging station projects a more attractive investment.

Grant agreement terms

- **Stacking state, utility and/or regional air district incentive programs can improve cost efficiency.**
  The North Coast Unified Air Quality Management District and San Joaquin Valley Air Pollution Control District co-funded several of ChargePoint's installations across the state. This allowed ChargePoint to add more charging stations into the same construction project – thus avoiding the costs associated with installing the additional stations at a brand-new site or later re-mobilizing a construction crew to the same site. When possible, funding agencies can promote these kind of cost efficiencies by aligning timelines with other incentive programs and allowing station owners to leverage multiple programs.
- **Contract terms and conditions may limit selection of subcontractors.**
  Over the course of ChargePoint's CEC-funded projects, four subcontractors with experience installing charging stations reported that they were unwilling to work under the prime contract's terms and conditions. Specifically, they expressed concern about complying with prevailing wage requirements, providing the documentation required of major subcontractors, limiting their profit to a 10% markup on select expense categories, or agreeing to the many other flow-down

provisions. These conditions may prevent CEC-funded projects from leveraging a wide pool of subcontractors. Furthermore, even subcontractors that do agree to participate in a CEC project may be disincentivized from providing their most competitive bids or performing at their highest level if they know it is cumbersome for the prime contractor to amend the contract to add other subcontractors or shift budget and scope among subcontractors. The CEC and other funding agencies may want to consider more flexible conditions to ensure plenty of subcontractors participate in these grants and offer competitive bids.

GLOSSARY

CALIFORNIA DEPARTMENT OF TRANSPORTATION (Caltrans) – Responsible for the design, construction, maintenance, and operation of the California State Highway System, as well as that portion of the Interstate Highway System within the state's boundaries.[20]

CALIFORNIA ENERGY COMMISSION (CEC) – The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are:

1. Forecasting future statewide energy needs
2. Licensing power plants sufficient to meet those needs
3. Promoting energy conservation and efficiency measures
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels
5. Planning for and directing state response to energy emergencies.

CONNECTOR: A connector is what is plugged into a vehicle to charge it. Multiple connectors and connector types (such as CHAdeMO and CCS) can be available on one port, but only one vehicle will charge at a time. Connectors are sometimes called plugs.[21]

DIRECT CURRENT (DC) – A charge of electricity that flows in one direction and is the type of power that comes from a battery.

DIRECT CURRENT FAST CHARGER (DCFC) – DCFCs enable rapid charging, typically through 208/480V AC three-phase electrical service. These units provide 60 to 80 miles of range per 20 minutes of charging.[22]

ELECTRIC VEHICLES (EV) – A broad category that includes all vehicles that are fully powered by Electricity or an Electric Motor.

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20 Department of Transportation glossary webpage https://dot.ca.gov/az.html

21 Alternative Fuels Data Center: https://afdc.energy.gov/fuels/electricity_infrastructure.html

22 Alternative Fuels Data Center: https://afdc.energy.gov/fuels/electricity_infrastructure.html

LEVEL 2 (L2) – Level 2 equipment offers charging through 240V (typical in residential applications) or 208V (typical in commercial applications) electrical service. These units provide 10 to 20 miles of range per hour of charging.[23]

PORTS: A charging station port provides power to charge only one vehicle at a time even though it may have multiple connectors.[24]

23 Alternative Fuels Data Center: https://afdc.energy.gov/fuels/electricity_infrastructure.html

24 Alternative Fuels Data Center: https://afdc.energy.gov/fuels/electricity_infrastructure.html

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